Facility: **Watts Bar June 2011**	Scenario No.:**1**	Op Test No.: **1**	
Examiners:		Operators:	**SRO**
			RO
			BOP

Initial Conditions: 100% power, BOL. RCS boron is 1031 ppm. Control Bank D is at 220 steps.

Turnover: Train A/Channel I Work Week. 1A-A RHR pump is out of service for motor bearing replacement. LCOs 3.5.2 and 3.6.6 were entered 6 hours ago. Repairs to the 1A-A RHR pump are expected to be completed in 16 hours. A power reduction to 95% at 10%/hour is to be conducted to support removal of the 1A High Pressure feedwater heater from service. A Reactivity Plan has been provided by Reactor Engineering. Chemistry has requested that letdown flow be maintained at 75 gpm during the power reduction. A Severe Thunderstorm Warning has been issued for Rhea, Meigs, and McMinn Counties for the next 2 hours.

Event No.	Malf. No.	Event Type*	Event Description
1	n/a	R-RO N-SRO/BOP	Reduce power to 95% using GO-4, "Normal Power Operations," Section 5.3, "Unit Shutdown from 100% to 30% Reactor Power," to remove the 1A high pressure feedwater heater from service.
2	rp18d	I-BOP I-RO TS-SRO	120 VAC is lost to Eagle Rack 1-R-4, causing multiple instrument failures. Requires entry into AOI-2, "Malfunction of Reactor Control System," AOI-16, "Loss of Normal Feedwater," and AOI-44, "Eagle 21 Malfunctions." Requires Tech Spec evaluation.
3	rx07a 50	I-RO TS-SRO	1-PT-68-340 fails to 2100 psig. Requires entry into AOI-18, "Malfunction of Pressurizer Pressure Control System." Requires a Tech Spec evaluation.
4*	***rw14b***	***C-BOP TS-SRO***	***Train B ERCW Pipe break at the Intake Pumping Station. Requires entry into AOI-13, "Loss of Essential Raw Cooling Water." Requires a Tech Spec evaluation.***
5	th03c 2	C-RO	Small RCS leak develops. Requires entry into AOI-6, "Small RCS Leak."
6	th03c 20	M-All	Small RCS leak propagates to a Small Break Loss of Coolant Accident. Requires entry into E-0, "Reactor Trip or Safety Injection."
7	si08g rp55c	BOP	1A-A Motor Drive Auxiliary Feedwater pump fails to auto start. Turbine Driven Auxiliary Feedwater Pumps fail to automatically start. Requires the BOP to manually start 1A-A MDAFW and TDAFW pump.
8	ed06b 19	M-All	1B-B 6.9 KV Shutdown Board trips on differential relay operation 45 seconds after the reactor is tripped. Loss of the remaining RHR pump requires entry into ECA-1.1, "Loss of RHR Sump Recirculation."

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

NOTE: Since all applicants are Instant SROs, event 4 is optional. This scenario will be validated with, and without event 4.

Scenario 1 - Summary

Initial Condition	100% power, BOL. RCS boron is 1031 ppm. Control Bank D is at 220 steps.

Turnover	Train A/Channel I Work Week. 1A-A RHR pump is out of service for motor bearing replacement. LCOs 3.5.2 and 3.6.6 were entered 6 hours ago. Repairs to the 1A-A RHR pump are expected to be completed in 16 hours. A power reduction to 95% at 10%/hour is to be conducted to support removal of the 1A High Pressure feedwater heater from service. A Reactivity Plan has been provided by Reactor Engineering. Chemistry has requested that letdown flow be maintained at 75 gpm during the power reduction. A Severe Thunderstorm Warning has been issued for Rhea, Meigs, and McMinn Counties for the next 2 hours.

Event 1	Reduce power to 95% using GO-4, "Normal Power Operations," Section 5.3, "Unit Shutdown from 100% to 30% Reactor Power," to remove the 1A high pressure feedwater heater from service.
Event 2	120 VAC is lost to Eagle Rack 1-R-4, causing multiple instrument failures. Requires entry into AOI-2, "Malfunction of Reactor Control System," AOI-16, "Loss of Normal Feedwater," and AOI-44, "Eagle 21 Malfunctions." Requires Tech Spec evaluation.
Event 3	1-PT-68-340 fails to 2100 psig. Requires entry into AOI-18, "Malfunction of Pressurizer Pressure Control System." Requires manual control of Master Pressure Controller to stabilize pressure before lift setpoint of one PORV is exceeded. Requires a Tech Spec evaluation and entry into LCO 3.3.1, Reactor Trip System Instrumentation and 3.3.2, Engineered Safety Feature Actuation System (ESFAS) Instrumentation.
Event 4	***Train B ERCW Pipe break at the Intake Pumping Station. Requires entry into AOI-13, "Loss of Essential Raw Cooling Water." Performance of AOI-13, "Loss of Essential Raw Cooling Water" will result in cross-connection of the ERCW trains. Tech Spec evaluation will require entry into LCO 3.0.3.***
Event 5	Small RCS leak develops. Requires entry into AOI-6,"Small Reactor Coolant System Leak." AOI-6,"Small Reactor Coolant System Leak" will be performed to Step 16, at which point the leak will propagate into a Small Break Loss of Coolant Accident.
Event 6	Small RCS leak propagates to a Small Break Loss of Coolant Accident. Requires evaluation of plant parameters and the initiation of a reactor trip and safety injection. entry into E-0,"Reactor Trip or Safety Injection."
Event 7	1A-A Motor Drive Auxiliary Feedwater pump fails to auto start. Turbine Driven Auxiliary Feedwater Pumps fail to automatically start. Requires the BOP to manually start 1A-A MDAFW and TDAFW pump.
Event 8	1B-B 6.9 KV Shutdown Board trips on differential relay operation 45 seconds after the reactor is tripped. Loss of the remaining RHR pump requires entry into ECA-1.1, "Loss of RHR Sump Recirculation."

Scenario 1 - Critical Task Summary

Critical Task 1	Establish the minimum required auxiliary feedwater flow rate to the steam generators by manually starting the 1A-A motor driven or the turbine driven auxiliary feedwater pump prior to transitioning from E-0, “Reactor Trip or Safety Injection,” to E-1, “Loss of Reactor or Secondary Coolant.”
Critical Task 2	Establish a controlled RCS cooldown at a rate not to exceed 100°F in an hour, to support the SI reduction sequence and preclude swapover to the containment sump.

Op Test No.: NRC	Scenario # 1	Event # 1	Page 1 of 44
Event Description:	Power reduction to remove the 1A high pressure feedwater heater from service.		

Time	Position	Applicant's Actions or Behavior

EXAMINER: The crew will implement GO-4, "Normal Power Operations," Section 5.3, "Unit Shutdown from 100% to 30% Reactor Power," at Step 13. The SRO may direct that a boration be started prior to the beginning of GO-4 actions.

EXAMINER: The SRO may elect to perform the shutdown using MANUAL rod control. SOI-85.01, "Control Rod Drive and Indication System," Section 5.6, "Manual Rod Control With Reactor At Power," is includes as an Attachment 1.

SOI-62.02 — **The following actions are taken from SOI-62.02, "Boron Concentration Control," Section 6.7, "Minor Boration."**

NOTES

1) Section 6.7, may be reproduced, laminated, displayed, reused, etc. as desired.
2) Minor Boration is defined as the addition of Boric Acid done several times each shift early in core life, to compensate for burnable poison burn-up, and maintain Tavg on program.

Time	Position	Applicant's Actions or Behavior
	RO	[1] **ENSURE** 1-HS-68-341H, BACKUP HEATER C [1-M-4], is ON, to equalize RCS-Pzr CB. ***RO determines that that the GREEN indicating light is DARK and the RED indicating light is LIT on 1-HS-68-341H, BACKUP HEATER C.***
	RO	[2] **ADJUST** 1-FC-62-139, BA TO BLENDER [1-M-6], for desired flow rate. ***RO may elect to maintain the flow rate already established in the makeup control system.***
	RO	[3] **ADJUST** 1-FQ-62-139, BA BATCH COUNTER [1-M-6], for required quantity. ***From the TI-7.012 "Reactivity Control Plan" provided, RO determines that 100 gallons of boron are required for the power reduction to 95%.***
	RO	[4] **PLACE** 1-HS-62-140B, VCT MAKEUP MODE [1-M-6], in BOR. ***RO rotates 1-HH-62-140B, VCT MAKEUP MODE from the AUTO position two positions to the right to the BOR position.***
	RO	[5] **TURN** 1-HS-62-140A, VCT MAKEUP CONTROL [1-M-6], to START. [5.1] **CHECK** Red light is LIT. ***RO rotates 1-HS-62-140A VCT MAKEUP CONTROL to the right to the START position, and allows the switch to return to the mid position. RO observes the RED indicating light LIT in 1-HS-62-140A.***

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Event Description: Power reduction to remove the 1A high pressure feedwater heater from service.

Time	Position	Applicant's Actions or Behavior
	RO	[6] **MONITOR** the following parameters: Instrument / Location / Parameters: 1-PI-62-122 / 1-M-6 / VCT PRESS 1-LI-62-129A / 1-M-6 / VCT LEVEL 1-FI-62-139 / 1-M-6 / BA TO BLENDER FLOW 1-FQ-62-139 / 1-M-6 / BA BATCH COUNTER 1-FI-62-142 / 1-M-6 / PW TO BLENDER FLOW 1-FQ-62-142 / 1-M-6 / PW BATCH COUNTER 1-LI-62-238 / 1-M-6 / BAT A LEVEL 1-LI-62-242 / 1-M-6 / BAT C LEVEL
	RO	[7] **WHEN** Boration is COMPLETE, **THEN** PLACE 1-HS-62-140B, VCT MAKEUP MODE, in AUTO. ***RO rotates 1-HH-62-140B, VCT MAKEUP MODE from the BOR position two positions to the left to the AUTO position.***
	RO	[8] TURN 1-HS-62-140A, VCT MAKEUP CONTROL, to **START**. [8.1] CHECK Red light is LIT. ***When the boration stopped automatically, 1-HS-62-140A VCT MAKEUP CONTROL received a STOP signal. To enable AUTO makeup, 1-HS-62-140A VCT MAKEUP must be rotated the right to the START position.***
	RO	[9] RETURN 1-FC-62-139, BA TO BLENDER [1-M-6], to desired flow rate. ***If the RO elected to maintain the flow rate already established in the makeup control system, then no adjustment will be made.***

Op Test No.:	NRC	Scenario #	1	Event #	1	Page	3 of 44
Event Description:	Power reduction to remove the 1A high pressure feedwater heater from service.						

Time	Position	Applicant's Actions or Behavior
GO-4		**The following actions are taken from GO-4, "Normal Power Operations," Section 5.3, "Unit Shutdown from 100% to 30% Reactor Power," beginning at Step 13.**
		NOTES 1) Turbine maybe operated in IMP IN above 30% turbine load as long as IMP IN does NOT cause unit instability IMP IN will control turbine load as a percentage of impulse pressure that correlates to % load vs. % of valve opening in IMP OUT. This will allow for a more linear load ascension 2) Turbine load change may be stopped by depressing the HOLD push button, using VPL, or by depressing the MANUAL push button
	BOP	[13] **INITIATE** load reduction by PERFORMING the following on the Turbine EHC panel: [13.1] **IF** during any of the following steps the REFERENCE changes in an undesired manner **THEN ADJUST VPL** to stop turbine load rise. **OR** **PUSH** TURBINE MANUAL to place the turbine control mode in manual mode and proceed to section 5.6. **ADJUST** REFERENCE CONTROL ∇ (lower) button to set desired load in SETTER display. ***The BOP will depress the REFERENCE CONTROL ∇ (lower) button and lower the SETTER display by 1%.*** [13.2] **SET** LOAD RATE as required. [13.3] (ρ) **PUSH** GO button. [13.4] **MONITOR** Generator Megawatts DROPPING. [13.6] **CHECK** that load change has **STOPPED** when reference display equals setter **OR** **IF** desired to stop the load change, **THEN** **STOP** the load change by **DEPRESSING** the HOLD pushbutton [13.6] **WHEN** desired to resume the load change, **THEN** (ρ) **PRESS** the GO push button and continue to monitor load. [13.7] **ADJUST** VALVE POSITION LIMIT to ≤ 5% above the Gov Control Indication or as needed. [13.8] **REPEAT** Steps 5.3[13.1] to 5.3[13.4] to achieve desired load. ***Given a LOAD REDUCTION rate of 10% in one hour, the steps will be repeated approximately once every 6 minutes.***

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Event Description: Power reduction to remove the 1A high pressure feedwater heater from service.

Time	Position	Applicant's Actions or Behavior
CAUTION Do not exceed load rate of 5%/minute, or 10% step change		
	RO	[14] **MONITOR** the following during the load reduction: [14.1] TAVG following TREF program. [14.2] All RPIs, Step Counters, Loop ΔT, and NIS for correct power distribution, quadrant power tilts, rod insertion, rod misalignment, inoperable RPIs, and inoperable rods.
	SRO	**Crew Brief** would typically be conducted for this event as time allows prior to the next event.
	SRO	**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).
Cue Console Operator to insert Event 2.		

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Event Description: 120 VAC is lost to Eagle Rack 1-R-4, causing multiple instrument failures. Requires entry into AOI-2, "Malfunction of Reactor Control System," and AOI-16, "Loss of Normal Feedwater." Requires Tech Spec evaluation.

Time	Position	Applicant's Actions or Behavior
Indications: 110-F PROT SET TROUBLE 111-F PROT SET I CHANNEL FAILURE 118-A SG 3 PRESS LO 119-A SG 4 PRESS LO 122-A SG 3 PRESS NEG RATE 123-A SG 4 PRESS NEG RATE 94-A TAVG-TREF DEVIATION 66-A C-5 LO TURB IMPULSE PRESS ROD BLOCK 66-D C-7 LOSS OF LOAD STM DUMP INTERLOCK 58-B SG FEEDWATER FLOW HI 62-C SG 3 STM-FW FLOW MISMATCH 63-C SG 4 STM-FW FLOW MISMATCH 63-F SG LEVEL DEVIATION Rods inserting at 72 steps/minute. (If in AUTOMATIC) MFP speed dropping. ICS display of Eagle Racks indicates the failure of 1-R-4.		
	RO	Diagnoses and announces failure of Eagle Rack 1-R-4.
	RO	May place rods in MANUAL to stop inward motion due to 1-PT-1-73 failure low.
	BOP	May place Main Feedwater Pump Master controller in MANUAL to stabilize MFP speed.
	BOP	May place #3 and #4 main feedwater regulating valves in MANUAL.
	SRO	May enter and direct actions of AOI-2,"Malfunction of Reactor Control System."
	SRO	May enter and direct actions of AOI-16,"Loss of Normal Feedwater."
	SRO	May enter and direct action of AOI-44, "Eagle 21 Malfunctions."
AOI-2		**The following actions are taken from AOI-2, "Malfunction of Reactor Control System," Section 3.2, "Continuous Rod Withdrawal/Insertion."**
	RO	1. **PLACE** control rods in MAN. ***Eagle Rack 1-R-4 failure causes 1-PT-1-73 to fail low. If rods are in AUTOMATIC for the shutdown then the rods will be inserting and must be taken to MANUAL to stop the unwarranted insertion.***

Op Test No.:	NRC	Scenario #	1	Event #	2	Page	6 of 44

Event Description: 120 VAC is lost to Eagle Rack 1-R-4, causing multiple instrument failures. Requires entry into AOI-2, "Malfunction of Reactor Control System," and AOI-16, "Loss of Normal Feedwater." Requires Tech Spec evaluation.

Time	Position	Applicant's Actions or Behavior
	RO	2. **CHECK** control rod movement STOPPED. ***RO determines from CERPI displays and group demand counters that rod motion has stopped.***
	RO	3. **MAINTAIN** T-avg on PROGRAM. (Reference Attachment 1) • **USE** control rods. OR ***RO determines that MANUAL rod control is capable of control, and adjusts rod position to maintain T-avg on program.*** • **ADJUST** turbine load.
	RO	4. **CHECK** loop T-avg channels NORMAL. ***RO observes Loop Tavg indicators on panel 1-M-5 and determines that 1-Ti-68-2E LOOP 1 TAVG, 1-TI-68-25E, LOOP 2 TAVG, 1-TI-68-44E, LOOP 3 TAVG, and 1-TI-68-67A LOOP 4 Tavg all indicate the same temperature and are normal.***
	RO	5. **CHECK** Auct Tavg NORMAL on 1-TR-68-2B. ***RO observes the GREEN indicating line on 1-TR-68-2B TREF & TAVG - °F is normal. May also observe digital display to determine AUCT TAVG normal.***
	RO	6. **CHECK** NIS power range channels NORMAL. ***RO observes NIS Power Range channels on panel 1-M-4 and determines from 1-NI-41B, PR FLUX % POWER, 1-NI-42B, PR FLUX % POWER, 1-NI-43B, PR FLUX % POWER1-NI-44B, PR FLUX % POWER that NIS power range all indicate the same power and are normal.***
	RO	7. **CHECK** the following: • Turbine impulse pressure channel 1-PI-1-73, NORMAL. ***RO observes turbine impulse pressure channel 1-PI-1-73, % HP TURBINE POWER TR A on panel 1-M-4 and determines that the channel has failed low, by comparing to 1-PI-1-72, % HP TURBINE POWER TR B.*** • Tref and Auct Tavg NORMAL on 1-TR-68-2B (Reference Attachment 1)

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Event Description: 120 VAC is lost to Eagle Rack 1-R-4, causing multiple instrument failures. Requires entry into AOI-2, "Malfunction of Reactor Control System," and AOI-16, "Loss of Normal Feedwater." Requires Tech Spec evaluation.

Time	Position	Applicant's Actions or Behavior
	BOP	7. **RESPONSE NOT OBTAINED:** **PLACE** steam dumps in pressure mode as follows: a. **PLACE** steam dumps to OFF. ***BOP rotates 1-HS-1-103A, STEAM DUMP FSV "A" from the ON position to the left to the OFF RESET position. BOP rotates 1-HS-103B, STEAM DUMP FSV "B from the ON position to the left to the OFF RESET position.*** b. **PLACE** mode selector HS to STEAM PRESS. ***BOP rotates 1-HC-1-103D STEAM DUMP MODE to the right from the TAVG position to the right to the STEAM PRESS position.*** c. **ADJUST** steam dump demand to zero. ***BOP observes 1-XI-1-33, STEAM DUMP DEMAND, reduces to zero prior to performing the next step.*** d. **PLACE** steam dumps to ON. ***BOP rotates 1-HS-1-103A, STEAM DUMP FSV "A" to the right from the OFF RESET position to the ON position. BOP rotates 1-HS-103B, STEAM DUMP FSV "B to the right from the OFF RESET position to the ON position.*** e. **ENSURE** controller set at 84% (1092 psig). ***BOP observes that 1-PIC-1-33 STEAM DUMP PRESS CONTROL dial is set to 84%.*** f. **WHEN** conditions allow, **THEN REFER TO** SOI-1.02 and **PLACE** steam dumps in TAVG Mode.
	RO/BOP	8. **MONITOR** core power distribution parameters: • Power range channels. • ΔFlux Indicators. • T-avg. • Loop ΔT. • Incore TCs. • Feed flow/Steam flow.
	SRO	9. **INITIATE** repairs to failed equipment. ***When contacted as Work Control, the Console Operator will repeat back request to prepare a package to troubleshoot and repair 1-R-4.***

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Event Description: 120 VAC is lost to Eagle Rack 1-R-4, causing multiple instrument failures. Requires entry into AOI-2, "Malfunction of Reactor Control System," and AOI-16, "Loss of Normal Feedwater." Requires Tech Spec evaluation.

Time	Position	Applicant's Actions or Behavior
	SRO	10. **REFER TO** Tech Specs: • 3.1.1, Shutdown Margin. ***Not Applicable.*** • 3.1.5, Rod Group Alignment Limits. ***Not Applicable.*** • 3.1.6, Shutdown Bank Insertion Limits. ***Not Applicable.*** • 3.1.7, Control Bank Insertion Limits. ***Not Applicable.*** • 3.2.1, Heat Flux Hot Channel Factor. ***Not Applicable.*** • 3.2.2, Nuclear Enthalpy Rise Hot Channel Factor. ***Not Applicable.*** • 3.2.4, Quadrant Power Tilt Ratio. ***Not Applicable.*** • 3.2.3, Axial Flux Difference. ***Not Applicable.*** • 3.3.1, Reactor Trip System (RTS) Instrumentation. ***Function 16f, Turbine Impulse Pressure, P-13, Condition S. With one channel inoperable, verify the interlock is in the required state for existing unit conditions within 1 hour OR be in Mode 2 in 7 hours.*** • 3.3.2, Engineered Safety Features Actuation System (ESFAS) Instrumentation. ***Not Applicable.***
CAUTION		
Allowing at least 5 minutes between any rod control input (i.e., T-avg, T-ref, or NIS) change and placing rods in AUTO, will help prevent undesired control rod movement.		
	SRO	11. **NOTIFY** Chemistry of any reactor power changes greater than 15% in one hour.
	SRO	12. **IF** loop ΔT and loop Tavg channels were defeated due to Tavg channel failure, and Tavg channel has been repaired, **THEN PUSH IN** 1-XS-68-2D, ΔT CHANNEL DEFEAT, and 1-XS-68-2M, TAVG CHANNEL DEFEAT, and select away from all ΔT and Tavg channels. ***SRO determines that the step is not applicable at this time.***
	SRO	13. **WHEN** conditions allow auto rod control, **THEN**: a. **ENSURE** T-avg and T-ref within 1°F. b. **ENSURE** zero demand on control rod position indication [1-M-4]. c. **PLACE** rods in AUTO. ***With 1-PT-1-73 failed, the SRO determines that the step is not applicable at this time.***
	SRO	14. **WHEN** conditions allow auto pzr level control, **THEN ENSURE** pzr level returned to normal program, AND **PLACE** 1-FCV-62-93 in AUTO.
	SRO	15. **RETURN TO** Instruction in effect.

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Event Description: 120 VAC is lost to Eagle Rack 1-R-4, causing multiple instrument failures. Requires entry into AOI-2, "Malfunction of Reactor Control System," and AOI-16, "Loss of Normal Feedwater." Requires Tech Spec evaluation.

Time	Position	Applicant's Actions or Behavior
AOI-16		**The following actions are taken from AOI-16, "Loss of Normal Feedwater," Section 3.6, "MFW reg or bypass reg valve control failure."**
	BOP	1. **CONTROL** failed MFW reg or bypass reg valve in MANUAL. ***May place 1-FIC-3-90, SG 3 - MFW REG VLV in MANUAL by lifting the toggle switch up from the AUTO position to the MANUAL position, and 1-FIC-3-103, SG 4- REG VLV in MANUAL by lifting the toggle switch up from the AUTO position to the MANUAL position, in preparation for channel selection in later steps.***
	SRO	2. **EVALUATE** placing control rods in MANUAL. ***Based on the initial failure of 1-PT-1-73, the rods are already in MANUAL.***
	BOP	3. **CHECK** MFW pumps recirc valves CLOSED.
NOTES 1) Bypass reg. valve may be manually positioned up to 0.85 x 106 lb/hr flow to dampen oscillations in feedwater flow in loop of affected main reg valve. 2) A power tilt in the affected core quadrant may occur due to a rise in bypass flow. Flows above 84,500 lbm/hr in the bypass line will invalidate the value of computer point U1118		
	BOP	4. **CHECK** SG levels on bypass reg valve control. ***BOP determines that the bypass reg valves are in MANUAL and are NOT controlling level.***
	BOP	4. **RESPONSE NOT OBTAINED:** **GO TO** Step 6.
	BOP	6. **CHECK** S/G levels returning to PROGRAM. ***BOP observes SG levels are returning to NORMAL.***
	BOP	7. **MONITOR** TDMFW Pump speed normal for current power level ***BOP determines that two of the steam flow inputs to the MFP speed control circuit are failed and that both MFPs are reducing speed.***
	BOP	7. **RESPONSE NOT OBTAINED:** **PLACE** TDMFW Pump Master Speed Control to MANUAL, **THEN ADJUST** speed as necessary. ***The BOP may have already placed the 1-PC-46-20, TDMFW Pump Master Speed Controller in MANUAL and made adjustments to raise speed.***
NOTE A LO FW FLOW WTR HAMMER annunciation [59-C] will be received when any main feedwater flow drops to less than 0.75 x 106 lb/hr.		

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Event Description: 120 VAC is lost to Eagle Rack 1-R-4, causing multiple instrument failures. Requires entry into AOI-2, "Malfunction of Reactor Control System," and AOI-16, "Loss of Normal Feedwater." Requires Tech Spec evaluation.

Time	Position	Applicant's Actions or Behavior
	SRO	8. **WHEN** any S/G MFW flow drops to less than 0.55 x 106 lb/hr, **THEN INITIATE** manual anti-water hammer actions: ***SRO determines that the step is not applicable at this time.***
CAUTION		**Power range N41 controls S/G 1 and S/G 4 MFW reg valves. N42 controls S/G 2 and S/G 3 MFW reg valves.**
NOTE		All power range monitors input to auctioneered high anticipatory circuit for bypass FW reg valves.
	RO	9. **CHECK** power range N41 through N44 NORMAL. ***RO observes NIS Power Range channels on panel 1-M-4 and determines from 1-NI-41B, PR FLUX % POWER, 1-NI-42B, PR FLUX % POWER, 1-NI-43B, PR FLUX % POWER1-NI-44B, PR FLUX % POWER that NIS power range all indicate the same power and are normal.***
NOTE		Steps 10 & 11 should end up having the same channel (A or B) selected for steam flow and feed flow on each S/G to ensure a loss of voltage to any one channel will have minimal effect on the affected S/G level.
	BOP	10. **CHECK** controlling steam flow Channels NORMAL. ***BOP observes that 1-FI-1-21A SG 3 STEAM FLOW is indicating off-scale low, and that 1-FI-1-28A is indicating off-scale low.***
	BOP	10. **RESPONSE NOT OBTAINED:** a. **SELECT** operable channel. ***BOP rotates 1-XS-1-21D, SG 3 STM FLOW CONTROL CHANNEL SELECT from FI-1-21A position to the right to the 1-FI-1-21B position.*** ***BOP rotates 1-XS-1-28D, SG 4 STM FLOW CONTROL CHANNEL SELECT from FI-1-28A position to the right to the 1-FI-1-28B position.*** b. **EVALUATE** effect of the failed channel on the MFPs Speed Control and **ADJUST** in MANUAL as necessary while continuing this section. ***BOP determines that two of the steam flow inputs to the MFP speed control circuit are failed and that both MFPs are reducing speed.*** ***The BOP may have already placed the 1-PC-46-20, TDMFW Pump Master Speed Controller in MANUAL and made adjustments to raise speed.***
	BOP	11. **CHECK** controlling FW flow channels NORMAL.

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Event Description: 120 VAC is lost to Eagle Rack 1-R-4, causing multiple instrument failures. Requires entry into AOI-2, "Malfunction of Reactor Control System," and AOI-16, "Loss of Normal Feedwater." Requires Tech Spec evaluation.

Time	Position	Applicant's Actions or Behavior
		11. **RESPONSE NOT OBTAINED:** **SELECT** operable channel. ***BOP rotates 1-XS-3-90D, SG 3 FW FLOW CONTROL CHANNEL SELECT from FI-1-90A SG 3 FW CONTROL CHANNEL position to the right to the 1-FI-1-90B position.*** ***BOP rotates 1-XS-1-103D, SG 4 STM FLOW CONTROL CHANNEL SELECT from FI-1-103A SG 4 FW CONTROL CHANNEL position to the right to the 1-FI-1-103B position.***
	BOP	12. **CHECK** press compensation channel(s) NORMAL. ***BOP observes that 1-PI-1-20A SG 3 PRESS is indicating off-scale low, and that 1-PI-1-27A SG 3 PRESS is indicating off-scale low.***
	SRO	12. **RESPONSE NOT OBTAINED:** **REFER TO** Tech Specs: • 3.3.2, Engineered Safety Feature Actuation System (ESFAS) Instrumentation. ***Function 1.e, Safety Injection Steam Line Pressure - Low, Condition D, With one channel inoperable, place the channel in trip within 72 hours OR be in Mode 3 within 78 hours AND be in Mode 4 in 84 hours.*** ***Function 4.d.1, Steamline Isolation, Condition D (same as above).*** • 3.3.3, Post Accident Monitoring (PAM) Instrumentation. ***Function 24, SG Pressure, Condition A. With one or more Functions with one required channel inoperable, restore the required channel to OPERABLE status within 30 days.*** • 3.3.4, Remote Shutdown System.
	SRO	13. **ENSURE** same channel (A or B) selected for steam flow and feed flow on each S/G. ***BOP ensures that the "B" channel for steam flow and feedwater flow inputs to the SGWLC circuits are selected.***

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Event Description: 120 VAC is lost to Eagle Rack 1-R-4, causing multiple instrument failures. Requires entry into AOI-2, "Malfunction of Reactor Control System," and AOI-16, "Loss of Normal Feedwater." Requires Tech Spec evaluation.

Time	Position	Applicant's Actions or Behavior
	BOP	14. **IF** affected S/G controlling channel and level NORMAL, **THEN** a. **RETURN** MFW reg valve to AUTO. ***Returns 1-FIC-3-90, SG 3 - MFW REG VLV and 1-FIC-3-103, SG 4-REG VLV to AUTO after balancing input signals. Automatic is selected by lowering the toggle switch from the MANUAL position to the AUTO position.*** b. **RETURN** TDMFWP Speed Control to AUTO (if in MANUAL). ***Returns 1-PC-46-20, TDMFW Pump Master Speed Controller in AUTO after balancing input signals. Automatic is selected by lowering the toggle switch from the MANUAL position to the AUTO position.***
	RO	15. **WHEN** conditions allow auto rod control, **THEN** a. (ρ) **ENSURE** T-avg and T-ref within 1°F. b. **ENSURE** zero demand on control rod position indication [1-M-4]. c. **PLACE** rods in AUTO. ***With 1-PT-1-73 failed, the SRO determines that the step is not applicable at this time.***
	SRO	16. **INITIATE** repairs to failed equipment. ***SRO contacts Work Control and Console Operator repeats back request for troubleshooting and repair package.***
	SRO	17. **RETURN TO** Instruction in effect.

Op Test No.: NRC	Scenario # 1	Event # 2	Page 13 of 44

Event Description: 120 VAC is lost to Eagle Rack 1-R-4, causing multiple instrument failures. Requires entry into AOI-2, "Malfunction of Reactor Control System," and AOI-16, "Loss of Normal Feedwater." Requires Tech Spec evaluation.

Time	Position	Applicant's Actions or Behavior
AOI-44		**The following actions are taken from AOI-44, "Eagle 21 Malfunctions."**
	RO	1. **IDENTIFY** rack associated with failure: • **REFER TO** ALARM printer. **OR** • **REFER TO** ICS computer screen: 1) **SELECT** NSSS AND BOP 2) **SELECT** EAGLE 21 MENU 3) **SELECT** EGLRCK [upper right of screen] 4) **DETERMINE** which rack has failure by red light next to any rack status. ***Determination is made that Eagle Rack 4 has failed based on ICS display.***
NOTE Additional bistables lit in row may indicate a power or Logic Control Panel (LCP) failure. (PROT SET TROUBLE lights 19, 39, 59, & 79 are not bistables)		
	RO	2. **CHECK** bistable indications NORMAL. ***RO determines that additional bistable lights are lit.***
	SRO	2. **RESPONSE NOT OBTAINED:** **GO TO** Section 3.2, Response to LCP or Output Failure.
EXAMINER: The following actions are taken from AOI-44,"Eagle 21 Malfunctions," Section 3.2, "Response to LCP or Output Failure."		
	SRO	See table below. ***Determines that Section 3.2.4 is the applicable Section to implement.***
EXAMINER: The following actions are taken from AOI-44,"Eagle 21 Malfunctions," Section 3.2.4, "Rack 1-R-4 Failure."		

IF FAILURE IN:	** **GO TO**
Protection Set I/Channel 1	
1-R-1	Section 3.2.1
1-R-2	Section 3.2.2
1-R-3	Section 3.2.3
1-R-4	Section 3.2.4

Op Test No.:	NRC	Scenario #	1	Event #	2	Page	14 of 44

Event Description: 120 VAC is lost to Eagle Rack 1-R-4, causing multiple instrument failures. Requires entry into AOI-2, "Malfunction of Reactor Control System," and AOI-16, "Loss of Normal Feedwater." Requires Tech Spec evaluation.

Time	Position	Applicant's Actions or Behavior

CAUTION

Complete failure of LCP results in inoperable control functions and frozen or failed analog outputs. Partial failure may affect analog outputs only.

Time	Position	Applicant's Actions or Behavior
	SRO	1. **PERFORM** COMPENSATORY MEASURES to defeat control functions:

COMPENSATORY MEASURES

EQUIPMENT FAILED	EQUIPMENT REQUIRING CONTROL	PROCEDURE
Feedwater Flow (if selected)	Loops LPF-3-90A, 103A	AOI-16
Steam Flow (if selected)	Loops LPF-1-21A, 28A	AOI-16
Turb Impulse Pressure (including Tref & rod control)	Loop LPP-1-73	AOI-2
Steam Press Loops LPP-1-20A, 27A	N/A	N/A
Cont Sump Level Loop LPL-63-180 including Auto Recirc Intlk on Cont Sump HI Level	N/A	N/A

NOTE

Instrument loop inputs to U1118 and U2118 may change and some minor differences in megawatt thermal indication may be observed. Inputs to megawatt thermal indication include MFW flow and Steam Pressure.

Op Test No.: NRC	Scenario # 1	Event # 2	Page 15 of 44

Event Description: 120 VAC is lost to Eagle Rack 1-R-4, causing multiple instrument failures. Requires entry into AOI-2, "Malfunction of Reactor Control System," and AOI-16, "Loss of Normal Feedwater." Requires Tech Spec evaluation.

Time	Position	Applicant's Actions or Behavior
	SRO	2. Refer to Tech Specs. • 3.3.1 Reactor Trip Instrumentation. ***Function 16f, Turbine Impulse Pressure, P-13, Condition S. With one channel inoperable, verify the interlock is in the required state for existing unit conditions within 1 hour OR be in Mode 2 in 7 hours.*** • 3.3.2 ESFAS Instrumentation ***Function 1.e, Safety Injection Steam Line Pressure - Low, Condition D, With one channel inoperable, place the channel in trip within 72 hours OR be in Mode 3 within 78 hours AND be in Mode 4 in 84 hours.*** ***Function 4.d.1, Steamline Isolation, Condition D (same as above).*** ***Function 7.b, Auto Switchover to Containment Sump, Condition K, With one channel inoperable, place the channel in bypass within 72 hours, OR be in Mode 3 within 78 hours AND be in Mode 5 within 108 hours.*** • 3.3.3 PAM Instrumentation ***Function 7, Containment Sump Water Level, Condition A.*** ***Function 24, SG Pressure, Condition A. With one or more Functions with one required channel inoperable, restore the required channel to OPERABLE status within 30 days.*** • 3.3.6 - ***Not Applicable*** • 3.3.7 - ***Not Applicable*** • 3.3.8 - ***Not Applicable*** • TR 3.3.7>15% - ***Not Applicable***.
	SRO	3. **REFER** to Appendix A as necessary to compare expected bistable pattern with actual failure.
	SRO	4. **INITIATE** repairs to failed rack. ***SRO contacts Work Control to initiate a troubleshooting and Console Operator repeats back request for troubleshooting and repair package for 1-R-4.*** ***SRO may contact Instrument Maintenance directly for support in the diagnosis of the problem in 1-R-4. If contacted as Instrument Maintenance, the Console Operator repeats back request to investigated cause of 1-R-4 failure.***
	SRO	5. **CHECK** indications normal for other Eagle 21 rack(s). ***BOP monitors ICS display for Eagle 21 racks.***
	RO	6. **MONITOR** any alternate indications available for inputs lost to lit alarms.
	SRO	7. **RETURN TO** Instruction in effect.

Op Test No.: NRC	Scenario # 1	Event # 2	Page 16 of 44

Event Description: 120 VAC is lost to Eagle Rack 1-R-4, causing multiple instrument failures. Requires entry into AOI-2, "Malfunction of Reactor Control System," and AOI-16, "Loss of Normal Feedwater." Requires Tech Spec evaluation.

Time	Position	Applicant's Actions or Behavior
	SRO	**Crew Brief** would typically be conducted for this event as time allows prior to the next event.
	SRO	**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).
Cue Console Operator to insert Event 3.		

Op Test No.:	NRC	Scenario #	1	Event #	3	Page	17	of 44

Event Description: 1-PT-68-340 fails to 2100 psig. Requires entry into AOI-18, "Malfunction of Pressurizer Pressure Control System." Requires a Tech Spec evaluation

Time	Position	Applicant's Actions or Behavior
Indications: 90-B, PZR PRESS LO DEVIN BACKUP HTRS ON 1-PI-68-340A Pressurizer Pressure fails to 2100 psig over 45 seconds.		
	RO	Diagnoses and announces failure of 1-PT-68-340A to 2100 psig.
	RO	May place 1-PIC-68-340A in MANUAL and increase the setting to open the PZR spray valves and de-energize the PZR heaters to stabilize PZR Pressure.
	RO	Enters and directs actions of AOI-18, "Malfunction of Pressurizer Pressure Control System."
ARI 90-B		**The following actions are taken from ARI 90-B, "PZR PRESS LO DEVIN BACKUP HTRS ON."**
	RO	**[1] CHECK** PZR pressure on 1-PI-68-334 and 1-PI-68-340 [1-M-5]. ***1-PI-68-340A pressure indicator will be indicating 2100 psig, and the remaining pressure indicators will indicate rising pressure.***
	RO	**[2] IF** a PZR pressure channel has failed, **THEN** **[a] PLACE** PZR master controller 1-PIC-68-340A in manual control and stabilize pressure ***This action may have been taken by the RO to stabilize PZR pressure.*** ***Places 1-PIC-68-340A, PZR PRESS MASTER CONTROL in MANUAL by lifting the toggle switch up from the AUTO position to the MANUAL position.*** ***Since the failure caused the controller output to rise in AUTO, the output must be raised by moving the toggle switch to the right and observing pressure response.*** **[b] GO TO** AOI-18,

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Event Description: 1-PT-68-340 fails to 2100 psig. Requires entry into AOI-18, "Malfunction of Pressurizer Pressure Control System." Requires a Tech Spec evaluation

Time	Position	Applicant's Actions or Behavior
AOI-18		**The following actions are taken from AOI-18, "Malfunction of Pressurizer Pressure Control System."**
		NOTE 120 AC VITAL PWR BD 1-IV [breaker 2] supplies the plugmold power strip associated with both PZR spray valves and several other instruments required to respond to this event.
	RO	1. **CHECK** pressurizer pressure stable or trending to desired pressure: • 1-PI-68-340A, • 1-PI-68-334, • 1-PI-68-323, • 1-PI-68-322. ***1-PI-68-340A pressure indicator will be indicating 2100 psig, and the remaining pressure indicators will indicate rising pressure.***
	RO	1. **RESPONSE NOT OBTAINED:** **PLACE** pzr master controller 1-PIC-68-340A in MANUAL and **RESTORE** press to normal. ***These actions may have already been taken by the RO to stabilize PZR pressure.*** ***Places 1-PIC-68-340A, PZR PRESS MASTER CONTROL in MANUAL by lifting the toggle switch up from the AUTO position to the MANUAL position.*** ***Since the failure caused the controller output to rise in AUTO, the output must be raised by moving the toggle switch to the right and observing pressure response.***
	RO	2. **CHECK** 1-XS-68-340D selected to a failed controlling or backup channel. ***RO determines that 1-XS-68-340D is selected to the PT-68-340 & 334 position, and that 1-PT-68-340 has failed.***

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Event Description: 1-PT-68-340 fails to 2100 psig. Requires entry into AOI-18, "Malfunction of Pressurizer Pressure Control System." Requires a Tech Spec evaluation

Time	Position	Applicant's Actions or Behavior
	RO	3. **RESTORE** press control to normal: a. **SELECT** operable channels for control and backup with 1-XS-68-340D. ***RO selects PT-68-334 B323 position on 1-XS-68-340D, PZR PRESS CONTROL CHANNEL SELECT.*** b. **ENSURE** operable channel selected for recording with 1-XS-68-340B. ***Selector switch 1-XS-68-340B does not have to be repositioned.*** c. **ENSURE** TR-68-2A placed to operable channel using 1-XS-68-2B, ΔT RCDR TR-68-2A LOOP SELECT [1-M-5]. ***Selector switch 1-XS-68-2B must be moved from the Loop 1 position to any other Loop position.*** d. **WHEN** Pressurizer pressure on program, **THEN RETURN** Pzr master controller 1-PIC-68-340A to AUTO. ***RO will stabilize RCS pressure, then request permission to return 1-PIC-68-340A to AUTO.*** ***Returns 1-PIC-68-340A, PZR PRESS MASTER CONTROL to AUTO after balancing input signals. Automatic is selected by lowering the toggle switch from the MANUAL position to the AUTO position.***
	SRO	4. **NOTIFY** Work Control to remove failed channel from service. ***SRO contacts Work Control and Console Operator repeats back request for troubleshooting and repair package.***
	SRO	5. **GO TO** Step 17.

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Event Description: 1-PT-68-340 fails to 2100 psig. Requires entry into AOI-18, "Malfunction of Pressurizer Pressure Control System." Requires a Tech Spec evaluation

Time	Position	Applicant's Actions or Behavior
	SRO	17. **REFER TO** the following Tech Specs: a. 3.3.1, RTS Instrumentation. ***Function 6, OTΔT, Condition W, With one channel inoperable, place the channel in trip within 72 hours OR be in Mode 3 within 78 hours.*** ***Function 8.a, Low Pressure, Condition X, With one channel inoperable, place the channel in trip within 72 hours OR reduce THERMAL POWER to <P-7 within 78 hours.*** ***Function 8.b, High Pressure, Condition W (see above).*** b. 3.3.2, Engineered Safety Feature Actuation System (ESFAS) Instrumentation. ***Function 1.d, Pressurizer Pressure - Low, Condition D, With one channel inoperable, place the channel in trip within 72 hours OR be in Mode 3 within 78 hours AND be in Mode 4 in 84 hours.*** ***Function 8.b, P-11, Condition L, With one P-11 interlock channel inoperable, verify the interlock is in required state for existing unit conditions OR be in Mode 3 in 7 hours AND be in Mode 4 in 13 hours.*** c. 3.3.4, Remote Shutdown System. ***Not Applicable*** d. 3.4.1, RCS Pressure, Temperature, and Flow Departure from Nucleate Boiling (DNB) Limits. ***Not Applicable*** e. 3.4.3, RCS Pressure and Temperature (P/T) Limits. ***Not Applicable*** f. 3.4.9, Pressurizer. ***Not Applicable*** g. 3.4.10, Pressurizer Safety Valves. ***Not Applicable*** h. 3.4.11, Pressurizer Power - Operated Relief Valves. ***Not Applicable***
	SRO	18. **INITIATE** repairs to failed equipment. ***When contacted as Work Control, the Console Operator will repeat back request to prepare a package to troubleshoot and repair 1-PT-68-340A.***
	SRO	19. **RETURN TO** Instruction in effect.
	SRO	**Crew Brief** would typically be conducted for this event as time allows prior to the next event.
	SRO	**Notifications** should be addressed as applicable if not specifically addressed by the procedure or in the crew brief. Operations Management - Typically Shift Manager. Maintenance Personnel – Typically Maintenance Shift Supervisor (MSS). (**Note:** Maintenance notification may be delegated to the Shift Manager).

Op Test No.:	NRC	Scenario #	1	Event #	3	Page	21	of	44

Event Description: 1-PT-68-340 fails to 2100 psig. Requires entry into AOI-18, “Malfunction of Pressurizer Pressure Control System.” Requires a Tech Spec evaluation

Time	Position	Applicant's Actions or Behavior
Cue Console Operator to insert Event 4.		

Op Test No.:	NRC	Scenario #	1	Event #	4	Page	22	of	44

Event Description: *(OPTIONAL)* ***Train B ERCW Pipe break at the Intake Pumping Station. Requires entry into AOI-13, "Loss of Essential Raw Cooling Water." Requires a Tech Spec evaluation.***

Time	Position	Applicant's Actions or Behavior
Indications: 170-F, IPS VLV & STRNR ROOM B SUMP LEVEL HI 225-E, TR-A/B ERCW TO C&SS COMPR FLOW HI 227-A, ERCW PMP E-B DISCH PRESS LO 229-A, ERCW HEADER B SUP PRESS LO 229-B, ERCW PMP H-B DISCH PRESS LO 0-PI-67-17A, B ERCW SUP HDR PRESS dropping to less than 50 psig.		
	RO	Diagnoses and announces the ERCW leak in the Intake Pumping Station.
	SRO	Enters and directs actions of AOI-13, "Loss of Essential Raw Cooling Water,"
AOI-13		**The following actions are taken from AOI-13, "Loss of Essential Raw Cooling Water," Section 3.5, "Supply Header Rupture in IPS; Supply header flow low with Strainer DP alarm DARK, AND IPS sump alarm LIT."**
CAUTION **This Section applies to a header break prior to the ERCW Strainer inlet valves or as directed by another section in this procedure.**		
	BOP	1. **DISPATCH** personnel to determine location of rupture. ***After dispatched as the Outside AUO, the Console Operator will report that the IPS is flooding in the area of the "B" Strainer Room.***
	BOP	2. **DISPATCH** AUO, with a radio, to the Rx MOV Bds. ***After dispatched as the Control Building AUO, the Console Operator reports that he is at the Reactor MOV boards awaiting directions.***
NOTE MOVs with power normally removed may not travel to full closed position under high flow conditions; local verification of isolation may be required.		
	BOP	3. **CHECK** Train A Supply Header pressure at expected values for existing plant conditions. ***0-PI-67-18A, A ERCW SUP HDR PRESS indicates normal pressure 90-100 psig.***
	BOP	4. **CHECK** Train B Supply Header pressure at expected values for existing plant conditions. ***0-PI-67-17A, B ERCW SUP HDR PRESS indicates abnormally low pressure (30-50 psig.)***

Op Test No.:	NRC	Scenario #	1	Event #	4	Page	23	of	44

Event Description: (OPTIONAL) *Train B ERCW Pipe break at the Intake Pumping Station. Requires entry into AOI-13, "Loss of Essential Raw Cooling Water." Requires a Tech Spec evaluation.*

Time	Position	Applicant's Actions or Behavior
	BOP	**4. RESPONSE NOT OBTAINED:** **PERFORM** the following: a. **UNLOCK**, and **CLOSE** bkr on Rx MOV Bd 1A2-A c/11B, 1-FCV-67-147. ***When the BOP contacts the Control Building AUO to energize the breaker, the Console Operator will enter rwr12. BOP determines from the GREEN indicating light that power has been restored to 1-FCV-67-147A.*** b. **UNLOCK**, and **CLOSE** bkr on Rx MOV Bd 1A2-A c/15E, 1-FCV-67-458. ***When the BOP contacts the Control Building AUO to energize the breaker, the Console Operator will enter rwr22. BOP determines from the GREEN indicating light that power has been restored to 1-FCV-67-458A.*** c. **UNLOCK**, and **CLOSE** bkr on Rx MOV Bd 1B2-B c/8A, 1-FCV-67-24. ***When the BOP contacts the Control Building AUO to energize the breaker, the Console Operator will enter rwr06. BOP determines from the RED indicating light that power has been restored to 1-FCV-67-24A.*** d. **UNLOCK**, and **CLOSE** bkr on Rx MOV Bd 2B2-B c/8A, 2-FCV-67-24. ***When the BOP contacts the Control Building AUO to energize the breaker, the Console Operator will enter rwr31. BOP determines from the RED indicating light that power has been restored to 2-FCV-67-24A.*** e. **ENSURE** 2-FCV-67-147, CCS Hx C Sup From Hdr 2B, OPEN. ***BOP locates 2-HS-67-147A CCS HX C SUP HDR 2B, and determines from the label that the power is disconnected with the valve in the open position.*** f. **OPEN** 1-FCV-67-147, CCS Hx C Sup From Hdr 1A. ***BOP rotates 1-FCV-67-147A, CCS HX C SUP HDR 1A from the mid position to the right to the OPEN position. BOP observes GREEN indicating light DARK and RED indicating light LIT.*** g. **STOP**, and **PULL TO LOCK** all Tr B ERCW Pumps. ***Place each of the Train B ERCW pump handswitches 0-HS-67-47A, ERCW PMP E-B, 0-HS-67-51A, 0-HS-67-55A, ERCW PUMP G-B, 0-HS-67-59A, ERCW PUMP H-B in the STOP, PULL-TO-LOCK position.***

Op Test No.:	NRC	Scenario #	1	Event #	4	Page	24	of 44

Event Description: *(OPTIONAL)* ***Train B ERCW Pipe break at the Intake Pumping Station. Requires entry into AOI-13, "Loss of Essential Raw Cooling Water." Requires a Tech Spec evaluation.***

Time	Position	Applicant's Actions or Behavior
	BOP	h. **CLOSE** 1-FCV-67-24, Strainer 1B-B Inlet. ***BOP rotates 1-FCV-67-24A, STRAINER 1B-B INLET from the mid position to the left to the CLOSE position. BOP observes GREEN indicating light LIT and RED indicating light DARK.*** i. **CLOSE** 2-FCV-67-24, Strainer 2B-B Inlet. ***BOP rotates 2-FCV-67-24A, STRAINER 2B-B INLET from the mid position to the left to the CLOSE position. BOP observes GREEN indicating light LIT and RED indicating light DARK.*** j. **START** additional Tr A ERCW Pumps as required. ***SRO may direct the BOP to start the B-A ERCW Pump and or the C-A ERCW pump.*** k. **ENSURE** 1-FCV-67-223, ERCW Hdr 1B to 2A Xtie, OPEN. ***BOP locates 1-HS-67-223A ERCW HDR 1B TO 2A XTIE, and determines from the label that the power is disconnected with the valve in the open position.*** l. **ENSURE** 2-FCV-67-223, ERCW Hdr 2A To 1B Xtie, OPEN. ***BOP locates 2-HS-67-223A ERCW HDR 2A TO 1B XTIE, and determines from the label that the power is disconnected with the valve in the open position.*** m. **OPEN** 1-FCV-67-458, CCS Hx A Sup From Hdr 1B. ***BOP rotates 1-FCV-67-458A, CCS HX A SUP FROM HDR 1B from the mid position to the right to the OPEN position. BOP observes GREEN indicating light DARK and RED indicating light LIT.***
NOTE 1 With ruptured header strainer inlet valves closed, the flow indicators on the isolated supply headers will be off-scale low. **NOTE 2** With ERCW headers cross-tied, evaluate LCO 3.0.3 applicability.		
	BOP	5. **CHECK** in-service header(s) flow(s) and pressure(s) return to expected values for existing plant conditions. ***After isolation is completed, 0-PI-67-17A, B ERCW SUP HDR PRESS indicates normal pressure of 90-100 psig.***
	BOP	6. **CHECK** pump amps within limits. ***BOP observes amps on the running Train A ERCW pumps, and determines that the amps are within limits.***

Op Test No.:	NRC	Scenario #	1	Event #	4	Page	25	of 44

Event Description: *(OPTIONAL)* ***Train B ERCW Pipe break at the Intake Pumping Station. Requires entry into AOI-13, "Loss of Essential Raw Cooling Water." Requires a Tech Spec evaluation.***

Time	Position	Applicant's Actions or Behavior
	SRO	7. **REFER TO** Tech Specs: • 3.0.3, Applicability ***Since the ERCW headers are cross-connected, entry into LCO 3.0.3 is required.*** • 3.4.6, RCS Loops-Mode 4 - ***Not applicable.*** • 3.7.8, Essential Raw Cooling Water System (ERCW) ***Entered, but LCO 3.0.3 is most limiting.*** ***Condition A. One ERCW train inoperable, other than for Condition C, 1. Enter applicable Conditions and Required Actions of LCO 3.8.1, "AC Sources- Operating," for emergency diesel generator made inoperable by ERCW. Restore ERCW train to OPERABLE status within 72 hours*** • 3.8.1, AC Sources-Operating ***Condition C. Two required DGs in Train B inoperable may be entered. However, LCO 3.0.3 is the most limiting and a Safety Function Determination would be required in this situation.*** • OR 14.10 Fire Safe Shutdown Equipment ***14.10 With one or more of the breakers and/or valves specified in design output documents not in the noted position or condition, return the breakers and/or valve to the required position within 30 days.***
	SRO	8. **EVALUATE** ERCW availability to DGs. ***SRO determines that ERCW is available to all diesel generators at this time.***
	SRO	9. **INITIATE** repair. ***When the SRO contacts Work Control to request repairs to the ERCW system in the IPS, the Console Operator repeats back request.***
	SRO	10. **IF** ERCW to in-service CCS heat exchanger was interrupted, **THEN NOTIFY** Duty System Engineer to initiate evaluation for effect on CCS equipment and piping. ***If the SRO contacts the Duty System Engineer to complete the evaluation of CCS equipment, the Console Operator will repeat back the request.***
	SRO	Crew Brief would typically be conducted for this event as time allows prior to the next event.

Op Test No.: NRC	Scenario # 1	Event # 4		Page 26 of 44	
Event Description: (OPTIONAL)	***Train B ERCW Pipe break at the Intake Pumping Station. Requires entry into AOI-13, "Loss of Essential Raw Cooling Water." Requires a Tech Spec evaluation.***				

Time	Position	Applicant's Actions or Behavior
	SRO	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).
Cue Console Operator to insert Event 5.		

Op Test No.:	NRC	Scenario #	1	Event #	5	Page	27	of	44		

Event Description: Small RCS leak (approximately 50 gpm) develops. Requires entry into AOI-6, "Small RCS Leak."

Time	Position	Applicant's Actions or Behavior
Indications: 144-A ICE COND INLET DOOR OPEN 103-B CNTMT MOISTURE HI 173-B LWR CNTMT AIR 1-RM-106 RAD HI 160-C RX BDLG POCKET SUMP LEVEL HI Decreasing trend in PZR level Decreasing trend in VCT level		
	RO	Diagnoses and announces the RCS leak.
opening in	RO	May raise charging flow by placing 1-HIC-62-93A, CHARGING FLOW PZR LEVEL CONTROL in MANUAL moving the toggle to the left to open the valve, and by rotating the dial on 1-HIC-62-89A CHRG HDR - RCP SEALS FLOW CONTROL to the right to open the valve.
	SRO	Enters and directs actions of AOI-6, "Small Reactor Coolant System Leak."
AOI-6		**The following actions are taken from AOI-6, "Small Reactor Coolant System Leak."**
NOTE During performance of this instruction the need for a rapid load reduction or Unit trip should be continuously evaluated.		
	RO	1. **CHECK** pzr level DROPPING. ***RO observes a downward trend on 1-LR-68-339 PZR LEVEL - %.***
NOTE Pzr level must be allowed time to change following changes in charging flow.		
	RO	2. **CHECK** CCP in service. ***RO reports that the 1A-A CCP is in service.***
	RO	3. **MAXIMIZE** charging flow: a. **FULLY OPEN** 1-FCV-62-93. ***RO places 1-HIC-62-93A, CHARGING FLOW PZR LEVEL CONTROL in MANUAL by lifting the toggle switch up from the AUTO position to the MANUAL position. RO then moves the toggle to the left to OPEN the valve.*** b. **FULLY OPEN** 1-FCV-62-89. ***1-HIC-62-89A CHRG HDR - RCP SEALS FLOW CONTROL is opened fully rotating the dial on to the right to open the valve.*** c. **CHECK** letdown at 75 gpm. ***RO observes 1-FI-62-82 and determines that letdown flow is indicating 75 gpm.***

Op Test No.:	NRC	Scenario #	1	Event #	5	Page	28	of 44

Event Description: Small RCS leak (approximately 50 gpm) develops. Requires entry into AOI-6, "Small RCS Leak."

Time	Position	Applicant's Actions or Behavior
	RO	4. **INCREASE** VCT Auto makeup: a. **DOUBLE** setting on Boric Acid and PW water flow controllers • 1-FC-62-142 ***RO rotates the dial for 1-FC-62-142 from approximately 35 to the 70 position in order to double the flow setpoint.*** • 1-FC-62-139 ***RO rotates the dial for 1-FC-62-139 from approximately 30 to the 60 position in order to double the flow setpoint.*** b. **ENSURE** RED light lit on 1-HS-62-140A. ***RO observes that the RED indicating light is LIT, indicating that AUTO MAKEUP is set to start.***
	SRO	5. **CHECK** in Modes 1 through 3 ***SRO states that the unit is in Mode 1.***
	SRO	6. **MAKE** plant announcement via PA: "Attention plant personnel. A primary system leak has developed. Any personnel located either inside containment or in the Auxiliary Building should exit the area immediately." (Repeat)
	SRO	7. **MONITOR** pzr level STABLE or RISING. ***RO determines that with increased charging flow that PZR level is stable (depending on net charging flow, PZR level may be rising.)***
CAUTION **Attempts to quantify leak rate should not delay performance of the remaining steps.**		
	RO	8. **IF** pzr level STABLE or RISING and time permits, **THEN STABILIZE** the plant to quantify the leak rate: • STOP pzr heater/spray operation. • STOP any heatup/cooldown in progress. ***RO determines that no heatup is in progress.***
	BOP	9. **CHECK** secondary plant radiation normal: • Condenser exhaust monitors. • S/G blowdown monitors. • Main steam line monitors. ***BOP monitors and determines that main steam line (SG Discharge) radiation on 1-M-30 are normal, 1-RM-90-monitors, 1-RR-90-119, VACUUM PMP EXHAUST trends are normal, 1-RR-90-120, SG BLOWDOWN SAMPLE LIQUID trends are normal.***

Op Test No.: NRC Scenario # 1 Event # 5

Event Description: Small RCS leak (approximately 50 gpm) develops. Requires entry into AOI-6, "Small RCS Leak."

Time	Position	Applicant's Actions or Behavior
	RO	10. **CHECK** safety valves CLOSED: • **EVALUATE** tailpipe temp and acoustic monitors. ***RO observes response of 1-TI-68-330, SAFETY 68-563 TAILPIPE TEMP, 1-TI-68-329, SAFETY 68-564 TAILPIPE TEMP, and 1-TI-68-328, SAFETY 68-565, stable at approximately 110°F.*** ***BOP may observe 1-XI-68-363, PZR VALVES ACOUSTIC MONITOR indicating lights are DARK for 1-XI-68-363 (68-563), 1-XI-68-364 (68-564) and 1-XI-68-365 (68-565).***
	RO	11. **CHECK** PORVs CLOSED: • **EVALUATE** tailpipe temp and acoustic monitors. ***RO observes response of 1-TI-68-331, PORV 340A & 334 TAILPIPE TEMP stable at approximately 110°F.*** ***BOP may observe 1-XI-68-363, PZR VALVES ACOUSTIC MONITOR indicating lights are DARK for 1-XI-68-340A and 1-XI-68-334.***
NOTE Relief valves (pzr PORVs, pzr safeties, CVCS letdown, RHR suction, and SI lines), and Rx head vent isolation valves could be leaking to the PRT. Further investigation will have to be made if PRT conditions become abnormal and leakage path is not readily identifiable.		
	RO	12. **MONITOR** PRT conditions NORMAL: • Level. • Temperature. • Press. ***RO observes 1-PI-68-300, PRT LEVEL is approximately 70%, 1-TI-68-309, PRT TEMP is approximately 105°F, and 1-PI-68-30, PRT PRESS indicates approximately 6 psig. All parameter values are normal.***
NOTE Pzr level must be allowed time to stabilize following changes in charging or letdown flow.		

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Event Description: Small RCS leak (approximately 50 gpm) develops. Requires entry into AOI-6, "Small RCS Leak."

Time	Position	Applicant's Actions or Behavior
	RO	13. **ISOLATE** letdown: • **CLOSE** 1-FCV-62-72, (45 gpm). • **CLOSE** 1-FCV-62-73, (75 gpm). • **CLOSE** 1-FCV-62-74, (75 gpm). ***RO isolates letdown by rotating 1-HS-62-74A, LETDOWN ORIFICE C 75 GPM CIV-ϕA to the CLOSE position.*** • **CLOSE** 1-FCV-62-76, (5 gpm). • **CLOSE** 1-FCV-62-69. ***RO rotates 1-HS-62-69, RCS LETDOWN FRM LOOP 3 IN CNTMT to the CLOSE position.*** • **CLOSE** 1-FCV-62-70. ***RO rotates 1-HS-62-70, RCS LETDOWN FRM LOOP 3 IN CNTMT to the CLOSE position.***
	RO	14. **ISOLATE** charging: • **CLOSE** 1-FCV-62-85. • **CLOSE** 1-FCV-62-86. • **CLOSE** 1-FCV-62-90. • **CLOSE** 1-FCV-62-91. ***RO isolates charging by rotating 1-HS-62-86A ALT CHARGING TO LOOP 4, 1-HS-62-90A, CHARGING LINE ISOL and 1-HS-62-91, CHARGING LINE ISOL to the CLOSE position.***
NOTE	Normal range of seal injection flow is between 8 and 13 gpm per RCP with a minimum allowed flow of 6 gpm.	
	RO	15. **MINIMIZE** RCP seal injection flow (greater than 6 gpm per pump), and **EVALUATE** pzr level trend.
NOTE	If leak is on CVCS, pzr level will recover with charging and letdown isolated.	
	RO	16. **CHECK** pzr level DROPPING or STABLE. ***RO determines that PZR level is dropping.***
	RO	17. **REALIGN** charging and letdown, and **STABILIZE** pzr level: **REFER TO** Appendix A, Alignment of Charging And Letdown.
Cue Console Operator to modify leakage from 2% to 20% after the applicants complete Step 16, prior to realignment of charging and letdown.		

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Event Description: Small RCS leak progresses to a Small Break Loss of Coolant Accident. Requires entry into E-0, "Reactor Trip or Safety Injection." 1A and TD AFW pumps fail to start automatically. 1B-B 6.9 Kv Shutdown Board trips 45 seconds after entry into E-0. Loss of the second RHR pump requires entry into ECA-1.1, from E-1.

Time	Position	Applicant's Actions or Behavior
		E-0 — **The following actions are taken from E-0, "Reactor Trip or Safety Injection."**
		NOTE Steps 1 thru 4 are **IMMEDIATE ACTION STEPS.** Status Trees / SPDS should be monitored when transitioned to another instruction.
	RO	1. **ENSURE** reactor trip: • Reactor trip and bypass breakers OPEN. ***RO checks 1-52RTB, RX TRIP BKR A RED indicating light LIT on panel 1-M-4.*** ***RO checks 1-52RTB, RC TRIP BKR B RED indicating light LIT on panel 1-M-4*** ***RO checks 1-52BYA, BYPASS BKR A lights DARK*** ***RO checks 1-52BYB, BYPASS BKR B lights dark*** • RPIs at bottom of scale. ***RO observes 1-MON 85 5000/1 CERPI Monitor 1 and 1-MON-85 5000/2 CERPI MONITOR 2 for indication that all SHUTDOWN and CONTROL bank rods are inserted.*** • Neutron flux DROPPING. ***RO observes neutron flux trending down on 1-NR-92-145, NEUTRON FLUX LEVEL RECORDER. May also observe levels decreasing on 1-NI-92-135A, CH I NEUTRON MON % PWR, and 1-NI-92-136A, CH II NEUTRON MON % PWR.***
	RO	2. **ENSURE** Turbine Trip: • All turbine stop valves CLOSED. ***RO observes that indicating lights on 1-XX-47-1000 EHC CONTROL for individual throttle and governor valves are GREEN.***
	RO	3. **CHECK** 6.9 kV shutdown boards: a. At least one board energized from: CSST (offsite), OR D/G (blackout). ***When first observed by the RO during IMMEDIATE OPERATOR ACTIONS, both shutdown boards will be energized.*** ***At 45 seconds after the trip, the 1B-B 6.9 KV Shutdown Board suffers a differential relay operation causing the board to be lost. Step 3 is still valid after the 1B-B Shutdown Board is lost.***

Op Test No.: NRC	Scenario # 1	Event # 5, 6 and 7	Page 32 of 44

Event Description: Small RCS leak progresses to a Small Break Loss of Coolant Accident. Requires entry into E-0, "Reactor Trip or Safety Injection." 1A and TD AFW pumps fail to start automatically. 1B-B 6.9 Kv Shutdown Board trips 45 seconds after entry into E-0. Loss of the second RHR pump requires entry into ECA-1.1, from E-1.

Time	Position	Applicant's Actions or Behavior
	RO	4. **CHECK** SI actuated: a. Any SI annunciator **LIT**. ***RO will announce that the window 70-A, SI ACTUATED is LIT. May also announce that FIRST OUT 76-G SI MANUAL is LIT.*** b. Both trains SI **ACTUATED**. • 1-XX-55-6C • 1-XX-55-6D
EXAMINER: E-0, "Reactor Trip or Safety Injection," Appendixes A and B are included as Attachment 2.		
	BOP	5. **PERFORM** Appendixes A and B, E-0, pages 16-30. ***BOP is assigned to perform actions contained in the Appendices. A separate copy of the Appendices is contained in this package for Examiner use.***
	SRO	6. **ANNOUNCE** reactor trip and safety injection over PA system.

CRITICAL TASK:

Establish the minimum required auxiliary feedwater flow rate to the steam generators by manually starting the 1A-A motor driven or the turbine driven auxiliary feedwater pump prior to transitioning from E-0, "Reactor Trip or Safety Injection," to E-1, "Loss of Reactor or Secondary Coolant."

	RO	7. **ENSURE** secondary heat sink available with either: ***The 1A-A MD AFW pump and the TD AFW pump must be manually started due to the failure of the automatic start circuitry.*** • Total AFW flow greater than 410 gpm, OR ***It is expected that Adverse Containment (>2.81 psig) conditions will exist soon after the entry into E-0. When announced, the crew will use the bracketed parameter values.*** • At least one S/G NR level greater than 29% [39% ADV].
	RO	8. **MONITOR** RCS temperature stable at or trending to 557°F using: • RCS Loop T-avg with any RCP running, **OR** • RCS Loop T-cold with RCPs out-of-service.

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Event Description: Small RCS leak progresses to a Small Break Loss of Coolant Accident. Requires entry into E-0, "Reactor Trip or Safety Injection." 1A and TD AFW pumps fail to start automatically. 1B-B 6.9 Kv Shutdown Board trips 45 seconds after entry into E-0. Loss of the second RHR pump requires entry into ECA-1.1, from E-1.

Time	Position	Applicant's Actions or Behavior
		8. **RESPONSE NOT OBTAINED:** **IF** temp less than 557°F, **THEN ENSURE** steam dumps and S/G PORVs CLOSED. **IF** cooldown continues**, THEN CONTROL** total AFW flow to maintain greater than 410 gpm UNTIL NR level in at least one S/G greater than 29% [39% ADV]. **IF** cooldown continues after AFW flow is controlled, **THEN** • **PLACE** steam dump controls OFF. • **CLOSE** MSIVs. • **ENSURE** MSIV bypasses CLOSED. **IF** RCS temp greater than 564°F, **THEN ENSURE** either steam dumps or S/G PORVs OPEN.
	RO	9. **ENSURE** excess letdown valves CLOSED: • 1-FCV-62-54 • 1-FCV-62-55 ***RO observes GREEN indicating lights LIT on handswitches 1-HS-62-54A, EXCESS LTDN ISOL, and 1-HS-62-55A, EXCESS LTDN.***
	RO	10. **CHECK** pzr PORVs and block valves: a. Pzr PORVs CLOSED. b. At least one block valve OPEN. ***RO observes 1-HS-68-340AA, PZR PORV 340A, CLOSED, GREEN indicating light is LIT, RED indicating light is DARK.*** ***RO observes 1-HS-68-334A, PZR PORV 334, CLOSED, GREEN indicating light is LIT, RED indicating light is DARK.*** ***RO observes 1-HS-68-333A, BLOCK VLV FOR PORV 340A, OPEN, GREEN indicating light is DARK, RED indicating light is LIT.*** ***RO observes 1-HS-68-332A, BLOCK VLV FOR PORV 334, OPEN, GREEN indicating light is DARK, RED indicating light is LIT.***
	RO	11. **CHECK** pzr safety valves CLOSED: • EVALUATE tailpipe temperatures and acoustic monitors. ***RO observes response of 1-TI-68-330, SAFETY 68-563 TAILPIPE TEMP, 1-TI-68-329, SAFETY 68-564 TAILPIPE TEMP, and 1-TI-68-328, SAFETY 68-565, stable at approximately 110°F.*** ***BOP may observe 1-XI-68-363, PZR VALVES ACOUSTIC MONITOR indicating lights are DARK for 1-XI-68-363 (68-563), 1-XI-68-364 (68-564) and 1-XI-68-365 (68-565***

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Event Description: Small RCS leak progresses to a Small Break Loss of Coolant Accident. Requires entry into E-0, "Reactor Trip or Safety Injection." 1A and TD AFW pumps fail to start automatically. 1B-B 6.9 Kv Shutdown Board trips 45 seconds after entry into E-0. Loss of the second RHR pump requires entry into ECA-1.1, from E-1.

Time	Position	Applicant's Actions or Behavior
	RO	12. **CHECK** pzr sprays CLOSED. ***RO observes the pzr spray valves closed by GREEN indicating lights LIT for 1-XI-68-340B, PZR SPRAY LOOP 2 and 1-XI-68-340D, PZR SPRAY LOOP 1.***
NOTE **Seal injection flow should be maintained to all RCPs.**		
	RO	13. **CHECK** if RCPs should remain in service: ***The RCPs may have been tripped prior to reaching this step in E-0, due to the actuation of the Containment Phase B signal.*** a. Phase B signals DARK [MISSP]. b. RCS pressure greater than 1500 psig.
	RO	14. **CHECK** S/G pressures: • All S/G pressures controlled or rising. ***RO observes PAM pressure instruments on SG 1 through 4 (black labels) and determines that pressures are controlled. May also observe trends on 1-PR-1-2, SG 1 & 2 PRESS PSIG, and 1-PR-1-23, SG 3 & 4 PRESS PSIG to assess this step.*** • All S/G pressures greater than 120 psig. ***RO observes PAM pressure instruments on SG 1 through 4 (black labels) and determines that pressures are greater than 120 psig.***
	RO	15. **CHECK** for RUPTURED S/G • All S/Gs narrow range levels CONTROLLED or DROPPING. ***RO informs the SRO that S/G narrow range levels are controlled after observing PAM narrow range level instruments (black labels).*** • Secondary side radiation NORMAL from Appendix A. ***BOP informs the SRO that secondary radiation levels are normal after performing Appendix A, Step 8.***
	BOP	16. **CHECK** cntmt conditions: • Cntmt pressure NORMAL. ***RO reports containment pressure is abnormally high.*** • Radiation NORMAL from Appendix A. ***BOP informs the SRO that containment radiation recorders were not normal prior to isolation.*** • Cntmt sump level NORMAL. • Cntmt temp ann window DARK [104-B]. ***SRO enters RESPONSE NOT OBTAINED column.***

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Event Description: Small RCS leak progresses to a Small Break Loss of Coolant Accident. Requires entry into E-0, "Reactor Trip or Safety Injection." 1A and TD AFW pumps fail to start automatically. 1B-B 6.9 Kv Shutdown Board trips 45 seconds after entry into E-0. Loss of the second RHR pump requires entry into ECA-1.1, from E-1.

Time	Position	Applicant's Actions or Behavior
	SRO	16. **RESPONSE NOT OBTAINED:** ** GO TO E-1, Loss of Reactor or Secondary Coolant.

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Event Description: Small RCS leak progresses to a Small Break Loss of Coolant Accident. Requires entry into E-0, "Reactor Trip or Safety Injection." 1A and TD AFW pumps fail to start automatically. 1B-B 6.9 Kv Shutdown Board trips 45 seconds after entry into E-0. Loss of the second RHR pump requires entry into ECA-1.1, from E-1.

Time	Position	Applicant's Actions or Behavior
E-1		**The following actions are taken from E-1, "Loss of Reactor or Secondary Coolant."**
		EXAMINER: As the RCS leak becomes larger, containment temperature and pressure will rise sharply. 265-A UPPER CNTMT RE-271/272 RAD HI and 265-B LOWER CNTMT RE-273/274 are expected to alarm, since testing has shown rad monitor to give unreliable indication for up to 2 minutes following a rapid increase or decrease in containment temperature. The alarms will clear after the initial temperature transient.
		NOTE **Seal injection flow should be maintained to all RCPs.**
		EXAMINER: The RCPs may have been stopped previously.
	RO	1. **CHECK** if RCPs should remain in service: a. Phase B DARK [MISSP].
	RO	1. a. **RESPONSE NOT OBTAINED** a. **STOP** all RCPs. ** **GO TO** Step 2.
	SRO	2. **REFER TO** EPIP-1, Emergency Plan Classification Flowchart.
		NOTE **Time since initiation of event is defined by performance of Step 3.**
	SRO	3. **RECORD** current time to mark initiation of LOCA and determination of time for hot leg recirc.
	RO	4. **CHECK** S/G pressures: • All S/G pressures controlled or rising. ***RO observes PAM pressure instruments on SG 1 through 4 (black labels) and determines that pressures are controlled. May also observe trends on 1-PR-1-2, SG 1 & 2 PRESS PSIG, and 1-PR-1-23, SG 3 & 4 PRESS PSIG to assess this step.*** • All S/G pressures greater than 120 psig. ***RO observes PAM pressure instruments on SG 1 through 4 (black labels) and determines that pressures are greater than 120 psig.***
	BOP	5. **MAINTAIN** Intact S/G NR levels: a. **MONITOR** levels greater than 29% [39% ADV]. ***RO informs the SRO that S/G narrow range levels are controlled after observing PAM narrow range level instruments (black labels).*** b. **CONTROL** intact S/G levels between 29% and 50% [39% and 50% ADV]. ***RO acknowledges the need to control SG levels between 39 and 50%.***

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Event Description: Small RCS leak progresses to a Small Break Loss of Coolant Accident. Requires entry into E-0, "Reactor Trip or Safety Injection." 1A and TD AFW pumps fail to start automatically. 1B-B 6.9 Kv Shutdown Board trips 45 seconds after entry into E-0. Loss of the second RHR pump requires entry into ECA-1.1, from E-1.

Time	Position	Applicant's Actions or Behavior
EXAMINER: The status of secondary radiation may have already been reported as normal by the BOP during performance of E-0 Appendix A.		
	BOP	6. **CHECK** secondary radiation: • S/G discharge monitors NORMAL. • Condenser vacuum exhaust rad monitors NORMAL. • S/G blowdown rad monitor recorders NORMAL trend prior to isolation.
	BOP	7. **ENSURE** cntmt hydrogen analyzers in service: • **PLACE** 1-HS-43-200A in ANALYZE [M-10]. ***BOP places 1-HS-43-200A, H2 ANALYZER A FAN to the ANALYZE position on panel 1-M-10.*** • **PLACE** 1-HS-43-210A in ANALYZE [M-10]. ***BOP places 1-HS-43-200A, H2 ANALYZER A FAN to the ANALYZE position on panel 1-M-10.*** • **CHECK** low flow lights **NOT** lit [M-10]. ***BOP checks 1-XI-43-200, LO FLOW - ANAL A, WHITE indicating light is DARK.*** ***BOP checks 1-XI-43-210, LO FLOW - ANAL B, WHITE indicating light is DARK.*** • **LOCALLY CHECK** low analyzer temp lights **NOT** lit **AND RESET** local alarm panel. [North wall of Train A 480V SD Bd rm]. ***When contacted as the Control Building AUO the Console Operator repeat back request to check low analyzer temp lights, and reports that the lights are NOT LIT.***
	RO	8. **MONITOR** pzr PORVs and block valves: a. Pzr PORVs CLOSED. ***RO observes handswitch 1-HS-68-340AA, PZR PORV 340A GREEN light is LIT and 1-HS-68-334A, PZR PORV 334 GREEN light is LIT.*** b. At least one block valve OPEN. ***RO observes handswitch 1-HS-68-333A, BLOCK VLV FOR PORV 340A RED indicating light is LIT.***
EXAMINER: Containment pressure may not be below 2.0 psig when the operators evaluate this step initially. Since it is a continuous action step, when containment pressure does drop below 2.0 psig, the actions will be performed.		

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Event Description: Small RCS leak progresses to a Small Break Loss of Coolant Accident. Requires entry into E-0, "Reactor Trip or Safety Injection." 1A and TD AFW pumps fail to start automatically. 1B-B 6.9 Kv Shutdown Board trips 45 seconds after entry into E-0. Loss of the second RHR pump requires entry into ECA-1.1, from E-1.

Time	Position	Applicant's Actions or Behavior
	SRO	9. **DETERMINE** if cntmt spray should be stopped: a. **MONITOR** cntmt pressure less than 2.0 psig. b. **CHECK** at least one cntmt spray pump RUNNING. c. **RESET** cntmt spray signal. d. **STOP** cntmt spray pumps, and **PLACE** in A-AUTO. e. **CLOSE** cntmt spray discharge valves 1-FCV-72-2 and 1-FCV- 72-39.
	RO	9. a. **RESPONSE NOT OBTAINED:** **WHEN** cntmt pressure is less than 2.0 psig, **THEN** PERFORM Sub steps 9b thru e.
	BOP	10. **ENSURE** both pocket sump pumps STOPPED [M-15]: • 1-HS-77-410. • 1-HS-77-411. ***BOP observes handswitch 1-HS-77-410, POCKET SUMP PMP A GREEN indicating light is LIT, and 1-HS-77-411, POCKET SUMP PMP B GREEN indicating light is LIT.***
	RO	11. **CHECK** SI termination criteria: a. **CHECK** RCS subcooling greater than 65°F [85°F ADV]. ***RO determines that subcooling is less than 85°F by observing 1-TI-68-105, RCS SUBCOOLING and 1-XI-68-115 RCS SUBCOOLING indicators.***
	SRO	a. **RESPONSE NOT OBTAINED:** ** GO TO Caution prior to Step 12.

CAUTION

If offsite power is lost after SI reset, manual action will be required to restart the SI pumps and RHR pumps due to loss of SI start signal.

	RO	12. **RESET** SI and **CHECK** the following: ***RO resets SI signal by depressing 1-HS-63-134A, SI RESET TR A and 1-HS-63-134B one at a time.*** • SI ACTUATED permissive DARK. ***RO observes and reports that Window 70-A, SI ACTUATED is DARK.*** • AUTO SI BLOCKED permissive LIT. ***RO observes and reports that Window 70-B, AUTO SI BLOCKED is DARK.***

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Event Description: Small RCS leak progresses to a Small Break Loss of Coolant Accident. Requires entry into E-0, "Reactor Trip or Safety Injection." 1A and TD AFW pumps fail to start automatically. 1B-B 6.9 Kv Shutdown Board trips 45 seconds after entry into E-0. Loss of the second RHR pump requires entry into ECA-1.1, from E-1.

Time	Position	Applicant's Actions or Behavior
	RO	13. **DETERMINE** if RHR pumps should be stopped: ***Both RHR pumps are out-of-service at this point.*** a. **CHECK** RCS pressure greater than 150 psig. b. **CHECK** RHR suction aligned from RWST. c. **CHECK** RCS pressure stable or rising. d. **STOP** RHR pumps and **PLACE** in A-AUTO. e. **MONITOR** RCS pressure greater than 150 psig.
	RO	14. **CHECK** pressure in all S/Gs controlled or rising. ***RO observes PAM pressure instruments on SG 1 through 4 (black labels) and determines that pressures are controlled. May also observe trends on 1-PR-1-2, SG 1 & 2 PRESS PSIG, and 1-PR-1-23, SG 3 & 4 PRESS PSIG to assess this step.***
	RO	15. **CHECK** RCS pressure stable or dropping. ***RO observes RCS pressure on 1-XI-68-100, RVLIS - ICCM PLASMA DISPLAY and/or 1-XI-68-110, RVLIS - ICCM PLASMA DISPLAY and determines that pressure is dropping.***
	BOP	16. **MONITOR** electrical board status: a. **CHECK** offsite power available. b. **CHECK** all shutdown boards ENERGIZED by offsite power. c. **PLACE** any unloaded D/G in standby USING SOI-82 Diesel Generators.
EXAMINER: SOI-43.02, "Loss of Unit 1 Train B Shutdown Boards," is contained as Attachment 3.		
	SRO	16.b. **RESPONSE NOT OBTAINED:** **ENERGIZE** shutdown boards USING: • SOI-211 Shutdown Boards OR • AOI-43 Loss of Shutdown Boards OR ***SRO assigns SOI-43.02, "Loss of Unit 1 Train B Shutdown Boards," to the BOP for performance on a "not to interfere basis."*** • SOI-82 Diesel Generators
EXAMINER: AOI-17, "Turbine Trip," Section 3.3, "BOP Realignment" is contained as Attachment 4.		
		17. **INITIATE** BOP realignment: • **REFER TO** AOI-17, Turbine Trip. ***SRO assigns AOI-17, "Turbine Trip" to the BOP for performance on a "not to interfere basis."***

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Event Description: Small RCS leak progresses to a Small Break Loss of Coolant Accident. Requires entry into E-0, "Reactor Trip or Safety Injection." 1A and TD AFW pumps fail to start automatically. 1B-B 6.9 Kv Shutdown Board trips 45 seconds after entry into E-0. Loss of the second RHR pump requires entry into ECA-1.1, from E-1.

Time	Position	Applicant's Actions or Behavior
EXAMINER: E-1, "Loss of Reactor or Secondary Coolant," Appendixes are contained as Attachment 5.		
	BOP	18. **INITIATE** 480V board room breaker alignments USING the following: • Appendix A (E-1), CLA Breaker Operation. • Appendix B (E-1), 1-FCV-63-1 Breaker Operation. • Appendix C (E-1), 1-FCV-63-22 Breaker Operation. ***When contacted as the Control Building AUO, the Console Operator will repeat back the request, and then report that Appendix A through C have been performed. Console Operator enters remote functions sir01, sir14 and sir06 to perform actions.***
	RO	19. **ENSURE** RHR available for cntmt sump recirculation: • Power to at least one operable RHR pump AVAILABLE. ***The SRO determines that neither of the RHR pumps are available at this point, and transitions to the RESPONSE NOT OBTAINED column.*** • Cntmt sump valve 1-FCV-63-72 or 1-FCV-63-73 to operable RHR pump AVAILABLE.
	SRO	19. **RESPONSE NOT OBTAINED:** **IF** neither train of RHR is available for cntmt sump recirculation, **THEN ** GO TO** ECA-1.1, Loss of RHR Sump Recirculation.

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Event Description: Small RCS leak progresses to a Small Break Loss of Coolant Accident. Requires entry into E-0, "Reactor Trip or Safety Injection." 1A and TD AFW pumps fail to start automatically. 1B-B 6.9 Kv Shutdown Board trips 45 seconds after entry into E-0. Loss of the second RHR pump requires entry into ECA-1.1, from E-1.

Time	Position	Applicant's Actions or Behavior

ECA-1.1

The following actions are taken from ECA-1.1, "Loss of RHR Sump Recirculation."

CAUTION

IF RWST level drops to 8%, then any ECCS or cntmt spray pump taking suction from the RWST must be stopped.

Time	Position	Applicant's Actions or Behavior
	SRO	1. **CHECK** cntmt sump recirculation equipment AVAILABLE: • Power to RHR pumps AVAILABLE. ***The SRO determines that neither of the RHR pumps are available at this point, and transitions to the RESPONSE NOT OBTAINED column.*** • RHR pumps AVAILABLE. • Cntmt sump valves AVAILABLE.
		1. **RESPONSE NOT OBTAINED:** **RESTORE** at least one train. ***If not already accomplished, the SRO may contact Work Control to expedite repairs to both RHR pumps.***
	SRO	2. **IF** RHR sump recirculation restored during performance of this Instruction, **THEN RETURN TO** Instruction in effect.
	RO	3. **MONITOR** RWST level greater than 8%.

EXAMINER: Step 4.b. is a Continuous Action Step. When containment pressure is less than 2.0 psig, Step 4.c. RNO will be implemented. When the applicants first reach this step, containment pressure may be between 2.0 and 13.5 psig.

Position: RO

4. **DETERMINE** cntmt spray pump alignment and operation:
   a. **CHECK** cntmt spray pump suction aligned to RWST.
   b. **MONITOR** cntmt press, and **DETERMINE** number of spray pumps required:

CONTAINMENT PRESS	SPRAY PUMPS REQUIRED
Greater than 13.5 psig	2
2.0 psig to 13.5 psig	1
Less than 2.0 psig	0

   c. **CHECK** number of spray pumps running equal to number required.

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Event Description: Small RCS leak progresses to a Small Break Loss of Coolant Accident. Requires entry into E-0, "Reactor Trip or Safety Injection." 1A and TD AFW pumps fail to start automatically. 1B-B 6.9 Kv Shutdown Board trips 45 seconds after entry into E-0. Loss of the second RHR pump requires entry into ECA-1.1, from E-1.

Time	Position	Applicant's Actions or Behavior
	RO	4.c. **RESPONSE NOT OBTAINED** **STOP** and **PULL TO LOCK** any cntmt spray pump **NOT** required, **AND** **CLOSE** discharge valve(s) 1-FCV-72-2 and/or 1-FCV-72-39 for pump(s) stopped. Manually **OPERATE** spray pumps as required.
	RO	d. **DO NOT OPERATE** cntmt spray pumps as required by FR-Z.1, High Containment Pressure, UNTIL either of the following: • Cntmt spray pump suction aligned to cntmt sump, **OR** • RWST makeup sufficient to support cntmt spray pump operation.
EXAMINER: ECA-1.1, "Loss of RHR Sump Recirculation," Appendix B, "ERCW Operation," is contained as Attachment 6.		
	RO	5. **DETERMINE** if cntmt spray should be aligned to cntmt sump: a. **CHECK** spray pumps RUNNING. b. **ENSURE** ERCW system operating requirements met: • **REFER TO** Appendix B (ECA-1.1), ERCW Operation. c. **WHEN** cntmt sump level greater than 28% [36% ADV], **THEN ALIGN** suction to cntmt sump: 1) **STOP** both spray pumps, and PLACE in PULL TO LOCK. 2) **CLOSE** suction from RWST 1-FCV-72-21 and 1-FCV-72-22. 3) **OPEN** cntmt spray suction from sump 1-FCV-72-44. 4) **OPEN** cntmt spray suction from sump 1-FCV-72-45.
	RO	6. **MONITOR** cntmt press less than 2.0 psig.
	RO	7. **ENSURE** cntmt spray pumps in A-AUTO.
CAUTION **If offsite power is lost after SI reset, manual action may be required to restore ECCS equipment.**		
	RO	8. **RESET** SI, and **CHECK** the following: • SI ACTUATED permissive DARK. • AUTO SI BLOCKED permissive LIT. ***Step has been performed previously.***

Op Test No.: NRC	Scenario # 1	Event # 5, 6 and 7	Page 43 of 44				

Event Description: Small RCS leak progresses to a Small Break Loss of Coolant Accident. Requires entry into E-0, "Reactor Trip or Safety Injection." 1A and TD AFW pumps fail to start automatically. 1B-B 6.9 Kv Shutdown Board trips 45 seconds after entry into E-0. Loss of the second RHR pump requires entry into ECA-1.1, from E-1.

Time	Position	Applicant's Actions or Behavior
	RO	9. **RESET** SI interlock to RHR sump suction AUTO-swapover: • 1-HS-63-72D. ***RO rotates 1-HS-63-72D, RWST-CNTMT SUMP SWITCHOVER SI SIG TO FCV-63-72 to the right to the RESET position and verifies that the WHITE indicating light is DARK.*** • 1-HS-63-73D.
EXAMINER: The TSC is NOT manned at this point, so no direction will be given to the crew.		
	SRO	10. **INITIATE** makeup to RWST: a. **NOTIFY** Radprot/Chemistry to evaluate radiation level of water in cntmt sump for potential transfer to RWST. ***When contacted as Chemistry, the Console Operator will repeat back request to evaluate sump water rad levels.*** ***When contacted as Radiation Protection, the Console Operator will repeat back request to evaluate sump water rad levels.*** b. **NOTIFY** TSC to evaluate transferring water to RWST from one of the following: • Appendix C (ECA-1.1), Cntmt Spray Recirc to RWST Alignment. • Spent fuel pit. • Holdup tank. • Normal RWST fill USING SOI-62.02, Boron Concentration Control
	BOP	11. **MONITOR** CST volume greater than 200,000 gal. ***BOP reports current reading from 1-LI-2-230A CST A LEVEL as approximately 300,000 gal.***
	BOP	12. **MAINTAIN** Intact S/G NR levels: ***Step is already being performed.*** a. **MONITOR** Intact S/G NR levels greater than 29% [39% ADV]. b. **CONTROL** intact S/G levels between 29% and 50% [39% and 50% ADV].
	SRO	13. **MONITOR** shutdown margin during RCS cooldown: ***SRO assigns this task to the Surrogate STA.*** • **REFER TO** 1-SI-0-10, Shutdown Margin **OR** REACTINW Computer Program.

Op Test No.: NRC Scenario # 1 Event # 5, 6 and 7	Page 44 of 44
Event Description:	Small RCS leak progresses to a Small Break Loss of Coolant Accident. Requires entry into E-0, "Reactor Trip or Safety Injection." 1A and TD AFW pumps fail to start automatically. 1B-B 6.9 Kv Shutdown Board trips 45 seconds after entry into E-0. Loss of the second RHR pump requires entry into ECA-1.1, from E-1.

Time	Position	Applicant's Actions or Behavior
	BOP	14. **INITIATE** RCS cooldown to cold shutdown: a. **WHEN** RCS pressure is less than 1962 psig (P-11), **THEN** • **BLOCK** low pzr pressure SI. • **BLOCK** low steam pressure SI. b. **MAINTAIN** T-cold cooldown less than 100°F in any 1 hour. ***SRO determines that the RCS has not cooled down more than 100°F in 1 hour, and directs the BOP to begin a cooldown.*** c. **DUMP** steam to condenser from Intact S/Gs. ***Main steam isolation valves are closed due to high containment pressure, so steam dumps are unavailable.***
CRITICAL TASK **Establish a controlled RCS cooldown at a rate not to exceed 100°F in an hour, to support the SI reduction sequence and preclude swapover to the containment sump.**		
	BOP	c. **RESPONSE NOT OBTAINED:** IF condenser **NOT** available, THEN Manually or locally DUMP steam from Intact S/G: • USE Intact S/G PORV, ***RO places 1-PIC-1-6A, SG 1 PORV PCV-1-5, 1-PIC-1-13A, SG 2 PORV PCV-1-12, 1-PIC-1-24A, SG3 PORV PCV-1-23, and 1-PIC-1-31A, SG4 PORV PCV-1-30 control stations in MANUAL and throttles OPEN the valves to begin a cooldown. Cooldown rate established does not exceed limits of Step 14.b.*** OR • USE TD AFW pump supply from Intact S/G. OR • RESET Phase A, AND USE Intact S/G blowdown. IF Intact S/G NOT available, THEN USE Faulted S/G.

EXAMINER: When the cooldown is established in Step 14, inform applicants that another crew will continue from this point, and terminate the scenario.

END OF SCENARIO

SHIFT TURNOVER CHECKLIST

Page 1 of 2

SHIFT TURNOVER CHECKLIST

Page 1 of 1

- ☐ SM
- ☒ US/MCR Unit 1
- ☐ UO Unit
- ☐ AUO Station
- ☐ STA (STA Function)

Off-going - Name

On-coming - Name

Part 1 - Completed by off-going shift / Reviewed by on-coming shift: RCS Cb = 1030 ppm

- Abnormal equipment lineup / conditions:

  1A-A RHR pump is out of service for motor bearing replacement. LCOs 3.5.2 and 3.6.6 were entered 6 hours ago. Repairs to the 1A-A RHR pump are expected to be completed in 16 hours. A Severe Thunderstorm Warning has been issued for Rhea, Meigs, and McMinn Counties for the next 2 hours

- SI/Test in progress/planned: (including need for conduct of evolution briefings)

- Major Activities/Procedures in progress/planned:

  A power reduction to 95% is to be conducted to support removal of the 1A High Pressure feedwater heater from service. Control Bank D is at 220 steps. Reactor Engineering has provided a Reactivity plan for the power maneuver. Chemistry has requested that letdown flow be maintained at 75 gpm during the power change. Currently in GO-4, "Normal Power Operations," Section5.3, "Unit Shutdown from 100% to 30% Reactor Power," Step 13.

-
- Radiological changes in plant during shift:

Part 2 - Completed by on-coming shift prior to assuming duties

- ☐ Review station rounds / Abnormal reading (AUOs only)
- ☐ Review Narrative Logs (previous day and carry-over items)
- ☐ Current qualification status
- ☐ Review the current controlling Reactivity Management Plans (N/A for AUOs)
- ☐ Review current TS/TRM/ODCM/FPR Required Actions (N/A for AUOs)
- ☐ Walkdown MCR Control Boards with off-going Operator (N/A for AUOs, as applicable for SM/STAs)
- ☐ SR/PER reviews complete for previous shift (SM/US/STA)

Relief Time: ________ Relief Date: ________

Part 3 - Completed by on-coming shift. These items may be reviewed after assuming duties:

- ☐ Review Operator Workarounds, Burdens and Challenges (applicable Unit/Station)
- ☐ Review applicable ODMI actions (first shift of shift week)
- ☐ Review changes in Standing / Shift Orders (since last shift worked)
- ☐ Review changes to TACFs issued (since last shift worked) (N/A for AUOs)
- ☐ Review Control Room Deficiencies (first shift of shift week) (N/A for AUOs)
- ☐ Review Component Deviation Log (N/A for AUOs)

SHIFT TURNOVER CHECKLIST
Page 1 of 2

SHIFT TURNOVER CHECKLIST

Page 1 of 1

☐ SM
☐ US/MCR Unit 1
☒ UO Unit ____ ____________ Off-going - Name
☐ AUO Station ____________
☐ STA (STA Function) ____________ On-coming - Name

Part 1 - Completed by off-going shift / Reviewed by on-coming shift: RCS Cb = 1030 ppm

- Abnormal equipment lineup / conditions:
  1A-A RHR pump is out of service for motor bearing replacement. LCOs 3.5.2 and 3.6.6 were entered 6 hours ago. Repairs to the 1A-A RHR pump are expected to be completed in 16 hours. A Severe Thunderstorm Warning has been issued for Rhea, Meigs, and McMinn Counties for the next 2 hours
- SI/Test in progress/planned: (including need for conduct of evolution briefings)
- Major Activities/Procedures in progress/planned:
  A power reduction to 95% is to be conducted to support removal of the 1A High Pressure feedwater heater from service. Control Bank D is at 220 steps. Reactor Engineering has provided a Reactivity plan for the power maneuver. Chemistry has requested that letdown flow be maintained at 75 gpm during the power change. Currently in GO-4, "Normal Power Operations," Section5.3, "Unit Shutdown from 100% to 30% Reactor Power," Step 13.
-
- Radiological changes in plant during shift:

Part 2 - Completed by on-coming shift prior to assuming duties

☐ Review station rounds / Abnormal reading (AUOs only)
☐ Review Narrative Logs (previous day and carry-over items)
☐ Current qualification status
☐ Review the current controlling Reactivity Management Plans (N/A for AUOs)
☐ Review current TS/TRM/ODCM/FPR Required Actions (N/A for AUOs)
☐ Walkdown MCR Control Boards with off-going Operator (N/A for AUOs, as applicable for SM/STAs)
☐ SR/PER reviews complete for previous shift (SM/US/STA)

Relief Time: ____________ Relief Date: ____________

Part 3 - Completed by on-coming shift. These items may be reviewed after assuming duties:

☐ Review Operator Workarounds, Burdens and Challenges (applicable Unit/Station)
☐ Review applicable ODMI actions (first shift of shift week)
☐ Review changes in Standing / Shift Orders (since last shift worked)
☐ Review changes to TACFs issued (since last shift worked) (N/A for AUOs)
☐ Review Control Room Deficiencies (first shift of shift week) (N/A for AUOs)
☐ Review Component Deviation Log (N/A for AUOs)

Scenario 1
Attachment 1

SOI-85.01, “Control Rod Drive And Indication System.”

Section 5.6, “Manual Rod Control With Reactor At Power.”

Date ________ **Initials**

5.6 Manual Rod Control With Reactor At Power

NOTE

The manipulation of Control Rod position to maintain required parameter(s) is a continuous action by a Licensed Reactor Operator. The following is exempt from the "Continuous Use" requirements of SPP-2.2.

[1] **ENSURE** ROD BANK SELECT SWITCH (1-RBSS) in MANUAL. ________

[2] **POSITION** Control Rods as necessary to maintain Tavg with Tref using 1-FLRM, IN-HOLD-OUT SWITCH (maximum Tavg-Tref deviation < 3.0°F). ________

[3] **WHEN** AUTOMATIC Rod control is desired, **THEN**

ENSURE Tavg is within 1.0°F of Tref to avoid immediate rod movement on transfer. ________

CAUTION

Allowing at least 5 minutes between any rod control input (i.e., T-avg, T-ref, or NIS) change and placing rods in AUTO, will help prevent undesired control rod movement.

[4] **ENSURE** zero demand on control rod position indication [1-M-4]. ________

[5] **PLACE** ROD BANK SELECT SWITCH (1-RBSS) in AUTO. ________

[6] **WHEN** Rod Control is in AUTO, **THEN**

ENSURE the following: ________

A. Tavg and Tref within +/- 1.5°F ________

B. Step counters and RPIs within 12 steps ________

C. Bank Overlap maintained ________

D. Power distribution within limits, AFD/QPTR ________

Scenario 1
Attachment 2

E-0, “Reactor Trip or Safety Injection”

Appendix A and B
Attachments 1 through 5

Appendix A
(Page 1 of 9)
Equipment Verification

Step	Action/Expected Response	Response Not Obtained
1.	**ENSURE** PCBs OPEN: • PCB 5084. • PCB 5088.	**OPEN** manually.
2.	**ENSURE** AFW pump operation: • Both MD AFW pumps RUNNING. • TD AFW pump RUNNING. • LCVs in AUTO, OR controlled in MANUAL.	**ESTABLISH** at least one train AFW operation.
3.	**ENSURE** MFW isolation: • MFW isolation and bypass isolation valves CLOSED. • MFW reg and bypass reg valves CLOSED. • MFP A and B TRIPPED. • Standby MFP STOPPED. • Cond demin pumps TRIPPED. • Cond booster pumps TRIPPED.	Manually **CLOSE** valves **AND** **STOP** pumps, as necessary. **IF** any valves can **NOT** be closed, **THEN** **CLOSE** #1 heater outlet valves.

Appendix A
(Page 2 of 9)

Equipment Verification

Step	Action/Expected Response	Response Not Obtained
4.	**MONITOR** ECCS operation:	
	a. Charging pumps RUNNING.	a. Manually **START** charging pumps.
	b. Charging pump alignment: • RWST outlets 1-LCV-62-135 and 1-LCV-62-136 OPEN. • VCT outlets 1-LCV-62-132 and 1-LCV-62-133 CLOSED. • Charging 1-FCV-62-90 and 1-FCV-62-91 CLOSED.	b. **ENSURE** at least one valve in each set aligned.
	c. RHR pumps RUNNING.	c. Manually **START** RHR pumps.
	d. SI pumps RUNNING.	d. Manually **START** SI pumps.
	e. BIT alignment: • Outlets 1-FCV-63-25 and 1-FCV-63-26 OPEN. • Flow thru BIT.	e. **ENSURE** at least one valve aligned, and flow thru BIT.
	f. RCS pressure greater than 1650 psig.	f. **ENSURE** SI pump flow. **IF** RCS press drops to less than 150 psig, **THEN** **ENSURE** RHR pump flow.

Appendix A
(Page 3 of 9)

Equipment Verification

Step	Action/Expected Response	Response Not Obtained
5.	**CHECK** cntmt isolation: a. Phase A isolation: • Train A GREEN. • Train B GREEN. b. Cntmt vent isolation: • Train A GREEN. • Train B GREEN.	**ACTUATE** Phase A and Cntmt Vent Isolation signal, **OR** Manually **CLOSE** valves and dampers as necessary.

Appendix A
(Page 4 of 9)

Equipment Verification

Step	Action/Expected Response	Response Not Obtained
6.	**CHECK** cntmt pressure: • Phase B DARK [MISSP]. • Cntmt Spray DARK [MISSP]. • Cntmt press less than 2.8 psig.	**PERFORM** the following: 1) **ENSURE** Phase B actuated. 2) **ENSURE** Cntmt Spray actuated. 3) **ENSURE** cntmt spray pumps running. 4) **ENSURE** cntmt spray flow. 5) **ENSURE** Phase B isolation: • Train A GREEN. • Train B GREEN • Manually **CLOSE** valves and dampers as necessary. 6) **STOP** all RCPs. 7) **ENSURE** MSIVs and bypasses CLOSED. 8) **PLACE** steam dump controls OFF. 9) **WHEN** 10 minutes has elapsed since Phase B actuated, **THEN** **ENSURE** air return fans start. 10) **USE** adverse cntmt [ADV] setpoints where provided.
7.	**DISPATCH** AUO to perform Attachment 1 (E-0), Ice Condenser AHU Breaker Operation.	

Appendix A
(Page 5 of 9)

Equipment Verification

Step	Action/Expected Response	Response Not Obtained
8.	**CHECK** plant radiation NORMAL: • S/G blowdown rad recorder 1-RR-90-120 NORMAL prior to isolation [M-12]. • Condenser vacuum exhaust rad recorder 1-RR-90-119 NORMAL prior to trip [M-12]. • 1-RR-90-106 and 1-RR-90-112 radiation recorders NORMAL prior to isolation [M-12]. • S/G main steamline discharge monitors NORMAL [M-30]. • Upper and Lower containment high range monitors NORMAL [M-30]. • **NOTIFY** Unit Supervisor conditions NORMAL.	**NOTIFY** Unit Supervisor IMMEDIATELY.
9.	**ENSURE** all D/Gs RUNNING.	**EMERGENCY START** D/Gs
10.	**ENSURE** ABGTS operation:	
	a. ABGTS fans RUNNING.	a. Manually **START** fans.
	b. ABGTS dampers OPEN: • FCO-30-146A. • FCO-30-146B. • FCO-30-157A. • FCO-30-157B.	b. Locally **OPEN** dampers.

Appendix A
(Page 6 of 9)

Equipment Verification

Step	Action/Expected Response	Response Not Obtained
11.	**ENSURE** at least four ERCW pumps RUNNING, one on each shutdown board preferred.	Manually **START** pumps as necessary.
12.	**ENSURE** ERCW supply valves OPEN to running D/Gs.	**IF** ERCW can **NOT** be aligned to running D/G, **THEN** **EMERGENCY STOP** affected D/G.
13.	**ENSURE** 0-FCV-67-152, CCS HX C ALT DISCH TO HDR B, is open to position A.	Manually **OPEN** 0-FCV-67-152 to position A.
14.	**CLOSE** 0-FCV-67-144, CCS HX C DISCH TO HDR A.	
15.	**MONITOR** EGTS operation: • EGTS fans RUNNING. • **ENSURE** dampers OPEN - **VERIFY** filter bank dp between 5 and 9 inches of water.	Manually **START** fans **AND** **OPEN** dampers.
16.	**ENSURE** CCS pumps RUNNING: • 1A-A CCS pump. • 1B-B CCS pump. • C-S or 2B-B CCS pump.	Manually **START** pumps as necessary.
17.	**DISPATCH** AUO to shutdown Upper and Lower CNTMT rad monitors USING SOI-90.02.Gaseous Process Radiation Monitors	

Appendix A

Equipment Verification

Step	Action/Expected Response	Response Not Obtained
18.	**WHEN** Attachment 1 is complete (Ice Condenser AHU Breakers OPEN), **THEN** **ENERGIZE** hydrogen igniters [1-M-10]: • 1-HS-268-73 ON. • 1-HS-268-74 ON.	

NOTE The following equipment is located on 1-M-9.

Step	Action/Expected Response	Response Not Obtained
19.	**CHECK** CNTMT PURGE fans STOPPED.	**STOP** fans **AND** **PLACE** handswitch in PULL-TO-LOCK.
20.	**CHECK** FUEL HANDLING EXH fans STOPPED, Fuel and Cask loading dampers CLOSED:	**STOP** fans **AND** **PLACE** handswitch in PULL-TO-LOCK, **THEN** Manually **CLOSE** dampers.
21.	**ENSURE** AB GEN SUPPLY and EXH fans STOPPED.	**STOP** fans **AND** **PLACE** handswitch in PULL-TO-LOCK.

NOTE Dampers 1-HS-30-158 and 2-HS-30-270 remain open during ABI.

Step	Action/Expected Response	Response Not Obtained
22.	**ENSURE** AB GEN SUP & EXH dampers CLOSED.	Manually **CLOSE** dampers.

Appendix A
(Page 8 of 9)

Equipment Verification

Step	Action/Expected Response	Response Not Obtained
23.	**ENSURE** MCR & SPREAD RM FRESH AIR dampers CLOSED: • FCV-31-3. • FCV-31-4.	Manually **CLOSE** dampers.
24.	**ENSURE** at least one CB EMER CLEANUP fan RUNNING and associated damper OPEN:	
	• CB EMERG CLEANUP FAN A-A, **OR** • Fan B-B RUNNING..	Manually **START** fan.
	• FCO-31-8, OPEN. **OR** • FCO-31-7, OPEN	**NOTIFY** TSC if at least one damper **NOT** OPEN.
25.	**ENSURE** at least one CB EMER PRESS fan RUNNING and associated damper OPEN:	
	• CB EMERG PRESS FAN A-A, **OR** FAN B-B RUNNING.	Manually **START** fan.
	• FCO-31-6, OPEN. **OR** • FCO-31-5, OPEN.	**NOTIFY** TSC if at least one damper NOT OPEN.

Appendix A
(Page 9 of 9)

Equipment Verification

Step	Action/Expected Response	Response Not Obtained
26.	**ENSURE** Control Building fans STOPPED and dampers CLOSED:	
	• SPREADING ROOM SUPPLY and EXH FANS AND dampers. • TOILET & LKR RM EXHAUST FAN AND dampers.	Manually **STOP** fans **AND** **NOTIFY** TSC if any damper **NOT** CLOSED.
27.	**INITIATE** Appendix B (E-0), Phase B Pipe Break Contingencies.	

Appendix B
(Page 1 of 1)

Phase B Pipe Break Contingencies

Step	Action/Expected Response	Response Not Obtained
1.	**CHECK** PHASE B actuated. [MISSP - 1-XX-55-6C, -6D]	**WHEN** PHASE B actuation occurs, **THEN** **GO TO** step 2.
2.	**ENSURE** 1-FCV-32-110 CLOSED. [CISP - 1-XX-55-6E] (A-train, window 13)	**DISPATCH** AUO to perform Attachment 2 (E-0).
3.	**ENSURE** 1-FCV-67-107 CLOSED. [CISP - 1-XX-55-6E] (A -train, window 43)	**DISPATCH** AUO to perform Attachment 3 (E-0).
4.	**ENSURE** 1-FCV-70-92 CLOSED. [CISP - 1-XX-55-6E] (A -train, window 73)	**DISPATCH** AUO to perform Attachment 4 (E-0).
5.	**ENSURE** 1-FCV-70-140 CLOSED. [CISP - 1-XX-55-6F] (B -train, window 74)	**DISPATCH** AUO to perform Attachment 5 (E-0).

Attachment 1
(Page 1 of 1)
Ice Condenser AHU Breaker Operation

OPEN the following to remove power from ice condenser air handling units AND **REPORT** completion to UO:

BOARD	COMPT	NOMENCLATURE
480 V Reactor Vent Board 1A-A	13D	1-BKR-232-A000/13D ICE COND 1-AHU-61-1/4/8/12/16/20/24/28
480 V Reactor Vent Board 1A-A	14D	1-BKR-232-A000/14D ICE COND 1-AHU-61-3/7/11/15/19/23/27
480 V Reactor Vent Board 1B-B	13D	1-BKR-232-B000/13D ICE COND 1-AHU-61-2/6/10/14/18/22/26/30
480 V Reactor Vent Board 1B-B	14D	1-BKR-232-B000/14D ICE COND 1-AHU-61-5/9/13/17/21/25/29

Attachment 2
(Page 1 of 1)

Control Air Isolation

A. **CLOSE** 0-ISV-32-1013 - CONTROL AIR EL 713 AB HDR ISOL [A6/S EL. 713] (chain operated - behind Fuel and Waste Handling Bd. A).

B. **IF** 0-ISV-32-1013 CANNOT BE CLOSED,
THEN

OPEN and **DISCONNECT** C&SS air compressor breakers:

1. 0-BKR-32-25 [480V SD BD 1A2-A, C/3D]
2. 0-BKR-32-26 [480V SD BD 1B1-B, C/3D]
3. 0-BKR-32-27 [480V AUX BLDG COM BD, C/6C]
4. 0-BKR-32-4900A [480V TURB BLDG COM BD, C/6C]

Attachment 3
(Page 1 of 1)

ERCW Isolation

UNLOCK AND CLOSE 1-ISV-67-523B, LOWER CNTMT VENT CLR 1B &1D ERCW SUP ISOL [A2U/692] (U-1 penetration room - North of AB Pipe Chase Cooler 1B-B in overhead)

Attachment 4
(Page 1 of 1)

CCS Return Isolation

CLOSE 1-ISV-70-700, RCP OIL COOLER CCS RETURN ISOLATION [A4/V EL. 710 U-1 Penetration Room] (approximately 10 ft. North of Penetration Room Cooler 1B-B on mezzanine above RHR Sump Valve Room)

Attachment 5
(Page 1 of 1)

CCS Supply Isolation

CLOSE 1-ISV-70-516, REACTOR BUILDING CCS SUPPLY ISOLATION [A6/T EL. 737] (Behind Elevator approximately 2 ft. west on mezzanine above “A” CCS Heat Exchanger)

Scenario 1
Attachment 3

AOI-43.01, "Loss of Unit 1 Train B Shutdown Boards."

Section 3.1, "Initial Actions."

Section 3.4, "Compensatory Actions for Loss of 6.9kVSD BD 1B-B."

Watts Bar Nuclear Plant

Unit 1

Abnormal Operating Instruction

AOI-43.02

Loss of Unit 1 Train B Shutdown Boards

Revision 0008

Quality Related

Level of Use: Continuous Use

Effective Date: 01-24-2011

Responsible Organization: OPS, Operations

Prepared By: Nicholas Armour

Approved By: Brian McIlnay

Revision Log

Revision or Change Number	Effective Date	Affected Page Numbers	Description of Revision/Change
2	08/07/03	2, 17	Non-intent. Corrected typo.
3	10/02/2003	2, 7, 17, 20, 22	Non-intent. Deleted reference to Vital Inverter 2-II for DCN-51368, stage 2. Corrected protective relay operation verification.
4	09/17/07	2, 7, 28	Non-intent. Changed 1-HIC-62-81A required position from 25% open to 40-50% open to be consistent with SOI-62.01. Clarified step 12 to indicated manning is for additional manpower, not do to rep classification. Operator feedback.
5	12/03/07	2, 16	Added clarification for primary water system when in bypass mode. Operator feedback.
6	02/03/10	2, 33	Administrative change. Changed Maintenance Supply to 6.9KV SD BD 2A-A from 6.9KV Unit BD 2B (PER 170433)
7	07/12/10	All	General revision to incorporate corrective actions for PER 176605. Procedure rewritten to provide clarity and logical flow. Section 3 (Operator Actions) divided into subsections for Initial Actions, Energizing 6.9kV Shutdown Board, Restoration of 6.9kV SD BD after Energization, Compensatory Actions for Loss of 6.9kV SD BD. Added section to address loss of 480V SD BDs 1B1-B or 1B2-B. Added Appendix for list of equipment affected by loss of B-Train SD BDs. Increased level of detail through-out procedure. Added steps for resetting Black-Out Relays in Section 3.3.
8	01/24/11	2, 36, 39, 49, 50	Added Spare Charger 8-S (DCN 53437).

1.0 PURPOSE

This Instruction provides operator actions for:

- A loss of 6.9kV Shutdown Board 1B-B OR
- A loss of either 480V Shutdown Board 1B1-B or 1B2-B, without a loss of 6.9kV SD BD 1B-B

2.0 SYMPTOMS

2.1 Alarms

A. PNL 1-M-7 BREAKER TRIP [15-E].

B. 6.9 SD BD 1B-B UV/OV/CONTROL PWR FAILURE [13-B, 208-C].

C. 480 SD BD 1B1-B/1B2-B FAILURE/ABN [11-D, 207-D].

D. RX MOV VENT BD TRAIN B UNDERVOLTAGE [142-D].

E. C & A VENT BD 1B1-B/1B2-B UNDERVOLTAGE [142-E].

F. DG AUX BD 1B1-B/1B2-B UNDERVOLTAGE [207-E].

2.2 Indications

A. Low voltage on any Unit 1 Train B 6.9KV or 480V Shutdown Board.

B. Zero amps indicated on CSST to Shutdown Board indication.

C. Open breaker indications.

D. Failure of Shutdown Board supplied loads.

2.3 Automatic Actions

A. Diesel Generator 1B-B starts upon loss of voltage to 6.9KV SD BD 1B-B.

B. Designated loads are auto stripped from 6.9kV SD BD 1B-B, 480V SD BDs 1B1-B and 1B2-B.

C. Designated loads auto sequence on when voltage is restored to 6.9kV SD BD 1B-B and the Diesel Generator feeder breaker is closed.

D. Auto start for shed loads is blocked (except for SI auto start).

3.0 OPERATOR ACTIONS

NOTE 1 The loss of all onsite and offsite power is covered in the Emergency Instructions and AOI-40.

NOTE 2 A complete or partial loss of 161kV offsite power is addressed in AOI-35.

DIAGNOSTICS	
CONDITION	**APPLICABLE PROCEDURE SECTION**
6.9kV SD BD 1B-B energized from DG 1B-B following blackout	****GO TO** Section 3.3 Restoration After Energizing 6.9kV SD BD 1B-B
Loss of Power to 6.9kV SD BD 1B-B	**GO TO** Section 3.1, Initial Actions
Loss of Power to 480V SD BD 1B1-B without Loss of 6.9kV SD BD 1B-B	**GO TO** Section 3.5.1, Energize 480V SD BD 1B1-B
Loss of Power to 480V SD BD 1B2-B without Loss of 6.9kV SD BD 1B-B	**GO TO** Section 3.5.2, Energize 480V SD BD 1B2-B

End of Section

Step	Action/Expected Response	Response Not Obtained

3.1 Initial Actions

1.	**MONITOR** A TRAIN 6.9KV SD BD 1A-A ENERGIZED.	**EMERGENCY START** DGs: • 1-HS-82-15 [1-M-1]. • 2-HS-82-15 [2-M-1]. **IF** BOTH Unit 1 6.9KV SD BDs still de-energized, AND a. **IF** Unit in MODE 1, 2, 3, or 4, **THEN** ****GO TO** ECA-0.0, Loss of Shutdown Power. b. **IF** Unit in MODE 5, or 6,**THEN:** 1) **TRIP** RCPs 2) **PERFORM** AOI-14, Loss of RHR SD Cooling, WHILE continuing this procedure at Step 2.
2.	**ENSURE** Diesel Generators running: • DG 1A-A • DG 1B-B • DG 2A-A • DG 2B-B	**EMERGENCY START** Diesel Generators: • 1-HS-82-15 [1-M-1]. • 2-HS-82-15 [2-M-1].

Step	Action/Expected Response	Response Not Obtained

3.1 Initial Actions (continued)

IF any D/G is NOT RUNNING, **THEN**

EVALUATE RESETTING EMERGENCY STOP

IF RESET and START of a DG is desired, **THEN**:

a. **PRESS** and **RELEASE** DG AUTO SAFETY SHUTDOWN RELAY-RESET [0-M-26]:
   - 1-HS-82-20 [1A-A].
   - 1-HS-82-50 [1B-B].
   - 2-HS-82-80 [2A-A].
   - 2-HS-82-110 [2B-B].

b. **EMERGENCY START** Diesel Generator [0-M-26]:
   - 1-HS-82-16A [1A-A].
   - 1-HS-82-46A [1B-B].
   - 2-HS-82-76A [2A-A].
   - 2-HS-82-106A [2B-B].

Step	Action/Expected Response	Response Not Obtained
3.1	**Initial Actions (continued)**	
	NOTES • Appendix A provides a list of affected equipment. • RCPs can be operated for up to 10 minutes after a loss of CCS flow.	
3.	**MONITOR** RCP seal cooling available: • Seal injection flow OR • CCS flow through Thermal Barrier Heat Exchangers	**MANUALLY START** • CCP 1A-A • CCS pump 1A-A. **IF** seal cooling not restored, **THEN** **MONITOR** RCP trip criteria (reference AOI-24 as required).
4.	**EVALUATE** ERCW supply on B Train headers: a. **ENSURE** at least one B Train ERCW Pump In-service: • ERCW Pump G-B • ERCW Pump H-B b. **START** second pump as needed.	**IF** any B Train Diesel Generator running with NO ERCW cooling, **THEN** 1) **EMERGENCY STOP** B Train DGs. 2) **OPEN** 1-FCV-67-65, DG 1B-B ERCW SUP from Hdr. 2A, Manually [1B-B DG RM] 3) **OPEN** 2-FCV-67-65, DG 2B-B ERCW SUP from Hdr. 2A, Manually. [2B-B DG RM] 4) **RESET** and **EMERGENCY START** B Train Diesel Generators Stopped due to lack of ERCW Cooling.

Step	Action/Expected Response	Response Not Obtained

3.1 Initial Actions (continued)

CAUTION Further damage may occur if 86 LOCKOUT relay(s) are reset before status of board is evaluated and understood.

Step	Action/Expected Response	Response Not Obtained
5.	**DISPATCH** personnel to inspect the following equipment for damage, protective relay operation, and determine reason for BO: • 6.9kV SD BD 1B-B • DG 1B-B • 480V SD BD 1B1-B • 480V SD BD 1B2-B • 480V SD Xfmrs	
6.	**NOTIFY** Work Control for support and evaluation of BD.	
7.	**MONITOR** containment upper and lower compartment average air temperatures are within limits: • S/R 3.6.5.1, Computer Point U9019 • S/R 3.6.5.2, Computer Point U9020	**START** containment fans as needed: • CRD Mech Cooler Fans • Lower Compartment Cooler Fans • Upper Compartment Cooler Fans
8.	**ENSURE** 1A Primary Water Pump in-service as required.	

Step	Action/Expected Response	Response Not Obtained

3.1 Initial Actions (continued)

NOTE Operability verification of remaining AC power sources is required to be completed within one hour per LCO 3.8.1. S/R 3.8.1.1 (0-SI-82-2)

Step	Action/Expected Response	Response Not Obtained
9.	**NOTIFY** Shift Manager to evaluate staffing the TSC/OSC for support,	
10.	**EVALUATE** Relay Operation and Damage reports, **THEN** **DETERMINE** if safe to energize 6.9kV SD BD 1B-B.	**GO TO** Section 3.4, Compensatory Actions for Loss of 6.9kVSD BD 1B-B, WHILE continuing to Evaluate Energizing 1B-B 6.9kV SD BD.
11.	**GO TO** Section 3.2	

End of Section

Step	Action/Expected Response	Response Not Obtained

3.4 Compensatory Actions for Loss of 6.9kVSD BD 1B-B

NOTE Appendix A provides list of Unavailable Equipment resulting from a loss of 6.9kV SD BD 1B-B.

Step	Action/Expected Response	Response Not Obtained
1.	**MONITOR** condition of 6.9kV SD BD 1B-B and supply sources, **WHEN** ready to energized Board from available power supply, **THEN** ** **GO TO** Section 3.2.1, Step 1.	
2.	**DISPATCH** AUO to D/G Bldg to monitor D/Gs conditions USING SOI-82 series, APPENDIX A, for operating parameters.	
3.	**CHECK** any charging pump RUNNING.	**PERFORM** the following: a. **ISOLATE** letdown: • **CLOSE** letdown orifice(s). • **CLOSE** 1-FCV-62-69A. • **CLOSE** 1-FCV-62-70A. b. **RESTORE** charging and letdown using APPENDIX E ALIGNMENT OF CHARGING AND LETDOWN.

Step	Action/Expected Response	Response Not Obtained
3.4	**Compensatory Actions for Loss of 6.9kVSD BD 1B-B (continued)**	
4.	**CHECK** A Train CCS flow adequate.	**START** 1A-A CCS Pump. **ENSURE** one of the following CLOSED to avoid excessive flow • RHR HTX A , 1-FCV-70-156 **OR** • SFP HTX A, 0-FCV-70-197 **IF** A Train CCS is lost, **THEN** **REFER TO** AOI-15, Loss of Component Cooling Water (CCS) FOR LOSS OF CCS FLOW.
5.	**ENSURE** Thermal Barrier Booster Pump 1A-A in-service (SOI-70.01).	**REFER TO** AOI-15, Loss of Component Cooling Water (CCS) FOR LOSS OF CCS FLOW.
6.	**EVALUATE** transferring one of the following to preserve Vital Battery life: • 480V AC Vital Transfer Switch II to Alternate power supply (SOI-235.02). OR • 125V Vital Batt BD II to Battery Charger 6-S or 8-S (SOI-236.02)	
7.	**EVALUATE** transferring 24V CAP Battery Charger 2 from Normal to Alternate (SOI-252).	
8.	**ENSURE** Aux Bldg General Supply and Exhaust Fans in-service as required to maintain ventilation and pressure (SOI-30.05).	

Step	Action/Expected Response	Response Not Obtained

3.4 Compensatory Actions for Loss of 6.9kVSD BD 1B-B (continued)

9. **ENSURE** EBR Air Conditioning Unit A-A and MCR Air Conditioning Unit A-A in-service (SOI-31.01).

10. **ENSURE** 1A Annulus Vacuum Fan in-service (SOI-65.01).

11. **ENSURE** 6.9kV SDBR Air Conditioning Unit A-A in-service. (SOI-30.07)

12. **ENSURE** A Train or B Train 480V Shutdown Board Room Ventilation in-service (SOI-30.07).

3.4 Compensatory Actions for Loss of 6.9kVSD BD 1B-B (continued)

CAUTION LCO 3.8.1 is expected to require performance of S/R 3.8.1.1 (0-SI-82-2). Performers are NOT to take ANY actions which would interrupt power supplies in-service by this AOI.

13. **REFER TO** Tech Specs:
    - 3.5.2, ECCS-Operating.
    - 3.5.3, ECCS-Shutdown.
    - 3.8.1, AC Sources-Operating.
    - 3.8.2, AC Sources-Shutdown.
    - 3.8.4, DC Sources-Operating.
    - 3.8.5, DC Sources-Shutdown.
    - 3.8.9, Distribution Sys-Operating.
    - 3.8.10, Distribution Sys-SD.

14. **REFER TO** EPIP-1, Emergency Plan Classification Flowchart.

15. **CONTINUE MONITORING** 6.9Kv SD BD 1B-B supply sources using 1-EI-82-36A [0-M-26]. .

    WHEN Power supply AVAILABLE,
    THEN
    ****GO TO** Section 3.2.1 Step 1.

End of Section

Scenario 1
Attachment 4

AOI-17, “Turbine Trip.”

Section 3.3, “BOP Realignment.”

Step	Action/Expected Response	Response Not Obtained

3.3 BOP Realignment

CAUTION Performance of this instruction should not be allowed to delay or interfere with actions required by applicable emergency procedures or abnormal operating procedures.

NOTES

- Control room operators may initiate shutdown of pumps and equipment from the bench board immediately after a trip. Performance of this instruction will subsequently verify proper secondary equipment alignment.
- Steps in this section and items in Attachment 1 may be performed out of sequence.
- Attachment 1 may be initiated as soon as Turbine has tripped while MCR completes Section 3.2. Initiation of Attachment 1 may be part of briefing for preplanned Turbine trip with performance to begin when NAUO is notified of Turbine trip by UO.

1. **DISPATCH** turbine building NAUO to perform Attachment 1.
2. **NOTIFY** condensate demineralizer NAUO prior to Operator initiated press changes in condensate.
3. **REMOVE** generator excitation from service:
   a. **PLACE** voltage regulator to TEST.
   b. **OPEN** exciter field breaker.
   c. **PLACE** exciter regulator control to OFF.

Step	Action/Expected Response	Response Not Obtained

3.3 BOP Realignment (continued)

4. **MONITOR** main turbine:

   a. **VERIFY** seal oil backup pump running.

      RNO: a. **ENSURE** seal oil backup pump 1-HS-47-61D in NORMAL (T7J/729 behind MTOT)

   b. **ENSURE** turning gear oil pump RUNNING.

   c. **WHEN** less than 600 rpm,
      THEN
      ENSURE bearing lift oil pump RUNNING.

   d. **WHEN** turbine is at ZERO RPM,
      THEN
      ENSURE turbine on turning gear.

   e. **MAINTAIN** MTOT lube oil temp between 95°F° and 100°F (may require RCW isolation if TCV has excessive leakage).

   f. **MAINTAIN** GENERATOR H2 (Cold Gas) temp 95°F (may require RCW isolation if TCV has excessive leakage).

   g. **ENSURE** Gland Steam Spillover Bypass valve is CLOSED using 1-HS-47-191A.

5. **ALIGN** MSRs:

   a. **PUSH** RESET on MSR control panel.

   b. **CLOSE** MSR HP steam and bypass isol.

   c. **ENSURE** MSR warming valves CLOSED.

   d. **OPEN** MSR startup vents.

   e. **CLOSE** MSR operating vents.

Step	Action/Expected Response	Response Not Obtained
3.3	**BOP Realignment (continued)**	
6.	**CHECK** MSIVs OPEN.	**IF** vacuum is to be maintained, **THEN** **ENSURE** auxiliary boiler is aligned for steam seals.
7.	**ENSURE** adequate FW press: a. **ENSURE** two hotwell pumps RUNNING. b. **IF** FW isolation reset, **THEN** **ENSURE** one condensate booster pump RUNNING if needed for unit conditions. c. **ENSURE** CNDS demin pumps OFF. d. **STOP** #3 HDT pumps, and **CLOSE** the discharge valves to condensate heater strings. Notify NAUO performing Attachment 1 that #3 HDT pumps are stopped. e. **STOP** #7 HDT pumps, and **CLOSE** the discharge valves to condensate heater strings.	
8.	**SHUTDOWN** any MFW pump NOT required.	
9.	**SHUTDOWN** any RCW pumps NOT required.	
10.	**SHUTDOWN** any CCW pumps NOT required.	

3.3 **BOP Realignment (continued)**

11. **ALIGN** extraction steam valves and drain valves:
    a. **CLOSE** #1 and #2 Heater extraction steam valves.
    b. **ENSURE** turbine drain valves OPEN.
    c. **OPEN** MFW pump turbine drain valves.

12. **PERFORM** as required:
    a. **OBTAIN** switching instructions from NEAD, and
    OPEN main generator PCB(s) MODs.
    b. **PULL-TO-LOCK** bus duct cooling fans.
    c. **VERIFY** MTOT and seal oil temps STABLE and trending to 95°F.

13. **IF** MFW isolated to steam generators,
    THEN
    REQUEST Chem Lab sample condensate and feedwater prior to re-admitting water to S/Gs from condensate-feedwater system.

14. **IF** EGTS started,
    THEN
    SHUTDOWN one train after 1 to 2 hours and place in P-AUTO:
    - **REFER TO** SOI-65.02, Emergency Gas Treatment System, section on Auto EGTS Actuation.

Step	Action/Expected Response	Response Not Obtained

3.3 BOP Realignment (continued)

15.	**IF** ABGTS started, **THEN** **SHUTDOWN** one train after 1 to 2 hours and place in P-AUTO: • **REFER TO** SOI-30.06, Auxiliary Building Gas Treatment System, section on Auto Start of ABGTS	

CAUTION Rx trip bkrs must be cycled to allow reset of MFW when isolated by SI, HI-HI S/G level, or flood level in MS valve vault room. If any SI signal is present with Auto SI blocked, cycling Rx trip bkrs will initiate SI actuation.

16.	**IF** MFW **NOT** in service, **THEN** **ESTABLISH** MFW: • **REFER TO** Attachment 2, Establishing MFW Following Reactor Trip.	
17.	**CHECK** S/G NR levels between 38% and 50%.	**IF** S/G level can NOT be maintained, **THEN** **START** M-D AFW pumps.
18.	**RETURN TO** applicable Instruction.	

End of Subsection

Scenario 1
Attachment 5

E-1, “Loss of Reactor or Secondary Coolant.”

Appendix A through D

Appendix A
(Page 1 of 1)
CLA Breaker Operation

CLOSE the following to restore power to cold leg accumulator isolation valves:

BOARD	COMPT	NOMENCLATURE
480 V Reactor MOV Board 1A1-A	3F2	1-BKR-63-118A SIS CL ACCUM 1 OUT ISOL (1-FCV-63-118)
480 V Reactor MOV Board 1A1-A	17F2	1-BKR-63-80A SIS CL ACCUM 3 OUT ISOL (1-FCV-63-80)
480 V Reactor MOV Board 1B1-B	3F2	1-BKR-63-98A SIS CL ACCUM 2 OUT ISOL (1-FCV-63-98)
480 V Reactor MOV Board 1B1-B	16F2	1-BKR-63-67A SIS CL ACCUM 4 OUT ISOL (1-FCV-63-67)

Appendix B
(Page 1 of 1)

1-FCV-63-1 Breaker Operation

CLOSE the following to restore power to 1-FCV-63-1:

BOARD	COMPT	NOMENCLATURE
480 V Reactor MOV Board 1A1-A	2E1	1-BKR-63-1A RWST TO RHR SUCT (1-FCV-63-1)

Appendix C
(Page 1 of 1)

1-FCV-63-22 Breaker Operation

CLOSE the following to restore power to 1-FCV-63-22:

BOARD	COMPT	NOMENCLATURE
480 V Reactor MOV Board 1B1-B	2F2	1-BKR-63-22A SIP COLD LEG INJECTION (1-FCV-63-22) SHUNT TRIP BREAKER

Appendix D
(Page 1 of 1)

Equipment Evaluation

A. **EVALUATE** plant equipment and systems needed to support long term cooling and recovery actions, as time and personnel availability permits:

1. Cntmt Isolation Status.
2. Emergency Gas Treatment System: One train in operation, **REFER TO** SOI-65.02.
3. Auxiliary Building Gas Treatment: One train in operation, **REFER TO** SOI-30.06.
4. Auxiliary Building Isolation alignment: **REFER TO** SOI-30.06.
5. Main Control Room Isolation alignment: **REFER TO** SOI-31.01.
6. ERCW System: Both trains in operation.
7. Component Cooling Water System: Both trains in operation.
8. Ice Condenser System: AHUs energized after cntmt hydrogen concentration verified (if applicable). **REFER TO** SOI-61.01.
9. Permanent Hydrogen Mitigation System: Igniters de-energized when no longer needed. **REFER TO** SOI-268.01.

Scenario 1
Attachment 6

ECA-1.1, “Loss of RHR Sump Recirculation.”

Appendix B

Appendix B
(Page 1 of 1)

ERCW Operation

1.0 INSTRUCTIONS

A. **ENSURE** at least two ERCW pumps running on each train.

B. **ALIGN** ERCW to Train A cntmt spray:

- **OPEN** 1-FCV-67-125 CNTMT SPRAY HX 1A INLET.
- **OPEN** 1-FCV-67-126 CNTMT SPRAY HX 1A RETURN.

C. **ALIGN** ERCW to Train B cntmt spray:

- **OPEN** 1-FCV-67-123 CNTMT SPRAY HX 1B INLET.
- **OPEN** 1-FCV-67-124 CNTMT SPRAY HX 1B RETURN.

D. **IF** supply flow less than 5200 gpm on 1-FI-67-136, CS HX 1A SUP FLOW, and 1-FI-67-122, CS HX 1B SUP FLOW, **THEN**

ADJUST CCS heat exchanger outlet valves as necessary, **AND**

CONSULT TSC.

Facility:	**Watts Bar June 2011**	Scenario No.:**2**	Op Test No.: **1**
Examiners:	______	Operators:	______ **SRO**
	______		______ **RO**
	______		______ **BOP**

Initial Conditions: 30% RTP, BOL. RCS boron concentration is 1396 ppm. Control Bank D rods are at 154 steps.

Turnover: A power escalation to 100% is to be conducted after turnover. 1A-A Containment Spray pump is out-of-service for motor winding inspection. LCO 3.6.6, Containment Spray, was entered 4 hours ago. The 1A-A Containment Spray pump is expected to be returned to service within the next 12 hours. Chemistry has requested that letdown flow be maintained at 75 gpm during the power escalation. A Severe Thunderstorm Warning has been issued for Rhea, Meigs, and McMinn Counties for the next 2 hours. Train A/Channel I Work Week.

Event No.	Malf. No.	Event Type*	Event Description
1	n/a	R-RO N-SRO/BOP	Raise reactor power using GO-4, "Normal Power Operations," Section 5.2, "Unit Startup from 30% to 100% Reactor Power."
2	rx05b 15	C-RO TS-SRO	1-LI-68-335 fails to 15% over 15 seconds. Requires entry into AOI-20, "Malfunction of Pressurizer Level Control System." Requires a Tech Spec evaluation.
3	rw18a	C-BOP TS-SRO	ERCW pump A-A pump shaft shears. Requires entry into AOI-13, "Loss of Essential Raw Cooling Water." Requires a Tech Spec evaluation. When another A Train pump is started, the selected pump bearings seize, resulting in a motor overload condition. One of the remaining Train A ERCW pump must be started. Requires a Tech Spec evaluation, which will depend on the final pump configuration.
4	rx24 100	I-BOP	1-PT-3-1, #1 HTR INLET PRESS, fails high. Requires entry into AOI-16, "Loss of Normal Feedwater."
5	cv04 60	C-RO	Letdown line leak develops in the Auxiliary Building. Requires entry into AOI-6, "Small RCS Leak."
6	mux_05c080 on mux_05c072 on ms02d 50 ms04a ms04b mso4c ms04d	M-All	Seismic Event occurs, causing a main steam line break on SG #4 outside Containment 25 seconds after the receipt of the alarms. Reactor auto trips and crew enters E-0, "Reactor Tip or Safety Injection," then transitions to E-2, "Faulted Steam Generator Isolation," then to ECA-2.1, "Uncontrolled Depressurization of All Steam Generators." All MSIVs fail to auto close and cannot be closed manually. Cooldown requires entry into FR-P.1, "Pressurized Thermal Shock."

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

Scenario 2 - Summary

Initial Condition	30% RTP, BOL. RCS boron concentration is 1396 ppm. Control Bank D rods are at 154 steps.

Turnover	A power escalation to 100% is to be conducted after turnover. 1A-A Containment Spray pump is out-of-service for motor winding inspection. LCO 3.6.6, Containment Spray, was entered 4 hours ago. The 1A-A Containment Spray pump is expected to be returned to service within the next 12 hours. Chemistry has requested that letdown flow be maintained at 75 gpm during the power escalation. A Severe Thunderstorm Warning has been issued for Rhea, Meigs, and McMinn Counties for the next 2 hours. Train A/Channel I Work Week.

Event 1	Raise reactor power using GO-4, "Normal Power Operations," Section 5.2, "Unit Startup from 30% to 100% Reactor Power."
Event 2	1-LI-68-335 fails to 15% over 15 seconds. Requires entry into AOI-20, "Malfunction of Pressurizer Level Control System," to remove the failed backup channel from service and to restore charging and letdown. Requires a Tech Spec evaluation and entry into LCO 3.3.1 Reactor Trip Instrumentation, for the failed pressurizer level channel.
Event 3	ERCW pump A-A pump shaft shears. Requires entry into AOI-13, "Loss of Essential Raw Cooling Water." Requires a Tech Spec evaluation. When another A Train pump is started, the selected pump bearings seize, resulting in a motor overload condition. One of the remaining Train A ERCW pump must be started. Requires a Tech Spec evaluation, which will depend on the final pump configuration.
Event 4	1-PT-3-1, #1 HTR INLET PRESS, fails high. Requires entry into AOI-16, "Loss of Normal Feedwater."
Event 5	Letdown line leak develops in the Auxiliary Building. Requires entry into AOI-6, "Small RCS Leak." Letdown will be isolated, and excess letdown will be placed in service to allow continued plant operation.
Event 6	An earthquake occurs, causing Windows 166-D, OBE SPECTRA EXCEEDED, and 166-E, SEISMIC RECORDING INITIATED to be received. Due to the earthquake, a main steam line break on SG #4 outside containment occurs. At the trip, the steam line ruptures and all of the MSIVs fail to close. The crew enters E-0, "Reactor trip or Safety Injection" and transitions to E-2, "Faulted Steam Generator Isolation." From E-2, "Faulted Steam Generator Isolation" the crew transitions to ECA-2.1, "Uncontrolled Depressurization of All Steam Generators." Ultimately, conditions will degrade to the point that an ORANGE path condition exists on the Pressurized Thermal Shock Status Tree. The crew will then enter FR-P.1, "Pressurized Thermal Shock."

Scenario 2 - Critical Task Summary

Critical Task 1	Control the AFW flow rate in order to minimize the RCS cooldown rate before a RED path develops to the Pressurized Thermal Shock Status Tree.
Critical Task 2	Terminate ECCS flow order to minimize the RCS cooldown rate before a RED path develops to the Pressurized Thermal Shock Status Tree.

Watts Bar Nuclear Plant
06-2011 NRC Examination Scenario 2
Simulator Console Operators Instructions

SIMULATOR SETUP INFORMATION

1. **ENSURE NRC Examination Security has been established.**
2. **RESET to Initial Condition 342 by performing the following actions:**
   a. **Select ICManager on the THUNDERBAR menu (right hand side of Instructor Console Screen).**
   b. **Locate IC# 342.**
   c. **Right "click" on IC# 342.**
   d. **Select Reset on the drop down menu.**
   e. **Right "click" on RESET.**
   f. **Enter the password for IC 342.**
   g. **Select "Yes" on the INITIAL CONDITION RESET pop-up window.**
   h. **Perform SWITCH CHECK.**
3. **SELECT Director on the THUNDERBAR menu (right hand side of Instructor Console Screen).**
4. **ENSURE the following information appears on the Director Screen:**

	Key	Description	Type	Event	Delay	Inserted	Ramp	Initial	Final	Value
	hs-72-27a-1	06020 cntmt spray pump a mtr sw(green)	O		00:00:00	00:00:00	00:00:00		Off	Off
	ms04d	msiv fails to close fcv-1-29	M		00:00:00	00:00:00	00:00:00		Active	Active
	ms04c	msiv fails to close fcv-1-22	M		00:00:00	00:00:00	00:00:00		Active	Active
	hs-72-22a-1	05020 rwst spray hdr a fcv(green)	O		00:00:00	00:00:00	00:00:00		Off	Off
	hs-72-39a-1	05080 cs hdr a isol vlv sw.(green)	O		00:00:00	00:00:00	00:00:00		Off	Off
	hs-72-34a-1	05060 cs pump a recirc fcv(green)	O		00:00:00	00:00:00	00:00:00		Off	Off

SIMULATOR SETUP INFORMATION

	Key	Description	Type	Event	Delay	Inserted	Ramp	Initial	Final	Value
	hs-72-44a-1	05040 cntmt sump hdr a fcv(green)	O		00:00:00	00:00:00	00:00:00		Off	Off
	ms04a	msiv fails to close fcv-1-4	M		00:00:00	00:00:00	00:00:00		Active	Active
	ms04b	msiv fails to close fcv-1-11	M		00:00:00	00:00:00	00:00:00		Active	Active
	rx05b	pzr level transmitter fails to position chnl 1 68-335	M	2	00:00:00		00:00:15		15	36.6692
	rw19b	ercw pump b-a bearing wear	M	20	00:00:00		00:00:00		10	0
	rw19C	ercw pump c-a bearing wear	M	21	00:00:00		00:00:00		10	0
	rw18a	ercw pump a-a sheared shaft	M	3	00:00:00		00:00:00		Active	InActive
	rx24	feed water header pressure transmiter pt-3-1 fail to position	M	4	00:00:00		00:00:00		100	74.0718
	cv04	letdown line break, in aux building	M	5	00:00:00		00:00:00		60	0
	ms02d	main steam line break outside containment sg #4	M	6	00:00:25		00:00:00		50	0
	mux_05c072	166-d obe spectra exceeded	M	6	00:00:00		00:00:00		Alarm	None
	mux_05c080	166-e seismic recording initiated	M	6	00:00:00		00:00:00		Alarm	None

5. **Place simulator in RUN and acknowledge any alarms.**

6. **ENSURE 1-HS-72-27A, CNTMT SPRAY PMP A is in Stop, PULL-TO-LOCK, with a Hold Order Tag. ENSURE Hold Order Tags on 1-HS-72-22A, RWST TO CS PMP A SUCTION, 1-HS-72-39A CNTMT SPRAY HDR A TO CNTMT.**

7. **ENSURE the "Train A Week - Channel 1" sign is placed on 1-M-30.**

8. **Place simulator in FREEZE.**

9. **ENSURE Watts Bar Nuclear Plant Unit 1 Reactivity Briefing Book (Simulator Copy) BOL (Beginning Of Life) is updated and on the desk, and that the BOL placards are on 1-M-6, below the Boric Acid and Primary Water Integrators. ENSURE Reactivity Plan for power maneuver is available to the crew.**

10. **WHEN prompted by the Chief Examiner, place the Simulator in RUN.**

Exam Event No.	Simulator Event No.	Description/Role Play
2	2	1-LI-68-335 fails to 15% over 15 seconds. ***ROLE PLAY: When contacted as Work Control, acknowledge request for a troubleshooting and repair package for 1-LI-68-335. If requested, acknowledge request for Instrument Maintenance to perform IMI-160 to remove the channel from service.***
3	3	ERCW pump A-A pump shaft shears. When the additional ERCW pump (B-A or C-A) started, the pump bearings seize, resulting in a motor overload condition ***ROLE PLAY: When contacted as the Outside Routine AUO, state that the A-A ERCW motor is turning, but the pump shaft has failed.*** ***ROLE PLAY: When contacted state that the additional ERCW pump (B-A or C-A) shaft has seized.*** ***ROLE PLAY: When contacted as Outside Routine AUO, the Console Operator will acknowledge the request to close the B-A ERCW or C-A Pump discharge valve. BOP may look at Flow Diagram or SOI-67.01, "Essential Raw Cooling Water System," and provide nomenclature for discharge valve as 0-ISV-67-504B for B-A ERCW pump or 0-ISV-67-504C for the C-A ERCW pump.*** ***ROLE PLAY: When contacted as Work Control, the Console Operator will acknowledge the request for a repair package for the additional ERCW pump.***
4	4	1-PT-3-1, #1 HTR INLET PRESS, fails high. Requires entry into AOI-16, "Loss of Normal Feedwater." ***ROLE PLAY: When contacted as Work Control, acknowledge the request for a repair package for 1-PT-3-1, #1 HTR INLET PRESS.***
5	5	Letdown line leak develops in the Auxiliary Building. ***ROLE PLAY: When contacted as Radiation Protection, acknowledge the request for surveys of the Auxiliary Building.*** ***ROLE PLAY: If contacted as the Auxiliary Building AUO, acknowledge the request to look for leakage in the Auxiliary Building.*** ***ROLE PLAY: When contacted as Work Control, acknowledge the request for repairs to the letdown line.***

Exam Event No.	Simulator Event No.	Description/Role Play
6	6	Seismic Event occurs. ***ROLE PLAY: As Nuclear Security and report that a violent shaking of the ground has been reported by multiple Security Officers at a variety of locations on site.***
7	7	Main steam line break on #2 SG OUTSIDE containment. MSIVs fail to close ***ROLE PLAY: As Outside AUO, state that there is a large cloud of steam outside the plant outside the Service Building roll-up door.*** ***ROLE PLAY: As Control Building AUO report that the ACR switches for the MSIVs are in the "Aux" position.*** **Insert remote function msr26a, msr26b, msr26c and msr26d to AUX.** ***ROLE PLAY: As Control Building AUO report that the fuses for the MSIVs have been removed per E-2, Attachment 1 or ECA-2.1, Attachment 1.*** **ALL MSIVs WILL REMAIN OPEN FOR THE DURATION OF THE SCENARIO.**

Op Test No.: NRC	Scenario # 2	Event # 1	Page 1 of 46

Event Description: Raise reactor power using GO-4, "Normal Power Operation," beginning at Section 5.2, "Unit Startup from 30% to 100% Reactor Power," Step 11.

Time	Position	Applicant's Actions or Behavior

EXAMINER: The turnover package contains a copy of GO-4, "Normal Power Operation," Section 5.2, "Unit Startup from 30% to 100% Reactor Power," completed through Step 10. The crew may perform actions of SOI-62.02, "Boron Concentration Control," Section 6.6, "Minor Dilution," prior to performing of GO-4, "Normal Power Operation," Section 5.2, "Unit Startup from 30% to 100% Reactor Power," Step 11.

SOI-62.02 — **The following actions are taken from, "Boron Concentration Control," Section 6.6, "Minor Dilution."**

NOTES

1) Section 6.6, Minor Dilution, may be reproduced, laminated, displayed, reused, etc. as desired.

2) Minor Dilution is defined as the addition of Primary Water done several times each shift to compensate for fuel burn-up, and maintain Tavg on program.

Time	Position	Applicant's Actions or Behavior
	RO	[1] **ENSURE** 1-HS-68-341H, BACKUP HEATER C, is ON, to equalize Pzr-RCS CB. ***RO determines that that the GREEN indicating light is DARK and the RED indicating light is LIT on 1-HS-68-341H, BACKUP HEATER C.***
	RO	[2] **ADJUST** 1-FQ-62-142, PW BATCH COUNTER, for required quantity. ***From the TI-7.012 "Reactivity Control Plan" provided, RO enters between 150 and 200 gallons of primary water in the batch counter to accomplish a 1% power change.***
	RO	[3] **PLACE** 1-HS-62-140B, VCT MAKEUP MODE in DIL. ***RO rotates 1-HS-62-140B, VCT MAKEUP MODE from the AUTO position three positions to the right to the DIL position.***
	RO	[4] **(ρ) TURN** 1-HS-62-140A, VCT MAKEUP CONTROL, to START. [4.1] **CHECK** Red light is LIT. ***RO rotates 1-HS-62-140A VCT MAKEUP CONTROL to the right to the START position, and allows the switch to return to the mid position. RO observes the RED indicating light LIT in 1-HS-62-140A.***
	RO	[5] **MONITOR** the following parameters:

Instrument	Location	Parameters
1-PI-62-122	1-M-6	VCT PRESS
1-LI-62-129A	1-M-6	VCT LEVEL
1-FI-62-142	1-M-6	PW TO BLENDER FLOW
1-FQ-62-142	1-M-6	PW BATCH COUNTER
1-FQ-62-139	1-M-6	BA BATCH COUNTER

Op Test No.: NRC	Scenario # 2	Event # 1		Page 2 of 46	
Event Description:	Raise reactor power using GO-4, "Normal Power Operation," beginning at Section 5.2, "Unit Startup from 30% to 100% Reactor Power," Step 11.				

Time	Position	Applicant's Actions or Behavior
	RO	[6] **WHEN** dilution is COMPLETE, AND 1-FCV-62-128 is closed, **THEN PLACE** 1-HS-62-140B, VCT MAKEUP MODE, in AUTO. ***RO rotates 1-HS-62-140B, VCT MAKEUP MODE from the DIL position three positions to the left to the AUTO position.***
	RO	[7] **TURN** 1-HS-62-140A, VCT MAKEUP CONTROL, to START. [7.1] **CHECK** Red light is LIT. ***When the dilution stopped automatically, 1-HS-62-140A VCT MAKEUP CONTROL received a STOP signal. To enable AUTO makeup, 1-HS-62-140A VCT MAKEUP must be rotated the right to the START position.***
	RO	[8] **IF** desired to reduce VCT level, **THEN GO TO** Section 8.5, VCT Level Reduction.

Op Test No.: NRC	Scenario # 2	Event # 1			Page 3	of 46	

Event Description: Raise reactor power using GO-4, "Normal Power Operation," beginning at Section 5.2, "Unit Startup from 30% to 100% Reactor Power," Step 11.

Time	Position	Applicant's Actions or Behavior
GO-4		**The following actions are taken from GO-4, Normal Power Operation," Section 5.2, "Unit Startup from 30% to 100% Reactor Power," beginning at Step 11.**
	BOP	[11] **INITIATE** power rise to between 45 and 49% by performing the following: [11.1] **IF** during any of the following steps the REFERENCE changes in an undesired manner, **THEN ADJUST** VPL to stop turbine load rise **OR PUSH** TURBINE MANUAL to place the turbine control mode in manual mode and PROCEED to section 5.6 [11.2] **ENSURE** power escalation limits of TI-45 or SOI-47.02 are not exceeded. [11.3] **SET** VALVE POSITION LIMIT to 60% or as desired ≤ 5% above Gov Control Indication. [11.4] **SET** LOAD RATE at predetermined value. [11.5] **PUSH** REFERENCE CONTROL Δ (raise) button to set desired load in SETTER display. ***The BOP will depress the REFERENCE CONTROL Δ (raise) button and raise the SETTER display by 1%.***

NOTE

RCS should be diluted to raise TAVG, then Turbine load raised along with TAVG. Control rods will be used along with dilution to maintain ΔI and if needed for temperature.

Time	Position	Applicant's Actions or Behavior
	BOP	[11.6] **(ρ) PUSH** GO button. [11.7] **MONITOR** Generator Megawatts RISING. [11.8] **CHECK** that load rise has **STOPPED** when reference display equals setter **OR IF** desired to stop the load change, **THEN STOP** the load change by depressing the HOLD pushbutton ***BOP monitors load rise and checks that the load change stops when the REFERENCE and SETTER displays are matched.*** [11.9] **WHEN** desired to resume the load change, **THEN** (ρ) **PRESS** the GO push button and continue to monitor load. [11.10] **REPEAT** Steps 5.2[11.2] through 5.2[11.9] to bring load to between 45 and 49%, **WHILE CONTINUING** this instruction during load rise. ***Given a LOAD ESCALATION rate of 10% in one hour, the steps will be repeated approximately once every 6 minutes.***

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Event Description: Raise reactor power using GO-4, "Normal Power Operation," beginning at Section 5.2, "Unit Startup from 30% to 100% Reactor Power," Step 11.

Time	Position	Applicant's Actions or Behavior
NOTES 1) TAVG is programmed from 557°F at no load, to 586.2°F at 100% at a rate of 0.29 °F/% power. 2) Pzr level is programmed at 25% to 60% as a function of TAVG. 3) MIG support is required if controller adjustments are needed.		
	BOP/RO	[12] **MONITOR** the following as load is raised: • **COMPARE** TAVG, ΔT, and NIS to check indications are consistent with expected values. [C.1] • RCP seal flow between 8 and 13 gpm per pump. • Pzr level on program. • All RPIs, Step Counters, Loop ΔT, and NIS for correct power distribution, quadrant power tilts, rod insertion, rod misalignment, inoperable RPIs, and inoperable rods. [C.6] • MFW Regs operating properly in auto (within 5% from 0 deviation is acceptable). • IF MFW Regs not maintaining SG level in the 5% band, **THEN ENSURE** Instrument Maintenance (MIG) is notified. • Feedwater Heater, MSR Drain Tank, and Heater Drain Tank level controllers are adjusted to maintain levels normal.
NOTE MFP suction pressure should be maintained greater than 175 psig.		
	BOP	[13] **WHEN** required to support MFP suction pressure, **THEN PERFORM** the following per SOI-2 & 3.01: [13.1] **START** the third HW Pump. [13.2] **START** 1 CBP.
After sufficient power change has been observed, cue Console Operator to insert Event 2.		

Op Test No.:	NRC	Scenario #	2	Event #	2	Page	5	of	46

Event Description: 1-LI-68-335 fails to 15% over 15 seconds. Requires entry into AOI-20, "Malfunction of Pressurizer Level Control System." Requires a Tech Spec evaluation.

Time	Position	Applicant's Actions or Behavior
Indications: 92-C,PZR LEVEL LO-HTRS OFF & LTDN CLOSED		
	RO	Diagnoses and announces the failure of 1-LI-68-335, PZR LEVEL low, to 15% level.
	RO	May isolate charging since letdown has isolated.
	SRO	May enter and direct action of ARI 92-C, "PZR LEVEL LO-HTRS OFF & LTDN CLOSED."
	SRO	Enters and directs actions of AOI-20, "Malfunction of Pressurizer Level Control System."
ARI 92-C		**The following actions are taken from ARI 92-C, "PZR LEVEL LO-HTRS OFF & LTDN CLOSED."**
	RO	**[1] CHECK** PZR level indication on 1-M-4: • 1-LI-68-320 • 1-LI-68-335A ***RO determines that 1-LI-68-335 is indicating 15% level.*** • 1-LI-68-339
	RO	**[2] IF** LETDOWN is NOT in service, **THEN ISOLATE** CHARGING. ***RO isolates charging by rotating 1-HS-62-90A, CHARGING LINE ISOL and 1-HS-62-91, CHARGING LINE ISOL to the CLOSE position.***
	RO	**[3] CHECK** PZR level and reference level on 1-LR-68-339 [1-M-5]. ***RO determines that the input to 1-LR-68-339 is selected to the LT-68-335 position. Reference level (program) indicates approximately 35%, which is correct for 30% power.***
	RO	**[4] IF** Malfunction Of Pressurizer Level Control System, **THEN GO TO** AOI-20, *MALFUNCTION OF PRESSURIZER LEVEL CONTROL SYSTEM.* ***If entered, the SRO exits ARI 92-C at this point and implements actions of AOI-20, "Malfunction of Pressurizer Level Control System."***
	RO	**[5] IF** level is low, **THEN** **[a] ENSURE** All PZR heaters **OFF**. **[b] ENSURE** Letdown orifice 1-FCV-62-72, -73 & -74, **CLOSED**. **[c] ENSURE** Letdown isolation 1-FCV-62-69 and -70, **CLOSED**.
	RO	**[6] IF** PZR level control system cannot maintain level to program, **THEN REFER TO** AOI-6, *SMALL REACTOR COOLANT SYSTEM LEAK.*

Op Test No.:	NRC	Scenario #	2	Event #	2	Page	6	of 46

Event Description: 1-LI-68-335 fails to 15% over 15 seconds. Requires entry into AOI-20, "Malfunction of Pressurizer Level Control System." Requires a Tech Spec evaluation.

Time	Position	Applicant's Actions or Behavior
	RO	[7] **REFER TO** Tech Specs. • 3.3.1, Reactor Trip System (RTS) Instrumentation. ***Function 9 Pressurizer Water Level - High, Condition X With one channel inoperable, place the channel in trip within 72 hours or be in Mode 3 within 78 hours (One channel may be bypassed for up to 12 hours for surveillance testing.*** • 3.3.3, Post Accident Monitoring (PAM) Instrumentation. ***Function 13 RCS Pressurizer Level Condition A With One or more Functions with one required channel inoperable, restore required channel to OPERABLE status within 30 days.*** 3.4.9, Pressurizer. ***Not applicable.***

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Event Description: 1-LI-68-335 fails to 15% over 15 seconds. Requires entry into AOI-20, "Malfunction of Pressurizer Level Control System." Requires a Tech Spec evaluation.

Time	Position	Applicant's Actions or Behavior

AOI-20 — **The following actions are taken from AOI-20, "Malfunction Of Pressurizer Level Control System."**

CAUTION

Charging and letdown must be in service together. If letdown isolates or charging is lost, the other must be isolated.

Time	Position	Applicant's Actions or Behavior
	RO	1. **CHECK** pzr level program signal NORMAL: • 1-LR-68-339 (green pen). ***Reference level 1-LR-68-339 green pen (program) indicates approximately 35%, which is correct for 30% power.***

NOTE

1-XS-68-339E selects one channel to control level to program and one backup channel for control interlocks.

Time	Position	Applicant's Actions or Behavior
	RO	2. **CHECK** if 1-XS-68-339E is selected to FAILED channel (control or backup): • LI-68-339, OR • LI-68-320, OR • LI-68-335. ***RO determines that 1-LI-68-335 is indicating 15% level, and that 1-XS-68-339E, PZR LEVEL CONTROL CHANNEL SELECT is selected to the "LI-68-339 & 335" position.***
	RO	3. **CHECK** failure HIGH.
	RO	3. **RESPONSE NOT OBTAINED:** **IF** letdown in service, **THEN GO TO** Step 4. **IF** letdown ISOLATED, **THEN PERFORM** the following: a. **PLACE** charging valve controller 1-HIC-62-93A in MAN. ***1-HIC-62-93A, CHARGING FLOW PZR LEVEL CONTROL is placed in MANUAL by lifting the toggle switch from the AUTO position.*** b. **CLOSE** 1-FCV-62-89. ***The RO rotates 1-HIC-62-89A, CHG HDR - RCP SEALS FLOW CONTROL knob to the LEFT to close the valve.*** c. **MAINTAIN** RCP seal flow between 8 and 13 gpm with charging valve controller 1-HIC-62-93A. ***The RO observes RCP seal flow on 1-FI-62-1A, RCP 1 SEAL SUP FLOW, 1-FI-62-14A, RCP 2 SEAL SUP FLOW, 1-FI-62-27A, RCP 3 SEAL SUP FLOW, 1-FI-62-40A, RCP 4 SEAL SUP FLOW between 8 and 13 gpm, and adjusts 1-HIC-62-93A, CHARGING FLOW PZR LEVEL CONTROL to maintain proper flow rate.*** d. **GO TO** Step 5.

Op Test No.:	NRC	Scenario #	2	Event #	2	Page	8 of 46

Event Description: 1-LI-68-335 fails to 15% over 15 seconds. Requires entry into AOI-20, "Malfunction of Pressurizer Level Control System." Requires a Tech Spec evaluation.

Time	Position	Applicant's Actions or Behavior
	RO	5. **SELECT** operable pzr level channels for control and indication [1-M-5]: a. **SELECT** operable channels for control and backup with 1-XS-68-339E. ***RO will rotate 1-XS-68-339E from the LI-68-339 & 335 position to the left to the LI-68-339 B 320 position.*** b. **ENSURE** operable channel selected for recording with 1-XS-68-339B. ***RO will rotate 1-XS-68-339B from the LT-68-335 position to either the LT-68-339 (left) or LT-68-320 (right) positions.*** c. **IF** backup channel failed high and Letdown still in service, **THEN GO TO** Step 8. ***Since the conditions of Step 5.c. do not exist, Step 6 will be implemented.***
	RO	6. **CHECK** letdown IN SERVICE: • 1-FCV-62-69 OPEN. • 1-FCV-62-70 OPEN. • 1-FCV-62-77 OPEN. • Letdown orifice OPEN. ***RO observes that 1-FCV-62-69 and all of the letdown orifice isolation valves are CLOSED.***
	RO	6. **RESPONSE NOT OBTAINED:** **ESTABLISH** letdown: • **REFER TO** Attachment 1.

Op Test No.:	NRC	Scenario #	2	Event #	2	Page	9	of 46

Event Description: 1-LI-68-335 fails to 15% over 15 seconds. Requires entry into AOI-20, "Malfunction of Pressurizer Level Control System." Requires a Tech Spec evaluation.

Time	Position	Applicant's Actions or Behavior
		EXAMINER: The following actions are taken from AOI-20, "Malfunction of Pressurizer Level Control System," Attachment 1, "Alignment of Charging And Letdown."
	RO	1. **IF** charging **NOT** established, **THEN PERFORM** the following: a. **CLOSE** 1-FCV-62-89, CHRG HDR-RCP SEALS FLOW CONTROL. ***1-HIC-62-89A, CHG HDR - RCP SEALS FLOW CONTROL was CLOSED in a previous step. RO may rotate the knob to the left to confirm valve is closed.*** b. **ENSURE** Charging Pump running. ***RO ensures 1A-A CCP is in service by observing RED indicating light LIT on 1-HS-62-108A, CCP A-A ECCS. RO may observe 1-EI-62-108A, CCP A-A AMPS and/or 1-PI-62-92A, CHARGING HDR PRESS to ensure charging is in service.*** c. **OPEN** 1-FCV-62-90 and 1-FCV-62-91, CHARGING LINE ISOL. ***RO restores charging by rotating 1-HS-62-90A, CHARGING LINE ISOL and 1-HS-62-91, CHARGING LINE ISOL to the OPEN position.*** d. **ENSURE** 1-FCV-62-85, NORM CHARGING TO LOOP 1, or 1-FCV-62-86, ALT CHARGING TO LOOP 4, OPEN. ***RO observes 1-FCV-62-86, ALT CHARGING TO LOOP 4 is open by RED indicating light LIT.*** e. **ADJUST** 1-FCV-62-93 to maintain seal injection flow between 8 and 13 gpm for each RCP.
	RO	2. **ENSURE** letdown isol valves OPEN: • 1-FCV-62-69, CVCS LETDOWN ISOLATION. ***1-HS-62-69, RCS LETDOWN FRM LOOP 3 IN CNTMT is rotated to the right to the OPEN position and held until the RED indicating light is LIT and the GREEN indicating light is DARK.*** • 1-FCV-62-70, CVCS LETDOWN ISOLATION. ***1-HS-62-70, RCS LETDOWN FRM LOOP 3 IN CNTMT is rotated to the right to the OPEN position and held until the RED indicating light is LIT and the GREEN indicating light is DARK.*** • 1-FCV-62-77, CVCS LP LETDOWN ISOLATION.
	RO	3. **PLACE** 1-HIC-62-78A, LETDOWN HX OUTLET TEMP TCV-70-192 CNTL, in MANUAL at 25% OPEN. ***1-HIC-62-78A, LETDOWN HX OUTLET TEMP TCV-70-192 CNTL is placed in MANUAL by lifting the toggle switch from the AUTO position, the toggle is pushed to the right to open the valve to 25% (as read on the controller.)***

Op Test No.:	NRC	Scenario #	2	Event #	2	Page	10 of 46

Event Description: 1-LI-68-335 fails to 15% over 15 seconds. Requires entry into AOI-20, "Malfunction of Pressurizer Level Control System." Requires a Tech Spec evaluation.

Time	Position	Applicant's Actions or Behavior
	RO	4. **PLACE** 1-HIC-62-81A, LETDOWN PRESS CONTROL, in MANUAL at 40-50% OPEN if using 75 gpm orifice (20-30% OPEN if using 45 gpm orifice). ***1-HIC-62-81A, LETDOWN PRESS CONTROL is placed in MANUAL by lifting the toggle switch from the "AUTO" position, the toggle is pushed to the right to open the valve to 40-50% (as read on the controller).***
	RO	5. **THROTTLE OPEN** 1-FCV-62-89 and **ESTABLISH** 75 gpm or greater charging flow while maintaining seal injection flow between 8 and 13 gpm for each RCP using 1-FCV-62-93. ***RO establishes 75 gpm charging flow on 1-FI-62-93A, and 8 to 13 gpm on 1-FI-62-1A, RCP 1 SEAL SUP FLOW, 1-FI-62-14A, , RCP 2 SEAL SUP FLOW, 1-FI-62-27A, RCP 3 SEAL SUP FLOW, and 1-FI-62-40A, RCP 4 SEAL SUP FLOW.***
	RO	6. **OPEN** letdown orifices as needed: • 1-FCV-62-72 (45 gpm). • 1-FCV-62-73 (75 gpm). • 1-FCV-62-74 (75 gpm). • 1-FCV-62-76 (5 gpm). ***RO selects either 1-HS-62-73A. LETDOWN ORIFICE B 75 GPM - CIV-ϕA, or 1-FCV-62-74, LETDOWN ORIFICE C 75 GPM - CIV-ϕA and rotates the selected handswitch to the right to the OPEN position.***
	RO	7. **ADJUST** 1-HIC-62-81A, LETDOWN PRESS CONTROL, for desired press, (320 psig at normal letdown temp), and **PLACE** in AUTO. ***1-HIC-62-81A, LETDOWN PRESS CONTROL toggle switch is moved to the right to close the valve and raise pressure to 320 psig. 1-HIC-62-81A is placed in AUTO by pushing the toggle switch down to the AUTO position.***
	RO	8. **PLACE** 1-HIC-62-78A, LETDOWN HX OUTLET TEMP TCV-70-192 CNTL, in AUTO. ***1-HIC-62-78A, LETDOWN HX OUTLET TEMP TCV-70-192 CNTL, is placed in AUTO by pushing the toggle switch down to the AUTO position.***
	RO	9. **RETURN** pzr level to program. ***RO makes periodic adjustments to 1-HIC-62-93A, CHARGING FLOW PZR LEVEL CONTROL and 1-HIC-62-89A, CHG HDR - RCP SEALS FLOW CONTROL to return PZR level to program level.***

Op Test No.:	NRC	Scenario #	2	Event #	2	Page	11	of	46

Event Description: 1-LI-68-335 fails to 15% over 15 seconds. Requires entry into AOI-20, "Malfunction of Pressurizer Level Control System." Requires a Tech Spec evaluation.

Time	Position	Applicant's Actions or Behavior
	RO	10. **RETURN** 1-HIC-62-93A, CHARGING FLOW PZR LEVEL CONTROL, in AUTO. ***1-HIC-62-93A, CHARGING FLOW PZR LEVEL CONTROL, is placed in AUTO once PZR level is on program.***

Op Test No.:	NRC	Scenario #	2	Event #	2	Page	12 of 46

Event Description: 1-LI-68-335 fails to 15% over 15 seconds. Requires entry into AOI-20, "Malfunction of Pressurizer Level Control System." Requires a Tech Spec evaluation.

Time	Position	Applicant's Actions or Behavior
		EXAMINER: The following actions are taken from AOI-20, "Malfunction Of Pressurizer Level Control System," beginning at Step 7.
	RO	7. **RESTORE** pzr level control to normal: a. **MAINTAIN** regen hx letdown temp < 380 °F. b. **CONTROL** charging and letdown to return pzr level to program. ***(Addressed previously)*** c. **ENSURE** pzr control heater bank D red light LIT. ***RO observes handswitch 1-HS-68-341F, CONTROL HEATERS D RED indicating light LIT.*** d. Momentarily **PLACE** 1-HS-68-341H, pzr backup heater bank C, to OFF. ***RO places handswitch 1-HS-68-341H, BACKUP HEATERS C in the OFF position, then may place the handswitch to the ON position for boron concentration control. Handswitch 1-HS-68-341H is then returned to P-AUTO position.*** e. **CHECK** pzr program level NORMAL. • 1-LR-68-339 (green pen) f. **RETURN** charging valve controller 1-HIC-62-93A to AUTO. ***(Addressed previously)***
	SRO	8. **NOTIFY** Work Control to remove failed channel from service. ***When contacted as Work Control, the Console Operator will acknowledge the request for a troubleshooting and repair package for 1-LI-68-335.***
	SRO	9. **REFER TO** the following Tech Specs: • 3.3.1, Reactor Trip System (RTS) Instrumentation. ***Function 9 Pressurizer Water Level - High, Condition X With one channel inoperable, place the channel in trip within 72 hours or be in Mode 3 within 78 hours (One channel may be bypassed for up to 12 hours for surveillance testing.*** • 3.3.3, Post Accident Monitoring (PAM) Instrumentation. ***Function 13 RCS Pressurizer Level Condition A With One or more Functions with one required channel inoperable, restore required channel to OPERABLE status within 30 days.*** • 3.4.9, Pressurizer. ***Not applicable.***
	SRO	10. **INITIATE** repairs to failed instrument/circuitry.
	SRO	11. **RETURN TO** instruction in effect.
	SRO	**Crew Brief** would typically be conducted for this event as time allows prior to the next event.

Op Test No.:	NRC	Scenario #	2	Event #	2	Page	13	of 46

Event Description: 1-LI-68-335 fails to 15% over 15 seconds. Requires entry into AOI-20, "Malfunction of Pressurizer Level Control System." Requires a Tech Spec evaluation.

Time	Position	Applicant's Actions or Behavior
	SRO	**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).
Cue Console Operator to insert Event 3.		

Op Test No.: NRC	Scenario # 2	Event # 3	Page 14 of 46

Event Description: ERCW pump A-A pump shaft shears. Requires entry into AOI-13, "Loss of Essential Raw Cooling Water." Requires a Tech Spec evaluation. When another A Train pump is started, the selected pump bearings seize, resulting in a motor overload condition. One of the remaining Train A ERCW pump must be started. Requires a Tech Spec evaluation, which will depend on the final pump configuration.

Time	Position	Applicant's Actions or Behavior
Indications: 223-B ERCW PMP A-A DISCH PRESS LO		
	BOP	Diagnoses and announces failure of A-A ERCW pump to pump forward.
	BOP	May place A-A ERCW pump in STOP, PULL-TO-LOCK
	BOP	May enter and take actions of ARI 223-B ERCW PMP A-A DISCH PRESS LO.
	SRO	Enters and directs actions of AOI-13, Loss of Essential Raw Cooling Water."
ARI 223-B		**The following actions are taken from ARI 223-B ERCW PMP A-A DISCH PRESS LO.**
	BOP	[1] **CHECK** the following [0-M-27A]: • 0-PI-67-29A, ERCW PMP A-A DISCH PRESS ***0-PI-67-29A, ERCW PMP A-A DISCH PRESS indicates 0 psig.*** • 0-EI-67-27A, ERCW PMP A-A AMPS ***0-EI-67-27A, ERCW PMP A-A AMPS indicates 0 amps.***
	BOP	[2] **START** additional pumps, if needed. ***BOP starts either B-A ERCW pump using 0-HS-67-32A or C-A ERCW pump using 0-HS-67-36A.***
	BOP	[3] **DISPATCH** Operator to check ERCW Pump A-A at IPS. ***When contacted as Outside Routine AUO, the Console Operator will acknowledge the request go to the Intake Pumping Station to check the A-A ERCW Pump. Reports back that the A-A ERCW pump shaft is broken.***
	SRO	[4] **REFER TO** AOI-13, *LOSS OF ESSENTIAL RAW COOLING WATER.*

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Event Description:	ERCW pump A-A pump shaft shears. Requires entry into AOI-13, "Loss of Essential Raw Cooling Water." Requires a Tech Spec evaluation. When another A Train pump is started, the selected pump bearings seize, resulting in a motor overload condition. One of the remaining Train A ERCW pump must be started. Requires a Tech Spec evaluation, which will depend on the final pump configuration.

Time	Position	Applicant's Actions or Behavior
AOI-13		**The following actions are taken from AOI-13, "Loss of Essential Raw Cooling Water," Section 3.2, "Loss of ERCW Pump."**
	BOP	1. **START** redundant trained ERCW Pump. ***BOP starts either B-A ERCW pump using 0-HS-67-32A or C-A ERCW pump using 0-HS-67-36A.***
	BOP	2. **ENSURE** header pressures and flows return to expected values for existing plant conditions. ***BOP ensures 0-PI-67-18A A ERCW SUP HDR PRESS indicates approximately 100 psig. BOP ensures that 1-FI-67-81, 1A ERCW SUP HDR FLOW returns to approximately 1100 gpm.***
	BOP	3. **ENSURE** pump amps NORMAL. ***BOP observes that B-A or C-A ERCW pump amps are high.***
	BOP	4. **PLACE** failed pump HS in PULL TO LOCK. ***BOP places 0-HS-67-28A ERCW PUMP A-A in the STOP position, and then pulls the handswitch out.***
	BOP	5. **DISPATCH** personnel to determine reason for pump failure. ***When contacted as Outside Routine AUO, the Console Operator will acknowledge the request to go to the Intake Pumping Station to check the A-A ERCW Pump. Reports back that the A-A ERCW pump shaft is broken.***
	BOP	6. Locally **CLOSE** discharge valve on failed pump. ***When contacted as Outside Routine AUO, the Console Operator will acknowledge the request to close the A-A ERCW Pump discharge valve. BOP may look at Flow Diagram or SOI-67.01, "Essential Raw Cooling Water System," and provide nomenclature for discharge valve as 0-ISV-67-504A.***
	BOP	7. **ENSURE** applicable emergency power selector switch selected away from failed pump. ***BOP places 1-XS-67-285, ERCW PMP A-A/B-A DG POWER SEL in the PUMP B-A position.***
	SRO	8. **INITIATE** repair. ***When contacted as Work Control, the Console Operator will acknowledge the request for a repair package for the additional ERCW pump.***

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Event Description:	ERCW pump A-A pump shaft shears. Requires entry into AOI-13, "Loss of Essential Raw Cooling Water." Requires a Tech Spec evaluation. When another A Train pump is started, the selected pump bearings seize, resulting in a motor overload condition. One of the remaining Train A ERCW pump must be started. Requires a Tech Spec evaluation, which will depend on the final pump configuration.

Time	Position	Applicant's Actions or Behavior
		EXAMINER: The BOP will start either B-A ERCW pump or the C-A ERCW pump as the "redundant trained ERCW Pump." The Console Operator will insert the appropriate malfunction to cause the bearing on the ERCW pump that was started to seize.
		Indications: 226-D, ERCW PMP MOTOR OVERLOAD 226-E, ERCW/CCS MOTOR TRIPOUT
ARI 226-D		**The following actions are taken from ARI 226-D ERCW MOTOR OVERLOAD.**
	BOP	[1] **DETERMINE** which pump overloaded (amps), and if it has tripped.
	BOP	[2] **START** additional ERCW Pump to supplement inservice pumps.
	SRO	[3] **IF** affected pump did NOT trip, **THEN ENSURE** that its amps reduce after additional pump is started.
	SRO	[4] **IF** pump tripped, **THEN REFER TO** AOI-13, *LOSS OF ESSENTIAL RAW COOLING WATER.*
ARI 226-E,		**The following actions are taken from ARI 226-E, ERCW/CCS MOTOR TRIPOUT.**
	BOP	[1] ***DETERMINE*** which ERCW or CCS pump tripped.
	BOP	[2] **START** additional pumps, if needed.
	SRO	[3] **IF** ERCW pump tripped, **THEN REFER TO** AOI-13, *LOSS OF ESSENTIAL RAW COOLING WATER.*
	SRO	[4] **IF** CCS Pump tripped, **THEN REFER TO** AOI-15, *LOSS OF COMPONENT COOLING WATER (CCS).* ***SRO determines that this step is n/a.***
AOI-13		**The following actions are taken from AOI-13, "Loss of Essential Raw Cooling Water," Section 3.2, "Loss of ERCW Pump."**
	BOP	1. **START** redundant trained ERCW Pump. ***BOP starts the Train A ERCW pump that remains.***
	BOP	2. **ENSURE** header pressures and flows return to expected values for existing plant conditions. ***BOP ensures 0-PI-67-18A A ERCW SUP HDR PRESS indicates approximately 100 psig. BOP ensures that 1-FI-67-81, 1A ERCW SUP HDR FLOW returns to approximately 1100 gpm.***

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Event Description: ERCW pump A-A pump shaft shears. Requires entry into AOI-13, "Loss of Essential Raw Cooling Water." Requires a Tech Spec evaluation. When another A Train pump is started, the selected pump bearings seize, resulting in a motor overload condition. One of the remaining Train A ERCW pump must be started. Requires a Tech Spec evaluation, which will depend on the final pump configuration.

Time	Position	Applicant's Actions or Behavior
	BOP	3. **ENSURE** pump amps NORMAL. ***BOP ensures that B-A or C-A ERCW pump amps indicate approximately 56 amps.***
	BOP	4. **PLACE** failed pump HS in PULL TO LOCK. ***BOP places 0-HS-67-32A ERCW PUMP B-A or 0-HS-67-36A, ERCW PUMP C-A in the STOP position, and then pulls the handswitch out.***
	BOP	5. **DISPATCH** personnel to determine reason for pump failure. ***When contacted as Outside Routine AUO, the Console Operator will acknowledge the request go to the Intake Pumping Station to check the B-A ERCW Pump or C-A ERCW Pump.***
	BOP	6. Locally **CLOSE** discharge valve on failed pump. ***When contacted as Outside Routine AUO, the Console Operator will acknowledge the request to close the B-A ERCW or C-A Pump discharge valve. BOP may look at Flow Diagram or SOI-67.01, "Essential Raw Cooling Water System," and provide nomenclature for discharge valve as 0-ISV-67-504B for B-A ERCW pump or 0-ISV-67-504C for the C-A ERCW pump.***
	BOP	7. **ENSURE** applicable emergency power selector switch selected away from failed pump. ***If the C-A ERCW pump tripped, BOP places 1-XS-67-286, ERCW PMP C-A/D-A DG POWER SEL in the PUMP D-A position.*** ***If the B-A ERCW pump tripped, the power selection may not be made, since neither pump powered from 6.9 KV Shutdown Board 1A-A is operable.***
	SRO	8. **INITIATE** repair. ***When contacted as Work Control, the Console Operator will acknowledge the request for a repair package for the B-A ERCW or C-A ERCW pump.***

EXAMINER: If the B-A ERCW pump was started in response to the initial damage to the A-A ERCW, and then lost, Tech Spec 3.7.8 must be entered since two ERCW pumps powered from the same source are inoperable.

If the C-A ERCW pump was started in response to the initial damage to the A-A ERCW, and then lost Tech Spec 3.7.8 would not be entered. Tech Spec 3.7.8 would be applicable to the loss of the A-A ERCW pump during the time that the emergency power selector switch selected to the failed pump (A-A ERCW pump).

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Event Description: ERCW pump A-A pump shaft shears. Requires entry into AOI-13, "Loss of Essential Raw Cooling Water." Requires a Tech Spec evaluation. When another A Train pump is started, the selected pump bearings seize, resulting in a motor overload condition. One of the remaining Train A ERCW pump must be started. Requires a Tech Spec evaluation, which will depend on the final pump configuration.

Time	Position	Applicant's Actions or Behavior
	SRO	9. **REFER TO** Tech Spec 3.7.8, Essential Raw Cooling Water System (ERCW). ***3.7.8, Essential Raw Cooling Water, Condition A. One ERCW train operable, other than for Condition C. [A.1 NOTES 1. Enter applicable Conditions and Required Actions of LCO 3.8.1, "AC Sources- Operating," for emergency diesel generator made inoperable by ERCW. 2. Enter applicable Conditions and Required Actions of LCO 3.4.6, "RCS Loops-MODE 4," for residual heat removal loops made inoperable by ERCW.] Restore ERCW train to OPERABLE status within 72 hours.***
	SRO	10. **RETURN TO** Instruction in effect.
	SRO	**Crew Brief** would typically be conducted for this event as time allows prior to the next event.
	SRO	**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).
Cue Console Operator to insert Event 4.		

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Event Description: 1-PT-3-1, #1 HTR INLET PRESS, fails high. Requires entry into AOI-16, "Loss of Normal Feedwater."

Time	Position	Applicant's Actions or Behavior
Indications: 63-F, SG LEVEL DEVIATION Feedwater regulating valves opening on all 4 Steam Generators. Feedwater flow on all Steam Generators dropping. Speed dropping on 1-SI-46-20A, MFPT SPEED and 1-SI-46-20B, MFPT B SPEED.		
	BOP	Diagnoses and announces failure of 1-PT-3-1, #1 HTR INLET PRESS failing high.
	BOP	May place 1-PC-46-20, MFPT A & B MASTER SPEED CONTROL or 1-SIC-46-20A, MFPT A - SPEED CONTROL in MANUAL and raise 1A MFP speed to stabilize steam generator levels.
	RO	May place 1-RBSS, ROD BANK SELECT to MAN.
	SRO	Enters and directs actions of AOI-16, "Loss of Normal Feedwater," Section 3.7, "MFW pump speed control circuit failure."
ARI 63-F,		**The following actions are taken from ARI 63-F, SG LEVEL DEVIATION.**
	BOP	[1] **DETERMINE** which S/G has abnormal level. ***BOP determines that all steam generator levels are dropping.***
	BOP	[2] **CHECK** steam flow/feed flow instrumentation to **VERIFY** level controls are restoring S/G levels to **NORMAL**. ***BOP determines that all steam generator feed flow indications are dropping.***
	BOP	[3] **IF** level controls have malfunctioned, **THEN** [a] **PLACE** FW controls in manual. [b] **RESTORE** S/G level to normal and **GO TO** AOI-16, *LOSS OF NORMAL FEEDWATER.*

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Event Description: 1-PT-3-1, #1 HTR INLET PRESS, fails high. Requires entry into AOI-16, "Loss of Normal Feedwater."

Time	Position	Applicant's Actions or Behavior
	BOP	**[4] IF** MFPT speed controls have malfunctioned, **THEN** **[a] PLACE** MFPT speed controls in manual. ***BOP takes one of the two following actions to stabilize feed pump speed:*** ***1-PC-46-20, MFPT A & B MASTER SPEED CONTROL is placed in MANUAL by lifting the toggle switch from the "AUTO" position, and then moved to the right to raise MFP 1A speed*** ***OR*** ***1-SIC-46-20A, 1-SIC-46-20A, MFPT A - SPEED CONTROL is placed in MANUAL by lifting the toggle switch from the "AUTO" position, and then moved to the right to raise MFP 1A speed.*** **[b] RESTORE** MFW/MS ΔP to program AND **GO TO** AOI-16, *LOSS OF NORMAL FEEDWATER.* ***SRO enters AOI-16, "Loss Of Normal Feedwater."***
	SRO	**[5] INITIATE** WO for corrective action, if necessary. ***When contacted as Work Control, the Console Operator will acknowledge the request for a repair package for 1-PT-3-1, #1 HTR INLET PRESS.***

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Event Description: 1-PT-3-1, #1 HTR INLET PRESS, fails high. Requires entry into AOI-16, "Loss of Normal Feedwater."

Time	Position	Applicant's Actions or Behavior
AOI-16		**The following actions are taken from AOI-16, "Loss of Normal Feedwater," Section 3.7, "MFW pump speed control circuit failure."**
	BOP	1. **CHECK** MFWPT speed controller(s) NORMAL.
	BOP	1. **RESPONSE NOT OBTAINED:** **CONTROL** MFP speed using MANUAL control of master controller or individual controller(s) as required. ***BOP takes one of the two following actions to stabilize feed pump speed:*** ***1-PC-46-20, MFPT A & B MASTER SPEED CONTROL is placed in MANUAL by lifting the toggle switch from the "AUTO" position, and then moved to the right to raise MFP 1A speed*** ***OR*** ***1-SIC-46-20A, 1-SIC-46-20A, MFPT A - SPEED CONTROL is placed in MANUAL by lifting the toggle switch from the "AUTO" position, and then moved to the right to raise MFP 1A speed.*** (ρ) **IF** MANUAL control of individual MFWPT controller is ineffective, **THEN TRIP** affected MFWPT, and ** **GO TO** Section 3.4 or 3.5 as applicable. ***Manual control is expected to be effective, so the conditions of this step are NOT expected to be met.***
	BOP	2. **PLACE** control rods in MANUAL. ***RO places 1-RBSS ROD BANK SELECT in MANUAL.***
	BOP	3. **CHECK** MFW pumps recirc valves CLOSED. ***BOP checks 1-FIC-3-70 MFWP A RECIRC CONTROL CLOSED.***
	BOP	4. (ρ) **ENSURE** T-avg and T-ref within 3°.
	BOP	5. **MAINTAIN** MFWP discharge press on PROGRAM. ***BOP uses the OPERATOR AID 1-FC-46-20, and determines that MFP discharge pressure on 1-PI-3-34 should be at approximately 1200 psig.***
	BOP	6. **ENSURE** S/G levels return to PROGRAM. ***BOP determines that SG levels are returning to program by observing trends on 1-FR-3-35, SG 1, 1-FR-3-48, SG 2, 1-FR-3-90, and 1-FR-3-103, SG 4.***
	BOP	7. **CHECK** steam dump mode in T-AVG position. ***BOP observes 1-HS-1-103D, STEAM DUMP MODE, is selected to the TAVG position.***

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Event Description: 1-PT-3-1, #1 HTR INLET PRESS, fails high. Requires entry into AOI-16, "Loss of Normal Feedwater."

Time	Position	Applicant's Actions or Behavior
	SRO	8. **INITIATE** repairs to failed equipment. ***When contacted as Work Control, the Console Operator will acknowledge the request for a repair package for 1-PT-3-1, #1 HTR INLET PRESS.***
	RO	9. (p) **IF** desired to place control rods in AUTO, **THEN ENSURE** T-avg and T-ref within 1° and **PLACE** control rods in auto. ***After adjusting control rods to match Tavg and Tref within 1°F, RO places 1-RBSS ROD BANK SELECT in AUTO.***
	BOP	10. **WHEN** MFP pump control repairs completed, **THEN PLACE** MFP speed control in AUTO. ***1-PT-3-1 will NOT be repaired during the remainder of the scenario, requiring the BOP to control MFP speed manually.***
	SRO	11. **RETURN TO** Instruction in effect.
	SRO	**Crew Brief** would typically be conducted for this event as time allows prior to the next event.
	SRO	**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).
Cue Console Operator to insert Event 5.		

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Event Description: Letdown line leak develops in the Auxiliary Building. Requires entry into AOI-6, "Small RCS Leak," and AOI-31, "Abnormal Release of Radioactive Material."

Time	Position	Applicant's Actions or Behavior
Indications: 1-LI-62-129A, VCT LEVEL indicates a downward trend. 1-PI-62-81, LP LETDOWN PRESS indicates a downward trend. 1-PIC-62-81, LETDOWN PRESS CONTROL controller output indicates valve is CLOSING. 1-XI-030-5235A, LETDOWN HX PIPE BREAK WHITE indicating light LIT, after approximately 3 minutes. 1-XI-030-5235B, LETDOWN HX PIPE BREAK WHITE indicating light LIT, after approximately 3 minutes. 113-B, RHR/CVCS HI TEMP PIPE BREAK.		
	RO	Diagnoses and announces the leakage from the letdown line into the Auxiliary Building.
	RO	May isolate charging and letdown to stop leakage.
	SRO	May enter and direct actions of ARI 113-B, RHR/CVCS HI TEMP PIPE BREAK.
	SRO	Enters and directs actions of AOI-6, "Small Reactor Coolant System Leak."
ARI 113-B		**The following actions are taken from ARI 113-B, RHR/CVCS HI TEMP PIPE BREAK.**
	RO	**[1] CHECK** annunciator monitor, or RHR/CVCS Pipe Break Status lights on 1-M-6 for source of alarm. ***RO observes 1-XI-030-5235A, LETDOWN HX PIPE BREAK and 1-XI-030-5235B, LETDOWN HX PIPE BREAK WHITE indicating lights are LIT.***
	RO	**[2] IF** alarm associated with RHR **AND** RHR is in service, **THEN GO TO** AOI-14, Loss Of RHR Shutdown Cooling.
	RO	**[3] GO TO** AOI-6, Small Reactor Coolant System Leak. ***SRO implements AOI-6, "Small Reactor Coolant System Leak."***

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Event Description: Letdown line leak develops in the Auxiliary Building. Requires entry into AOI-6, "Small RCS Leak," and AOI-31, "Abnormal Release of Radioactive Material."

Time	Position	Applicant's Actions or Behavior
AOI-6		**The following actions are taken from AOI-6, "Small Reactor Coolant System Leak."**
		NOTE During performance of this instruction the need for a rapid load reduction or Unit trip should be continuously evaluated.
	RO	1. **CHECK** pzr level DROPPING. ***RO determines that PZR level is stable.***
	RO	1. **RESPONSE NOT OBTAINED:** **GO TO** Step 5.
		NOTE Pzr level must be allowed time to change following changes in charging flow.
	SRO	5. **CHECK** in Modes 1 through 3
	SRO	6. **MAKE** plant announcement via PA: "Attention plant personnel. A primary system leak has developed. Any personnel located either inside containment or in the Auxiliary Building should exit the area immediately." (Repeat)
	RO	7. **MONITOR** pzr level STABLE or RISING. ***RO determines that PZR level is stable.***
		CAUTION **Attempts to quantify leak rate should not delay performance of the remaining steps.**
	RO	8. **IF** pzr level STABLE or RISING and time permits, **THEN STABILIZE** the plant to quantify the leak rate: • STOP pzr heater/spray operation. • STOP any heatup/cooldown in progress.
	RO	9. **CHECK** secondary plant radiation normal: • Condenser exhaust monitors. • S/G blowdown monitors. • Main steam line monitors. ***BOP observes radiation monitors and reports that secondary radiation levels are normal.***

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Event Description: Letdown line leak develops in the Auxiliary Building. Requires entry into AOI-6, "Small RCS Leak," and AOI-31, "Abnormal Release of Radioactive Material."

Time	Position	Applicant's Actions or Behavior
	RO	10. **CHECK** safety valves CLOSED: • **EVALUATE** tailpipe temp and acoustic monitors. ***RO observes response of 1-TI-68-330, SAFETY 68-563 TAILPIPE TEMP, 1-TI-68-329, SAFETY 68-564 TAILPIPE TEMP, and 1-TI-68-328, SAFETY 68-565, stable at approximately 110°F.*** ***BOP may observe 1-XI-68-363, PZR VALVES ACOUSTIC MONITOR indicating lights are DARK for 1-XI-68-363 (68-563), 1-XI-68-364 (68-564) and 1-XI-68-365 (68-565).***
	RO	11. **CHECK** PORVs CLOSED: • **EVALUATE** tailpipe temp and acoustic monitors. ***RO observes response of 1-TI-68-331, PORV 340A & 334 TAILPIPE TEMP stable at approximately 110°F.*** ***BOP may observe 1-XI-68-363, PZR VALVES ACOUSTIC MONITOR indicating lights are DARK for 1-XI-68-340A and 1-XI-68-334.***
NOTE Relief valves (pzr PORVs, pzr safeties, CVCS letdown, RHR suction, and SI lines), and Rx head vent isolation valves could be leaking to the PRT. Further investigation will have to be made if PRT conditions become abnormal and leakage path is not readily identifiable.		
	RO	12. **MONITOR** PRT conditions NORMAL: • Level. • Temperature. • Press. ***RO observes 1-PI-68-300, PRT LEVEL is approximately 70%, 1-TI-68-309, PRT TEMP is approximately 105°F, and 1-PI-68-30, PRT PRESS indicates approximately 6 psig. All parameter values are normal.***
NOTE Pzr level must be allowed time to stabilize following changes in charging or letdown flow.		

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Event Description: Letdown line leak develops in the Auxiliary Building. Requires entry into AOI-6, "Small RCS Leak," and AOI-31, "Abnormal Release of Radioactive Material."

Time	Position	Applicant's Actions or Behavior
	RO	13. **ISOLATE** letdown: • **CLOSE** 1-FCV-62-72, (45 gpm). • **CLOSE** 1-FCV-62-73, (75 gpm). • **CLOSE** 1-FCV-62-74, (75 gpm). ***RO isolates letdown by rotating 1-HS-62-74A, LETDOWN ORIFICE C 75 GPM CIV-ϕA to the left to the CLOSE position.*** • **CLOSE** 1-FCV-62-76, (5 gpm). • **CLOSE** 1-FCV-62-69. ***RO rotates 1-HS-62-69, RCS LETDOWN FRM LOOP 3 IN CNTMT to the left to the CLOSE position.*** • **CLOSE** 1-FCV-62-70. ***RO rotates 1-HS-62-70, RCS LETDOWN FRM LOOP 3 IN CNTMT to the left to the CLOSE position.***
	RO	14. **ISOLATE** charging: • **CLOSE** 1-FCV-62-85. • **CLOSE** 1-FCV-62-86. • **CLOSE** 1-FCV-62-90. • **CLOSE** 1-FCV-62-91. ***RO isolates charging by rotating 1-HS-62-86A ALT CHARGING TO LOOP 4, 1-HS-62-90A, CHARGING LINE ISOL and 1-HS-62-91, CHARGING LINE ISOL to the left to the CLOSE position.***
NOTE Normal range of seal injection flow is between 8 and 13 gpm per RCP with a minimum allowed flow of 6 gpm.		
	RO	15. **MINIMIZE** RCP seal injection flow (greater than 6 gpm per pump), and **EVALUATE** pzr level trend.
NOTE If leak is on CVCS, pzr level will recover with charging and letdown isolated.		
	RO	16. **CHECK** pzr level DROPPING or STABLE.
EXAMINER: During the establishment of CCS flow through the excess letdown heat exchanger, there is the possibility of receiving Window 239-D, EXC LTDN HX & GFFD RET FLOW LO. This is possible if 1-FCV-70-143 is opened fully before 1-FCV-70-85 is open. The corrective action is to open 1-FCV-70-85, which is accomplished by the next procedural step.		

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Event Description: Letdown line leak develops in the Auxiliary Building. Requires entry into AOI-6, "Small RCS Leak," and AOI-31, "Abnormal Release of Radioactive Material."

Time	Position	Applicant's Actions or Behavior
	RO	16. **RESPONSE NOT OBTAINED:** **IF** pzr level RISING, **THEN PLACE** excess letdown in service: a. **OPEN** 1-FCV-70-143. ***BOP rotates 1-HS-70-143A, EXC LTDN HX SUP CIV-ϕA to the right to the OPEN position.*** b. **OPEN** 1-FCV-70-85. ***BOP rotates 1-HS-70-85, EXC LTDN HX SUP CIV-ϕA to the right to the OPEN position. BOP observes flow rising on 1-FI-70-84, EXC LTDN HX FLOW as valves open.*** c. **OPEN** 1-FCV-62-54. ***RO rotates 1-HS-62-54A EXCESS LTDN ISOL to the right to the OPEN position.*** d. **OPEN** 1-FCV-62-55. ***RO rotates 1-HS-62-55A EXCESS LTDN ISOL to the right to the OPEN position.*** e. **ENSURE** 1-FCV-62-59 in NORMAL. ***RO observes that 1-HS-62-59A EXCESS LTDN DIVERT handswitch is in the NORM position, with the RED indicating light labeled SEAL RET LIT.*** f. **ADJUST** 1-HIC-62-56A to obtain maximum flow and maintain excess letdown hx outlet temp less than 200 °F. **STABILIZE** pzr level by adjusting seal injection and excess letdown flows. **GO TO** Step 21. ***RO rotates 1-HIC-62-56A EXCESS LTDN FLOW CONTROL to the left to raise excess letdown flow, while maintaining 1-TI-62-58 EXCESS LTDN TEMP less than 200 °F.***
	RO	21. **MAINTAIN** pzr level on program.
	SRO	22. **REFER TO** EPIP-1, Emergency Plan Classification Flowchart: a. **DETERMINE** classification of event b. **INITIATE** manning the TSC. (if necessary)

NOTE

The following steps check indications to locate the leak and identify affected areas.

	SRO	23. **NOTIFY** RADPRO for support to locally IDENTIFY and ISOLATE leak. ***When contacted as Radiation Protection, the Console Operator will acknowledge the request for support to locally identify the leak in the CVCS line in the Auxiliary Building.***

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Event Description: Letdown line leak develops in the Auxiliary Building. Requires entry into AOI-6, "Small RCS Leak," and AOI-31, "Abnormal Release of Radioactive Material."

Time	Position	Applicant's Actions or Behavior
	RO	24. **CHECK** cntmt conditions NORMAL: • Lower cntmt temperature. ***RO announces that Window 104-B LWR CNTMT TEMP HI is DARK*** • Radiation monitors. ***BOP announces that 1-RR-90-106, LWR CNTMT and 1-RR-90-112, UPPER CNTMT recorders do not indicate a rising trend.*** • Rx bldg sumps.
	SRO	25. **INITIATE** 1-SI-68-32, Reactor Coolant System Water Inventory Balance.
EXAMINER: Depending on the duration of the leak into the Auxiliary Building, there may not be responses on the radiation monitors listed in the next step. If radiation levels are not elevated, then the crew will not refer to AOI-31, "Abnormal Release of Radioactive Material," for actions.		
	RO	26. **CHECK** aux bldg radiation for RCS leakage paths: • Area monitor recorders 1-RR-90-1 and 0-RR-90-12A aux bldg points NORMAL. • Vent monitor recorder 0-RR-90-101 NORMAL
EXAMINER: Crew may not initiate ABI in the following step based on current radiation levels.		
	BOP	26. **RESPONSE NOT OBTAINED:** **INITIATE** ABI with 1-HS-30-101A and 1-HS-30-101B. **NOTIFY** RADPRO **REFER TO** AOI-31, Abnormal Release of Radioactive Materials, WHILE continuing in this procedure.

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Event Description: Letdown line leak develops in the Auxiliary Building. Requires entry into AOI-6, "Small RCS Leak," and AOI-31, "Abnormal Release of Radioactive Material."

Time	Position	Applicant's Actions or Behavior
AOI-31		**The following actions are taken from AOI-31, "Abnormal Release of Radioactive Material."**
	BOP	1. **EVACUATE** affected area.
	BOP	2. **NOTIFY** Radiological Protection to monitor affected area for radiological hazards.
	BOP	3. **DETERMINE** point of release, and **TERMINATE** release.
	SRO	4. **IF** planned release in progress, **THEN**: a. **STOP** release. b. **NOTIFY** Chemistry to resample batch.
	SRO	5. **EVALUATE** plant release rate: • Plant Computer [EFF1 on TSC menu]. • EPIP-13, Initial Dose Assessment For Radiological Emergencies.
	SRO	6. **REFER TO** EPIP-1, Emergency Plan Classification Flowchart.
	BOP	7. **CHECK** ABI actuated: • ABI Train A window LIT [MISSP], OR • ABI Train B window LIT [MISSP]
	BOP	7. **RESPONSE NOT OBTAINED** **CHECK** conditions below: a. **CHECK** Spent fuel pit radiation monitor, 0-RM-90-102, in alarm. b. **CHECK** Spent fuel pit radiation monitor, 0-RM-90-103, in alarm. c. **CHECK** any Aux. Bldg. radiation monitor in alarm and evaluate as an indication of a LOCA outside containment. **IF** conditions a., b., and c. **NOT** met, **THEN RETURN TO** instruction in effect.

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Event Description: Letdown line leak develops in the Auxiliary Building. Requires entry into AOI-6, "Small RCS Leak," and AOI-31, "Abnormal Release of Radioactive Material."

Time	Position	Applicant's Actions or Behavior
AOI-6		**The following actions are taken from AOI-6, "Small Reactor Coolant System Leak."**
	BOP	27. **CHECK** TURB/AUX/RX BLDG FLOODED annunciator [167-D] DARK.
	RO	28. **CHECK** 1-TI-68-21, Flange Leakoff Temp, less than 120°F.
	RO	29. **CHECK** vessel head vent NORMAL: • 1-FSV-68-394 and 68-395 CLOSED or power removed. • 1-TI-68-398, RX HEAD VENT TEMP at AMBIENT. • RX HEAD VENT TEMP HI annunciator [88-E] DARK.
	RO	30. **CHECK** RCP thermal barrier flows NORMAL [0-M-27B]: • Less than 50 gpm per RCP. • Return temp less than 115°F.
	RO	31. **CHECK** excess letdown normal: • Outlet temperature, less than or equal to 200°F. ***Excess letdown is in service since the normal letdown path was isolated, and temperature is being maintained below 200°F.***
	SRO	32. **INITIATE** leak repair. ***When contacted as Work Control, the Console Operator will acknowledge the request for repairs to the letdown line.***
	SRO	33. **EVALUATE** continued operation: • Cntmt conditions. • RCP status. • Leakage within Tech Spec 3.4.13, RCS Operational Leakage limits. • S/G and secondary plant leakage. ***SRO may contact Chemistry to request additional RCS samples to determine if continued operation can be conducted with letdown isolated.***
	RO	34. **RETURN** BA and PW flow controllers to normal setting for current RCS CB. ***RO ensures that the original settings for the BA and PW controllers are set to maintain RCS boron concentration.***
	SRO	35. **RETURN TO** Instruction in effect.
	SRO	**Crew Brief** would typically be conducted for this event as time allows prior to the next event.

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Event Description: Letdown line leak develops in the Auxiliary Building. Requires entry into AOI-6, "Small RCS Leak," and AOI-31, "Abnormal Release of Radioactive Material."

Time	Position	Applicant's Actions or Behavior
	SRO	**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).
Cue Console Operator to insert Event 6.		

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Event Description: Seismic Event occurs, causing a main steam line break on SG #4 outside Containment. Reactor auto trips and crew enters E-0, "Reactor Tip or Safety Injection," then transitions to E-2, "Faulted Steam Generator Isolation," then to ECA-2.1, "Uncontrolled Depressurization of All Steam Generators." All MSIVs fail to auto close, and cannot be closed manually. Cooldown requires implementation of FR-P.1, "Pressurized Thermal Shock."

Time	Position	Applicant's Actions or Behavior
166-D OBE SPECTRA EXCEEDED. 166-E, SEISMIC RECORDING INITIATED. Power Range Instrumentation indicates rising power. RCS Tavg indicates a lowering trend. Containment parameters are normal.		
EXAMINER: The crew is not expected to enter the AOI-9, "Earthquake," since the steam line break will occur shortly after receipt of 166-D and 166-E.		
	BOP	Diagnoses and announces failure
	BOP	Enters Alarm Response Instructions 166-E, "SEISMIC RECORDING INITIATED", and 166-D, "OBE SPECTRA EXCEEDED".
	SRO	Due to the rapid nature of the steam line failure, the SRO will NOT enter and direct actions of AOI-9, "EARTHQUAKE", but will address the EOP entry.
EXAMINER: After Seismic Event, the #2 main steam line ruptures outside containment, and ALL of the MSIVs fail to close. MSIVS WILL REMAIN OPEN FOR THE DURATION OF THE SCENARIO.		
	BOP	Diagnoses and announces reactor trip and safety injection actuations
	RO	Performs E-0 Immediate Operator Actions.
	BOP	Performs E-0 Immediate Operator Actions.
	SRO	Enter and direct actions of E-0, "REACTOR TRIP OR SAFETY INJECTION".

Op Test No.:	NRC	Scenario #	2	Event #	6	Page	33	of 46

Event Description: Seismic Event occurs, causing a main steam line break on SG #4 outside Containment. Reactor auto trips and crew enters E-0, "Reactor Tip or Safety Injection," then transitions to E-2, "Faulted Steam Generator Isolation," then to ECA-2.1, "Uncontrolled Depressurization of All Steam Generators." All MSIVs fail to auto close, and cannot be closed manually. Cooldown requires implementation of FR-P.1, "Pressurized Thermal Shock."

Time	Position	Applicant's Actions or Behavior

E-0 — **The following actions are taken from E-0, "Reactor Trip or Safety Injection."**

NOTE

Steps 1 thru 4 are **IMMEDIATE ACTION STEPS.**

Status Trees / SPDS should be monitored when transitioned to another instruction.

Time	Position	Applicant's Actions or Behavior
	RO	1. **ENSURE** reactor trip: • Reactor trip and bypass breakers OPEN. ***RO checks 1-52RTB, RX TRIP BKR A RED indicating light LIT on panel 1-M-4.*** ***RO checks 1-52RTB, RC TRIP BKR B RED indicating light LIT on panel 1-M-4*** ***RO checks 1-52BYA, BYPASS BKR A lights DARK*** ***RO checks 1-52BYB, BYPASS BKR B lights dark*** • RPIs at bottom of scale. ***RO observes 1-MON 85 5000/1 CERPI Monitor 1 and 1-MON-85 5000/2 CERPI MONITOR 2 for indication that all SHUTDOWN and CONTROL bank rods are inserted.*** • Neutron flux DROPPING. ***RO observes neutron flux trending down on 1-NR-92-145, NEUTRON FLUX LEVEL RECORDER. May also observe levels decreasing on 1-NI-92-135A, CH I NEUTRON MON % PWR, and 1-NI-92-136A, CH II NEUTRON MON % PWR.***
	BOP	2. **ENSURE** Turbine Trip: • All turbine stop valves CLOSED. ***RO observes that indicating lights on 1-XX-47-1000 EHC CONTROL for individual throttle and governor valves are GREEN.***
	BOP	3. **CHECK** 6.9 kV shutdown boards: a. At least one board energized from: • CSST (offsite), OR • D/G (blackout). ***When observed by the RO during IMMEDIATE OPERATOR ACTIONS, both shutdown boards are energized, based on 1-EI-57-39, 6.9 SDB 1A-A VOLTS indicating approximately 7000 volts and 1-EI-57-66, 6.9 SDB 1B-B VOLTS indicating approximately 7000 volts.***

Op Test No.:	NRC	Scenario #	2	Event #	6	Page	34 of 46

Event Description: Seismic Event occurs, causing a main steam line break on SG #4 outside Containment. Reactor auto trips and crew enters E-0, "Reactor Tip or Safety Injection," then transitions to E-2, "Faulted Steam Generator Isolation," then to ECA-2.1, "Uncontrolled Depressurization of All Steam Generators." All MSIVs fail to auto close, and cannot be closed manually. Cooldown requires implementation of FR-P.1, "Pressurized Thermal Shock."

Time	Position	Applicant's Actions or Behavior
	RO	4. **CHECK** SI actuated: a. Any SI annunciator LIT. ***RO will announce that the window 70-A, SI ACTUATED is LIT. May also announce that FIRST OUT 79-G SI STEAM PRESS LO is LIT.*** b. Both trains SI **ACTUATED**. • 1-XX-55-6C • 1-XX-55-6D
EXAMINER: E-0, "Reactor Trip or Safety Injection," Appendixes A and B are included as Attachment 1.		
	BOP	5. **PERFORM** Appendixes A and B , E-0, pages 16-30 ***SRO assigns BOP to perform Appendixes A and B.***
	SRO	6. **ANNOUNCE** reactor trip and safety injection over PA system.
	BOP	7. **ENSURE** secondary heat sink available with either: • Total AFW flow greater than 410 gpm, ***BOP observes that AFW flow is greater than 410 gpm, and that all AFW pumps are running.*** OR • At least one S/G NR level greater than 29% [39% ADV].
	RO	8. **MONITOR** RCS temperature stable at or trending to 557°F using: • RCS Loop T-avg with any RCP running, **OR** • RCS Loop T-cold with RCPs out-of-service.

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Event Description: Seismic Event occurs, causing a main steam line break on SG #4 outside Containment. Reactor auto trips and crew enters E-0, "Reactor Tip or Safety Injection," then transitions to E-2, "Faulted Steam Generator Isolation," then to ECA-2.1, "Uncontrolled Depressurization of All Steam Generators." All MSIVs fail to auto close, and cannot be closed manually. Cooldown requires implementation of FR-P.1, "Pressurized Thermal Shock."

Time	Position	Applicant's Actions or Behavior
	RO	8. **RESPONSE NOT OBTAINED** **IF** temp less than 557°F, **THEN ENSURE** steam dumps and S/G PORVs CLOSED. **IF** cooldown continues, **THEN CONTROL** total AFW flow to maintain greater than 410 gpm UNTIL NR level in at least one S/G greater than 29% [39% ADV]. ***BOP takes manual control of AFW LCV's and reduces AFW flow.*** **IF** cooldown continues after AFW flow is controlled, **THEN** • **PLACE** steam dump controls OFF. ***BOP rotates 1-HS-1-103A, STEAM DUMP FSV A, and 1-HS-103B STEAM DUMP FSV B to the left to the "OFF RESET" position.*** • **CLOSE** MSIVs. ***Recognizes failure of AUTO closure and attempts to MANUALLY close MSIVs from the MCR handswitches. May dispatch an AUO to the Aux Control Room to place the MSIV handswitches to the AUX position.*** • **ENSURE** MSIV bypasses CLOSED. **IF** RCS temp greater than 564°F, **THEN ENSURE** either steam dumps or S/G PORVs OPEN.
	RO	9. **ENSURE** excess letdown valves CLOSED: • 1-FCV-62-54 • 1-FCV-62-55 ***Since excess letdown had been placed in service during AOI-6 performance, the excess letdown valves must be closed at this step.***
	RO	9. **RESPONSE NOT OBTAINED** Manually **CLOSE** valves.

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Event Description: Seismic Event occurs, causing a main steam line break on SG #4 outside Containment. Reactor auto trips and crew enters E-0, "Reactor Tip or Safety Injection," then transitions to E-2, "Faulted Steam Generator Isolation," then to ECA-2.1, "Uncontrolled Depressurization of All Steam Generators." All MSIVs fail to auto close, and cannot be closed manually. Cooldown requires implementation of FR-P.1, "Pressurized Thermal Shock."

Time	Position	Applicant's Actions or Behavior
	RO	10. **CHECK** pzr PORVs and block valves: a. Pzr PORVs CLOSED. b. At least one block valve OPEN. ***RO observes 1-HS-68-340AA, PZR PORV 340A, GREEN indicating light is LIT, RED indicating light is DARK.*** ***RO observes 1-HS-68-334A, PZR PORV 334, GREEN indicating light is LIT, RED indicating light is DARK.*** ***RO observes 1-HS-68-333A, BLOCK VLV FOR PORV 340A, GREEN indicating light is DARK, RED indicating light is LIT.*** ***RO observes 1-HS-68-332A, BLOCK VLV FOR PORV 334, GREEN indicating light is DARK, RED indicating light is LIT.***
	RO	11. **CHECK** pzr safety valves CLOSED: • **EVALUATE** tailpipe temperatures and acoustic monitors. ***RO observes response of 1-TI-68-330, SAFETY 68-563 TAILPIPE TEMP, 1-TI-68-329, SAFETY 68-564 TAILPIPE TEMP, and 1-TI-68-328, SAFETY 68-565, stable at approximately 110°F.*** ***BOP may observe 1-XI-68-363, PZR VALVES ACOUSTIC MONITOR indicating lights are DARK for 1-XI-68-363 (68-563), 1-XI-68-364 (68-564) and 1-XI-68-365 (68-565).***
	RO	12. **CHECK** pzr sprays CLOSED. ***RO observes the GREEN indicating lights are LIT for 1-XI-68-340B, PZR SPRAY LOOP 2 and 1-XI-68-340D, PZR SPRAY LOOP 1.***
NOTE **Seal injection flow should be maintained to all RCPs.**		
	RO	13. **CHECK** if RCPs should remain in service: a. Phase B signals DARK [MISSP]. b. RCS pressure greater than 1500 psig.
	RO	13. **RESPONSE NOT OBTAINED** a. **STOP** all RCPs. **GO TO** Step 14. b. **ENSURE** at least one Charging pump OR SI pump injecting. **WHEN** injection flow established, **THEN STOP** all RCPs.
	RO	14. **CHECK** S/G pressures: • All S/G pressures controlled or rising. • All S/G pressures greater than 120 psig.

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Event Description: Seismic Event occurs, causing a main steam line break on SG #4 outside Containment. Reactor auto trips and crew enters E-0, "Reactor Tip or Safety Injection," then transitions to E-2, "Faulted Steam Generator Isolation," then to ECA-2.1, "Uncontrolled Depressurization of All Steam Generators." All MSIVs fail to auto close, and cannot be closed manually. Cooldown requires implementation of FR-P.1, "Pressurized Thermal Shock."

Time	Position	Applicant's Actions or Behavior
	SRO	14. **RESPONSE NOT OBTAINED** **IF** S/G pressure low OR dropping uncontrolled, **THEN GO TO** E-2, Faulted Steam Generator Isolation.

[redacted]

E-2		**The following steps are taken from E-2, "Faulted Steam Generator Isolation."**
CAUTION **If a faulted S/G is NOT needed for RCS cooldown, it should remain isolated during subsequent recovery actions.**		
	BOP	1. **ENSURE** all MSIVs and MSIV bypasses CLOSED.
EXAMINER: E-2, "Reactor Trip or Safety Injection," Attachment 1 is included as Attachment 2.		
	BOP	1. **RESPONSE NOT OBTAINED** Manually **CLOSE** valves. **IF** valves can **NOT** be closed, **THEN** Locally **REMOVE** power to valves: • **DISPATCH** NAUO to perform Attachment 1 (E-2). ***When contacted as the Control Building AUO to perform Attachment 1, the Console operator will enter msr26a, msr26b, msr26c, and msr26d to place the MSIV switches in the Aux Control Room in the AUX position. The Console Operator will report back that this has been done***
NOTE If it is known that a steam leak exists in the Turbine building, the following step should not be performed until the affected steam header is depressurized.		
	BOP	2. **PLACE** steam dump controls OFF: • 1-HS-1-103A, STEAM DUMP FSV "A". • 1-HS-1-103B, STEAM DUMP FSV "B". ***Step already performed as part of E-0.***
	RO	3. **CHECK** for at least one Intact S/G: • Any S/G pressure controlled or rising, OR • Any S/G pressure greater than P-sat for RCS incore temperature.
	SRO	3. **RESPONSE NOT OBTAINED** **IF** pressure in all four S/Gs dropping uncontrolled, **THEN GO TO** ECA-2.1, Uncontrolled Depressurization of All Steam Generators.

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Event Description: Seismic Event occurs, causing a main steam line break on SG #4 outside Containment. Reactor auto trips and crew enters E-0, "Reactor Tip or Safety Injection," then transitions to E-2, "Faulted Steam Generator Isolation," then to ECA-2.1, "Uncontrolled Depressurization of All Steam Generators." All MSIVs fail to auto close, and cannot be closed manually. Cooldown requires implementation of FR-P.1, "Pressurized Thermal Shock."

Time	Position	Applicant's Actions or Behavior
ECA-2.1		**The following steps are taken from ECA-2.1, "Uncontrolled Depressurization of All Steam Generators."**
		CAUTION **If, at any time, except during SI termination steps 14 through 24, any Intact S/G can be isolated from the break and re-pressurized, then recovery actions should continue with E-2, Faulted Steam Generator Isolation.**
	SRO	1. **REFER TO** EPIP-1, Emergency Plan Classification Flowchart.
		CAUTION **If the TD AFW pump is the only available source of feed flow to ANY S/G, the steam supply must be maintained available.**
	RO	2. **ENSURE** secondary pressure boundary isolated: • **ENSURE** all MSIVs and MSIV bypasses CLOSED. • **PLACE** steam dump controls OFF. • **ENSURE** MFW reg and bypass reg valves CLOSED. • **ENSURE** MFW isolation and bypass isolation valves CLOSED. • **IF** both MD AFW pumps available, **THEN ENSURE** steam supply valves to TD AFW pump CLOSED. • **ENSURE** S/G PORVs CLOSED. • **ENSURE** S/G blowdown ISOLATED.
	SRO	2. **RESPONSE NOT OBTAINED** Manually **CLOSE** valves to restore pressure boundary on at least one S/G. **IF** valves can **NOT** be closed, **THEN DISPATCH** personnel to close valves locally, one loop at a time: • **CLOSE** MSIV and bypass valve as necessary USING Appendix A (ECA-2.1). ***E-2, Attachment 1 has been implemented, and contains the same actions as ECA-2.1 Appendix A. The MSIVs will NOT be closed during the scenario.*** • **ISOLATE** S/G atmospheric relief valve as necessary. • **CLOSE** additional feedwater or condensate MOVs as necessary. • **ISOLATE** blowdown locally as necessary.
		CAUTION **If total feed flow CAPABILITY of 410 gpm is available, FR-H.1, Loss of Secondary Heat Sink, should NOT be implemented.**

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Event Description: Seismic Event occurs, causing a main steam line break on SG #4 outside Containment. Reactor auto trips and crew enters E-0, "Reactor Tip or Safety Injection," then transitions to E-2, "Faulted Steam Generator Isolation," then to ECA-2.1, "Uncontrolled Depressurization of All Steam Generators." All MSIVs fail to auto close, and cannot be closed manually. Cooldown requires implementation of FR-P.1, "Pressurized Thermal Shock."

Time	Position	Applicant's Actions or Behavior

NOTE

Minimum detectable flow is assured by observing flow indicator response to valve movement.

Time	Position	Applicant's Actions or Behavior
	RO	3. **CONTROL** feed flow to minimize RCS cooldown and prevent S/G dryout: a. **CHECK** T-cold cooldown rate less than 100°F in the last one hour.

CRITICAL TASK

Control the AFW flow rate in order to minimize the RCS cooldown rate before a RED path develops to the Pressurized Thermal Shock Status Tree.

Time	Position	Applicant's Actions or Behavior
	RO	3.a. **RESPONSE NOT OBTAINED:** a. **REDUCE** feed flow to each S/G to minimum detectable to minimize cooldown. ***RO will rotate the TDAFW supply valve handswitch from the AUTO position AUTO position to the right to the ACC RESET MODULATE position, and then rotate the handswitch to the CLOSE position and pull the handswitch to the LOCK position.*** ***RO will perform the following actions for each MD AFW Supply valve to establish minimum detectable flow:*** ***Rotate the handswitch from the AUTO position to the right to the ACC RESET MODULATE position.*** ***Depress the R/M pushbutton.*** ***Move the "slider" bar to the left and lock it to fully close the valve.*** ***Once the valve is fully close, move the slider to the right until the related flow indicator deflects off the bottom scale.*** **GO TO** Substep 3c.
	RO	c. **IF** any S/G NR level drops to 29% [39% ADV], **THEN MAINTAIN** at least minimum detectable flow to each S/G with low level.
	SRO	4. **MONITOR** shutdown margin during RCS cooldown: • **REFER TO** 1-SI-0-10, Shutdown Margin OR REACTINW Computer Program. ***SRO requests performance of 1-SI-0-10 by the Surrogate STA.***
	SRO	5. **MONITOR** T-hot stable or dropping.

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Event Description: Seismic Event occurs, causing a main steam line break on SG #4 outside Containment. Reactor auto trips and crew enters E-0, "Reactor Tip or Safety Injection," then transitions to E-2, "Faulted Steam Generator Isolation," then to ECA-2.1, "Uncontrolled Depressurization of All Steam Generators." All MSIVs fail to auto close, and cannot be closed manually. Cooldown requires implementation of FR-P.1, "Pressurized Thermal Shock."

Time	Position	Applicant's Actions or Behavior

CAUTION

The 1500 psig RCP trip criteria is NOT applicable if the pressure drop is caused by S/G depressurization as indicated by RCS temperature at T-sat for S/G pressure.

NOTE

Seal injection flow should be maintained to all RCPs.

Time	Position	Applicant's Actions or Behavior
	SRO	6. **MONITOR** if RCPs should remain in service: a. Phase B DARK [MISSP]. b. RCS pressure greater than 1500 psig. ***RCPs may have been tripped previously during the performance of E-0, "Reactor Trip or Safety Injection," when RCS pressure dropped below 1500 psig and CCP/SI pumps had been confirmed injecting.***
	SRO	7. **MONITOR** pzr PORVs and block valves: a. Pzr PORVs CLOSED. b. At least one block valve OPEN. ***Actions previously performed.***
	SRO	8. **CHECK** secondary side activity levels: • S/G discharge rad monitors NORMAL. • Condenser vacuum exhaust rad monitors NORMAL. • S/G blowdown rad monitor recorders NORMAL trend prior to isolation, • S/G sample results by Chemistry NORMAL. ***BOP reports primary and secondary radiation during the performance of E-0, Appendix A. SRO may direct the BOP to recheck secondary radiation at this point, and call Chemistry to have SGs sampled for activity.***

CAUTION

If offsite power is lost after SI reset, manual action will be required to restart the SI pumps and RHR pumps due to loss of SI start signal.

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Event Description: Seismic Event occurs, causing a main steam line break on SG #4 outside Containment. Reactor auto trips and crew enters E-0, "Reactor Tip or Safety Injection," then transitions to E-2, "Faulted Steam Generator Isolation," then to ECA-2.1, "Uncontrolled Depressurization of All Steam Generators." All MSIVs fail to auto close, and cannot be closed manually. Cooldown requires implementation of FR-P.1, "Pressurized Thermal Shock."

Time	Position	Applicant's Actions or Behavior
	RO	9. **DETERMINE** if RHR pumps should be stopped: a. **CHECK** RHR suction aligned to RWST. b. **CHECK** RCS pressure greater than 150 psig. c. **CHECK** RCS pressure stable or rising. d. **RESET** SI, **AND CHECK** the following: • SI ACTUATED permissive DARK. • AUTO SI BLOCKED permissive LIT. e. **STOP** RHR pumps, **AND PLACE** in A-AUTO. f. **MONITOR** RCS pressure greater than 150 psig.
	BOP	10. **DETERMINE** if cntmt spray should be stopped: a. **MONITOR** cntmt pressure less than 2.0 psig. b. **CHECK** at least one cntmt spray pump RUNNING. c. **RESET** cntmt spray signal. d. **STOP** cntmt spray pumps, **AND PLACE** in A-AUTO. e. **CLOSE** cntmt spray discharge valves 1-FCV-72-2 and 1-FCV-72-39. ***Containment Spray Pumps are NOT running.***
	RO	11. **MONITOR** RWST level greater than 34%.
	RO	12. **DETERMINE** if cold leg accumulators should be isolated: a. **ENSURE** power to isolation valves restored USING Appendix B (ECA-2.1), CLA Breaker Operation. b. **CHECK** RCS pressure less than 250 psig.
	RO	12.b **RESPONSE NOT OBTAINED** **WHEN** RCS pressure is less than 250 psig, **THEN ** PERFORM** Substeps 12c and 12d.
	RO	13. **MONITOR** modified SI termination criteria: a. RCS subcooling greater than 65°F [85°F ADV]. b. RCS pressure stable or rising. c. Pzr level greater than 15% [33% ADV].

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Event Description: Seismic Event occurs, causing a main steam line break on SG #4 outside Containment. Reactor auto trips and crew enters E-0, "Reactor Tip or Safety Injection," then transitions to E-2, "Faulted Steam Generator Isolation," then to ECA-2.1, "Uncontrolled Depressurization of All Steam Generators." All MSIVs fail to auto close, and cannot be closed manually. Cooldown requires implementation of FR-P.1, "Pressurized Thermal Shock."

Time	Position	Applicant's Actions or Behavior
FR-P.1		**The transient in progress will cause an ORANGE PATH condition, which will require entry into FR-P.1 "PRESSURIZED THERMAL SHOCK." The following steps are taken from FR-P.1.**
	SRO	1. **CHECK** RCS pressure greater than 150 psig.
	RO	2. **CHECK** T-cold stable or rising.
	SRO	2. **RESPONSE NOT OBTAINED** **IF** T-cold dropping uncontrolled, **THEN:** • **ENSURE** steam dump valves CLOSED. • **ENSURE** S/G PORVs CLOSED. **IF** RHR System in Shutdown Cooling mode, **THEN STOP** any cooldown from RHR. **IF** uncontrolled cooldown continues, **THEN:** • **CLOSE** MSIVs, • **ENSURE** MSIV bypasses CLOSED. • **PLACE** steam dump controls OFF.

CAUTION

- **If the turbine-driven AFW pump is the only available source of feed flow, steam supply to the turbine-driven AFW Pump must be maintained from at least one S/G.**
- **If a faulted S/G is necessary for RCS temperature control feed flow to that generator should be maintained.**

NOTE

- A Faulted S/G is any S/G that is depressurizing in an uncontrolled manner or is completely depressurized.
- Minimum detectable flow is assured by observing flow indicator response to valve movement.

	SRO	3. **CHECK** S/G pressures: • All S/G pressures controlled or rising. • All S/G pressures greater than 120 psig.

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Event Description: Seismic Event occurs, causing a main steam line break on SG #4 outside Containment. Reactor auto trips and crew enters E-0, "Reactor Tip or Safety Injection," then transitions to E-2, "Faulted Steam Generator Isolation," then to ECA-2.1, "Uncontrolled Depressurization of All Steam Generators." All MSIVs fail to auto close, and cannot be closed manually. Cooldown requires implementation of FR-P.1, "Pressurized Thermal Shock."

Time	Position	Applicant's Actions or Behavior
	SRO	3. **RESPONSE NOT OBTAINED** **IF** S/G with low or dropping press has **NOT** been isolated, **THEN** **REFER TO** E-2, Faulted Steam Generator Isolation, while continuing with this instruction. **ENSURE** TD AFW pump being supplied from intact S/G. **IF** all S/Gs Faulted, **THEN CONTROL** feed flow at minimum detectable flow to each S/G. **IF** Faulted S/G necessary for RCS temp control, **THEN CONTROL** feed flow to minimum detectable flow to that S/G. **IF** Faulted S/G NOT necessary for RCS temp control, **THEN ISOLATE** all feedwater to Faulted S/G.
	RO	4. **MONITOR** CST volume greater than 200,000 gal.
	SRO	5. **MINIMIZE** RCS cooldown: a. **CHECK** at least one intact S/G NR level greater than 29% [39% ADV].
	SRO	5.a. **RESPONSE NOT OBTAINED:** a. CONTROL total feed flow to maintain greater than 410 gpm UNTIL NR level in at least one Intact S/G greater than 29% [39% ADV].
	SRO	5. **MINIMIZE** RCS cooldown: b. **CONTROL** feed flow to intact S/G(s) as necessary. c. **CONTROL** S/G pressures as necessary.
EXAMINER: FR-P.1, "Pressurizer Thermal Shock," Figure 1, "Cold Overpressure Limit Curve," is contained as Attachment 3.		
	RO	6. **MONITOR** pzr PORVs and block valves: a. **CHECK** at least one block valve OPEN. b. **CHECK** RCS temperature less than 350°F. c. **ARM** COPS with 1-HS-68-334D and 1-HS-68-340AD. d. **CHECK** RCS pressure less than cold overpressure limit: • **REFER TO** Figure 1, Cold Overpressure Limit Curve.
	RO	6.d. **RESPONSE NOT OBTAINED:** **ENSURE** at least one pzr PORV OPEN. **WHEN** press less than cold overpress limit, **THEN PERFORM** Substep 6g. **GO TO** Step 7.

Op Test No.:	NRC	Scenario #	2	Event #	6	Page	45	of	46

Event Description: Seismic Event occurs, causing a main steam line break on SG #4 outside Containment. Reactor auto trips and crew enters E-0, "Reactor Tip or Safety Injection," then transitions to E-2, "Faulted Steam Generator Isolation," then to ECA-2.1, "Uncontrolled Depressurization of All Steam Generators." All MSIVs fail to auto close, and cannot be closed manually. Cooldown requires implementation of FR-P.1, "Pressurized Thermal Shock."

Time	Position	Applicant's Actions or Behavior
	RO	e. **GO TO** Step 6g. f. **CHECK** pzr pressure less than 2335 psig. g. **ENSURE** pzr PORVs CLOSED.
	RO	7. **CHECK** ECCS in service: • Any SI pump RUNNING **OR** • Flow thru BIT.
NOTE **NOTE** Either Loop 1 or 2 pzr spray valve is effective for Loop 2 RCP in service or for Loops 1, 3, & 4 RCPs in service.		
CRITICAL TASK **Terminate ECCS flow order to minimize the RCS cooldown rate before a RED path develops to the Pressurized Thermal Shock Status Tree.**		
CRITICAL TASK	RO	8. **CHECK** SI termination criteria: • RVLIS greater than 60% with NO RCP running **OR** RVLIS greater than 63% with ANY RCP running. • RCS subcooling greater than 115°F [135°F ADV].
CAUTION **If offsite power is lost after SI reset, manual action will be required to restart the SI pumps and RHR pumps due to loss of SI start signal.**		
	RO	9. **RESET** SI, **AND CHECK** the following: • SI ACTUATED permissive DARK. • AUTO SI BLOCKED permissive LIT.
	BOP	10. **RESET** Phase A and Phase B, **AND INITIATE** Appendix A, (FR-P.1), CLA Breaker Operation.
	BOP	11. **ENSURE** cntmt air in service: a. Aux air press greater than 75 psig [M-15]. b. Cntmt air supply valves OPEN [M-15]: • 1-FCV-32-80. • 1-FCV-32-102. • 1-FCV-32-110.

Op Test No.: NRC	Scenario # 2	Event # 6	Page 46 of 46

Event Description: Seismic Event occurs, causing a main steam line break on SG #4 outside Containment. Reactor auto trips and crew enters E-0, "Reactor Tip or Safety Injection," then transitions to E-2, "Faulted Steam Generator Isolation," then to ECA-2.1, "Uncontrolled Depressurization of All Steam Generators." All MSIVs fail to auto close, and cannot be closed manually. Cooldown requires implementation of FR-P.1, "Pressurized Thermal Shock."

Time	Position	Applicant's Actions or Behavior
	RO	12. **STOP** ECCS pumps, **AND PLACE** in A-AUTO: • RHR pumps. • SI pumps. • All BUT one charging pump.
	RO	13. **ALIGN** charging: a. **CLOSE** RCP seal flow control 1-FCV-62-89. b. **OPEN** charging isolation valves 1-FCV-62-90 and 1-FCV-62-91. c. **ENSURE** charging valve 1-FCV-62-85 or 1-FCV-62-86 OPEN. d. **CHECK** RHR Suction aligned from RWST. e. **OPEN** seal return valves 1-FCV-62-61 and 1-FCV-62-63.
	RO	14. **CLOSE** BIT outlet valves 1-FCV-63-25 and 1-FCV-63-26.
		15. **CONTROL** charging flow: a. **ADJUST** 1-FCV-62-89 and 1-FCV-62-93 to maintain: • Seal injection flow between 8 and 13 gpm for each RCP. • Pzr level stable or rising. • Pzr press stable.

When Step 15 is addressed, inform the applicants that another crew will take the shift at this point.

END OF SCENARIO

Scenario 2
Attachment 1

E-0, "Reactor Trip or Safety Injection"

Appendix A and B
Attachments 1 through 5

Appendix A
(Page 1 of 9)

Equipment Verification

Step	Action/Expected Response	Response Not Obtained
1.	**ENSURE** PCBs OPEN: • PCB 5084. • PCB 5088.	**OPEN** manually.
2.	**ENSURE** AFW pump operation: • Both MD AFW pumps RUNNING. • TD AFW pump RUNNING. • LCVs in AUTO, OR controlled in MANUAL.	**ESTABLISH** at least one train AFW operation.
3.	**ENSURE** MFW isolation: • MFW isolation and bypass isolation valves CLOSED. • MFW reg and bypass reg valves CLOSED. • MFP A and B TRIPPED. • Standby MFP STOPPED. • Cond demin pumps TRIPPED. • Cond booster pumps TRIPPED.	Manually **CLOSE** valves **AND** **STOP** pumps, as necessary. **IF** any valves can **NOT** be closed, **THEN** **CLOSE** #1 heater outlet valves.

Appendix A
(Page 2 of 9)

Equipment Verification

Step	Action/Expected Response	Response Not Obtained
4.	**MONITOR** ECCS operation:	
	a. Charging pumps RUNNING.	a. Manually **START** charging pumps.
	b. Charging pump alignment: • RWST outlets 1-LCV-62-135 and 1-LCV-62-136 OPEN. • VCT outlets 1-LCV-62-132 and 1-LCV-62-133 CLOSED. • Charging 1-FCV-62-90 and 1-FCV-62-91 CLOSED.	b. **ENSURE** at least one valve in each set aligned.
	c. RHR pumps RUNNING.	c. Manually **START** RHR pumps.
	d. SI pumps RUNNING.	d. Manually **START** SI pumps.
	e. BIT alignment: • Outlets 1-FCV-63-25 and 1-FCV-63-26 OPEN. • Flow thru BIT.	e. **ENSURE** at least one valve aligned, and flow thru BIT.
	f. RCS pressure greater than 1650 psig.	f. **ENSURE** SI pump flow. **IF** RCS press drops to less than 150 psig, **THEN** **ENSURE** RHR pump flow.

Appendix A
(Page 3 of 9)

Equipment Verification

Step	Action/Expected Response	Response Not Obtained
5.	**CHECK** cntmt isolation: a. Phase A isolation: • Train A GREEN. • Train B GREEN. b. Cntmt vent isolation: • Train A GREEN. • Train B GREEN.	**ACTUATE** Phase A and Cntmt Vent Isolation signal, **OR** Manually **CLOSE** valves and dampers as necessary.

Appendix A
(Page 4 of 9)

Equipment Verification

Step	Action/Expected Response	Response Not Obtained
6.	**CHECK** cntmt pressure: • Phase B DARK [MISSP]. • Cntmt Spray DARK [MISSP]. • Cntmt press less than 2.8 psig.	**PERFORM** the following: 1) **ENSURE** Phase B actuated. 2) **ENSURE** Cntmt Spray actuated. 3) **ENSURE** cntmt spray pumps running. 4) **ENSURE** cntmt spray flow. 5) **ENSURE** Phase B isolation: • Train A GREEN. • Train B GREEN • Manually **CLOSE** valves and dampers as necessary. 6) **STOP** all RCPs. 7) **ENSURE** MSIVs and bypasses CLOSED. 8) **PLACE** steam dump controls OFF. 9) **WHEN** 10 minutes has elapsed since Phase B actuated, **THEN** **ENSURE** air return fans start. 10) **USE** adverse cntmt [ADV] setpoints where provided.
7.	**DISPATCH** AUO to perform Attachment 1 (E-0), Ice Condenser AHU Breaker Operation.	

Appendix A
(Page 5 of 9)

Equipment Verification

Step	Action/Expected Response	Response Not Obtained
8.	**CHECK** plant radiation NORMAL: • S/G blowdown rad recorder 1-RR-90-120 NORMAL prior to isolation [M-12]. • Condenser vacuum exhaust rad recorder 1-RR-90-119 NORMAL prior to trip [M-12]. • 1-RR-90-106 and 1-RR-90-112 radiation recorders NORMAL prior to isolation [M-12]. • S/G main steamline discharge monitors NORMAL [M-30]. • Upper and Lower containment high range monitors NORMAL [M-30]. • **NOTIFY** Unit Supervisor conditions NORMAL.	**NOTIFY** Unit Supervisor IMMEDIATELY.
9.	**ENSURE** all D/Gs RUNNING.	**EMERGENCY START** D/Gs
10.	**ENSURE** ABGTS operation:	
	a. ABGTS fans RUNNING.	a. Manually **START** fans.
	b. ABGTS dampers OPEN: • FCO-30-146A. • FCO-30-146B. • FCO-30-157A. • FCO-30-157B.	b. Locally **OPEN** dampers.

Appendix A
(Page 6 of 9)

Equipment Verification

Step	Action/Expected Response	Response Not Obtained
11.	**ENSURE** at least four ERCW pumps RUNNING, one on each shutdown board preferred.	Manually **START** pumps as necessary.
12.	**ENSURE** ERCW supply valves OPEN to running D/Gs.	**IF** ERCW can **NOT** be aligned to running D/G, **THEN** **EMERGENCY STOP** affected D/G.
13.	**ENSURE** 0-FCV-67-152, CCS HX C ALT DISCH TO HDR B, is open to position A.	Manually **OPEN** 0-FCV-67-152 to position A.
14.	**CLOSE** 0-FCV-67-144, CCS HX C DISCH TO HDR A.	
15.	**MONITOR** EGTS operation: • EGTS fans RUNNING. • **ENSURE** dampers OPEN - **VERIFY** filter bank dp between 5 and 9 inches of water.	Manually **START** fans **AND** **OPEN** dampers.
16.	**ENSURE** CCS pumps RUNNING: • 1A-A CCS pump. • 1B-B CCS pump. • C-S or 2B-B CCS pump.	Manually **START** pumps as necessary.
17.	**DISPATCH** AUO to shutdown Upper and Lower CNTMT rad monitors USING SOI-90.02.Gaseous Process Radiation Monitors	

Appendix A
(Page 7 of 9)

Equipment Verification

Step	Action/Expected Response	Response Not Obtained
18.	**WHEN** Attachment 1 is complete (Ice Condenser AHU Breakers OPEN), **THEN** **ENERGIZE** hydrogen igniters [1-M-10]: • 1-HS-268-73 ON. • 1-HS-268-74 ON.	

NOTE The following equipment is located on 1-M-9.

Step	Action/Expected Response	Response Not Obtained
19.	**CHECK** CNTMT PURGE fans STOPPED.	**STOP** fans **AND** **PLACE** handswitch in PULL-TO-LOCK.
20.	**CHECK** FUEL HANDLING EXH fans STOPPED, Fuel and Cask loading dampers CLOSED:	**STOP** fans **AND** **PLACE** handswitch in PULL-TO-LOCK, **THEN** Manually **CLOSE** dampers.
21.	**ENSURE** AB GEN SUPPLY and EXH fans STOPPED.	**STOP** fans **AND** **PLACE** handswitch in PULL-TO-LOCK.

NOTE Dampers 1-HS-30-158 and 2-HS-30-270 remain open during ABI.

Step	Action/Expected Response	Response Not Obtained
22.	**ENSURE** AB GEN SUP & EXH dampers CLOSED.	Manually **CLOSE** dampers.

Appendix A
(Page 8 of 9)

Equipment Verification

Step	Action/Expected Response	Response Not Obtained
23.	**ENSURE** MCR & SPREAD RM FRESH AIR dampers CLOSED: • FCV-31-3. • FCV-31-4.	Manually **CLOSE** dampers.
24.	**ENSURE** at least one CB EMER CLEANUP fan RUNNING and associated damper OPEN:	
	• CB EMERG CLEANUP FAN A-A, **OR** • Fan B-B RUNNING..	Manually **START** fan.
	• FCO-31-8, OPEN. **OR** • FCO-31-7, OPEN	**NOTIFY** TSC if at least one damper **NOT** OPEN.
25.	**ENSURE** at least one CB EMER PRESS fan RUNNING and associated damper OPEN:	
	• CB EMERG PRESS FAN A-A, **OR** FAN B-B RUNNING.	Manually **START** fan.
	• FCO-31-6, OPEN. **OR** • FCO-31-5, OPEN.	**NOTIFY** TSC if at least one damper NOT OPEN.

Appendix A
(Page 9 of 9)

Equipment Verification

Step	Action/Expected Response	Response Not Obtained
26.	**ENSURE** Control Building fans STOPPED and dampers CLOSED:	
	• SPREADING ROOM SUPPLY and EXH FANS AND dampers. • TOILET & LKR RM EXHAUST FAN AND dampers.	Manually **STOP** fans **AND** **NOTIFY** TSC if any damper **NOT** CLOSED.
27.	**INITIATE** Appendix B (E-0), Phase B Pipe Break Contingencies.	

Appendix B
(Page 1 of 1)

Phase B Pipe Break Contingencies

Step	Action/Expected Response	Response Not Obtained
1.	**CHECK** PHASE B actuated. [MISSP - 1-XX-55-6C, -6D]	**WHEN** PHASE B actuation occurs, **THEN** **GO TO** step 2.
2.	**ENSURE** 1-FCV-32-110 CLOSED. [CISP - 1-XX-55-6E] (A-train, window 13)	**DISPATCH** AUO to perform Attachment 2 (E-0).
3.	**ENSURE** 1-FCV-67-107 CLOSED. [CISP - 1-XX-55-6E] (A -train, window 43)	**DISPATCH** AUO to perform Attachment 3 (E-0).
4.	**ENSURE** 1-FCV-70-92 CLOSED. [CISP - 1-XX-55-6E] (A -train, window 73)	**DISPATCH** AUO to perform Attachment 4 (E-0).
5.	**ENSURE** 1-FCV-70-140 CLOSED. [CISP - 1-XX-55-6F] (B -train, window 74)	**DISPATCH** AUO to perform Attachment 5 (E-0).

Attachment 1
(Page 1 of 1)

Ice Condenser AHU Breaker Operation

OPEN the following to remove power from ice condenser air handling units AND **REPORT** completion to UO:

BOARD	COMPT	NOMENCLATURE
480 V Reactor Vent Board 1A-A	13D	1-BKR-232-A000/13D ICE COND 1-AHU-61-1/4/8/12/16/20/24/28
480 V Reactor Vent Board 1A-A	14D	1-BKR-232-A000/14D ICE COND 1-AHU-61-3/7/11/15/19/23/27
480 V Reactor Vent Board 1B-B	13D	1-BKR-232-B000/13D ICE COND 1-AHU-61-2/6/10/14/18/22/26/30
480 V Reactor Vent Board 1B-B	14D	1-BKR-232-B000/14D ICE COND 1-AHU-61-5/9/13/17/21/25/29

Attachment 2
(Page 1 of 1)

Control Air Isolation

A. **CLOSE** 0-ISV-32-1013 - CONTROL AIR EL 713 AB HDR ISOL [A6/S EL. 713] (chain operated - behind Fuel and Waste Handling Bd. A).

B. **IF** 0-ISV-32-1013 CANNOT BE CLOSED,
THEN

OPEN and **DISCONNECT** C&SS air compressor breakers:

1. 0-BKR-32-25 [480V SD BD 1A2-A, C/3D]
2. 0-BKR-32-26 [480V SD BD 1B1-B, C/3D]
3. 0-BKR-32-27 [480V AUX BLDG COM BD, C/6C]
4. 0-BKR-32-4900A [480V TURB BLDG COM BD, C/6C]

Attachment 3
(Page 1 of 1)

ERCW Isolation

UNLOCK AND CLOSE 1-ISV-67-523B, LOWER CNTMT VENT CLR 1B &1D ERCW SUP ISOL [A2U/692] (U-1 penetration room - North of AB Pipe Chase Cooler 1B-B in overhead)

Attachment 4
(Page 1 of 1)

CCS Return Isolation

CLOSE 1-ISV-70-700, RCP OIL COOLER CCS RETURN ISOLATION [A4/V EL. 710 U-1 Penetration Room] (approximately 10 ft. North of Penetration Room Cooler 1B-B on mezzanine above RHR Sump Valve Room)

Attachment 5
(Page 1 of 1)

CCS Supply Isolation

CLOSE 1-ISV-70-516, REACTOR BUILDING CCS SUPPLY ISOLATION [A6/T EL. 737] (Behind Elevator approximately 2 ft. west on mezzanine above "A" CCS Heat Exchanger)

Scenario 2
Attachment 2

E-2, “Faulted Steam Generator Isolation,”

Attachment 1,
"Isolation of MSIVs and MSIV Bypass Valves"

Attachment 1
(Page 1 of 4)

Isolation of MSIVs and MSIV Bypass Valves

1.0 INSTRUCTIONS

1.1 Isolation of MSIVs and MSIV Bypass Valves

A. **IF** any MSIV will **NOT** close, **THEN**

GO TO Section 1.2 (Attachment 1).

B. **IF** any MSIV bypass valve will **NOT** close, **THEN**

GO TO Section 1.3 (Attachment 1).

Attachment 1
(Page 2 of 4)

Isolation of MSIVs and MSIV Bypass Valves

1.2 MSIV Isolation

A. **PLACE** affected MSIV transfer control switch in AUX position:
[Auxiliary Control Room, Panels 1-L-11A and 1-L-11B]

S/G (Circle affected S/G)	EQUIPMENT	AUX TRANSFER SWITCH	AUX POSITION √
1	MSIV Loop 1, Train A, 1-FCV-1-4	1-XS-1-4A	☐
	MSIV Loop 1, Train B, 1-FCV-1-4	1-XS-1-4B	☐
2	MSIV Loop 2, Train A, 1-FCV-1-11	1-XS-1-11A	☐
	MSIV Loop 2, Train B, 1-FCV-1-11	1-XS-1-11B	☐
3	MSIV Loop 3, Train A, 1-FCV-1-22	1-XS-1-22A	☐
	MSIV Loop 3, Train B, 1-FCV-1-22	1-XS-1-22B	☐
4	MSIV Loop 4, Train A, 1-FCV-1-29	1-XS-1-29A	☐
	MSIV Loop 4, Train B, 1-FCV-1-29	1-XS-1-29B	☐

B. **CONSULT** UO to verify affected MSIV closed.

Attachment 1
(Page 3 of 4)

Isolation of MSIVs and MSIV Bypass Valves

1.2 MSIV Isolation (continued)

C. **IF** affected MSIV still open **OR**

Control power fuse removal desired, **THEN**

REMOVE MSIV fuses:

S/G (Circle affected S/G)	EQUIPMENT	FUSE LOCATION (Two per circuit)	FUSES REMOVED √
1	MSIV Loop 1, Train A, 1-FCV-1-4	125V Vital Battery Bd I Circuit A-46 Circuit B-46	 ☐ ☐
	MSIV Loop 1, Train B, 1-FCV-1-4	125V Vital Battery Bd II Circuit A-46 Circuit B-46	 ☐ ☐
2	MSIV Loop 2, Train A, 1-FCV-1-11	125V Vital Battery Bd I Circuit A-47 Circuit B-47	 ☐ ☐
	MSIV Loop 2, Train B, 1-FCV-1-11	125V Vital Battery Bd II Circuit A-47 Circuit B-47	 ☐ ☐
3	MSIV Loop 3, Train A, 1-FCV-1-22	125V Vital Battery Bd I Circuit A-48 Circuit B-48	 ☐ ☐
	MSIV Loop 3, Train B, 1-FCV-1-22	125V Vital Battery Bd II Circuit A-48 Circuit B-48	 ☐ ☐
4	MSIV Loop 4, Train A, 1-FCV-1-29	125V Vital Battery Bd I Circuit A-49 Circuit B-49	 ☐ ☐
	MSIV Loop 4, Train B, 1-FCV-1-29	125V Vital Battery Bd II Circuit A-49 Circuit B-49	 ☐ ☐

D. **NOTIFY** UO upon completion.

Attachment 1
(Page 4 of 4)

Isolation of MSIVs and MSIV Bypass Valves

1.3 MSIV Bypass Isolation

A. **PLACE** HS in OFF for MSIV bypass valves that will **NOT** close:

S/G (Circle affected S/G)	NOMENCLATURE	LOCATION	POSITION	UNID	HS OFF √
1	MAIN STEAM ISOL VLV LOOP 1 BYP WARMING VLV	A3U/737	OFF	1-HS-1-147B	☐
2	MAIN STEAM ISOL VLV LOOP 2 BYP WARMING VLV	A4U/757	OFF	1-HS-1-148B	☐
3	MAIN STEAM ISOL VLV LOOP 3 BYP WARMING VLV	A5U/757	OFF	1-HS-1-149B	☐
4	MAIN STEAM ISOL VLV LOOP 4 BYP WARMING VLV	A3U/737	OFF	1-HS-1-150B	☐

B. **NOTIFY** UO upon completion.

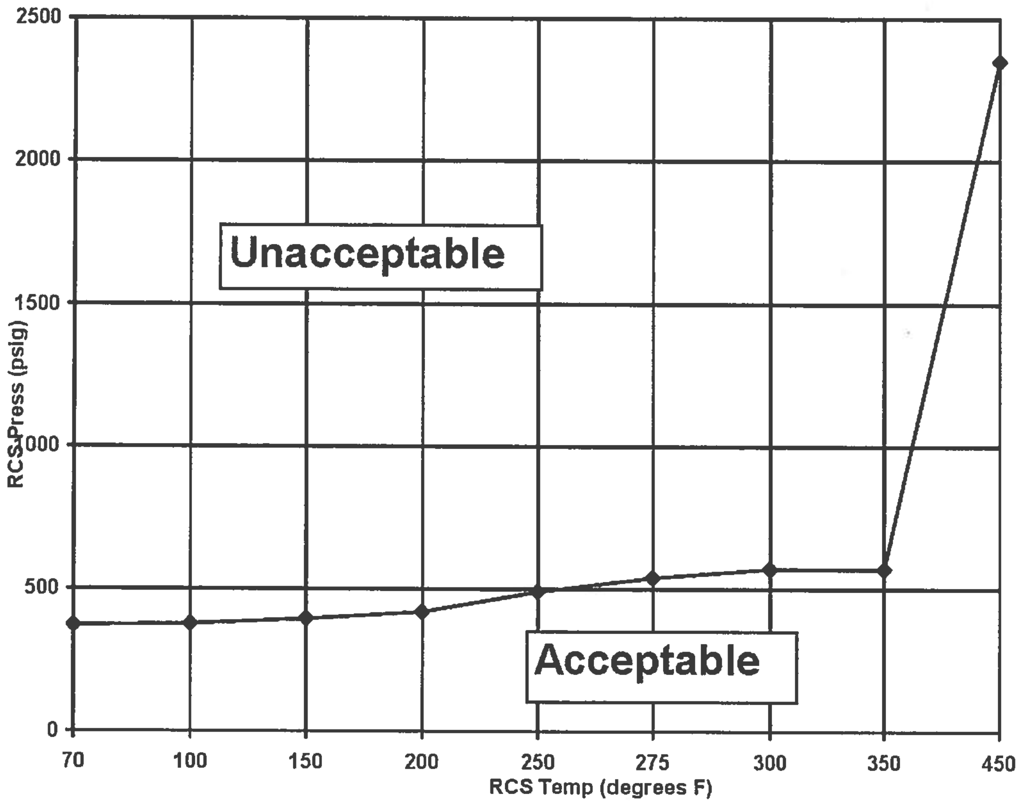
Scenario 2
Attachment 3

FR-P.1, “Pressurized
Thermal Shock,"

Attachment 1,
"Cold Overpressure Limit
Curve"

Figure 1
(Page 1 of 1)

Cold Overpressure Limit Curve



PCV-68-340

NOTE: The values at right are for ≤4 RCPs in operation with RCS temp. ≥105°F. The most conservative values (lowest pressure, first to open) for PCV-68-340 were used to generate the curve above. RCS press should **NOT** approach RCS press setpoints marked with an asterisk due to #1 seal ΔP concerns.

Temp °F	PCV 334 Setpoint, psig	PCV 340 Setpoint, psig
70	383*	373*
100	386	376*
150	405	395
200	430	420
250	510	490
275	560	540
300	590	570
350	590	570
450	2335	2335

*Setpoint violates pump seal limit.

SHIFT TURNOVER CHECKLIST

Page 1 of 2

SHIFT TURNOVER CHECKLIST

Page 1 of 1

- ☐ SM
- ☒ US/MCR Unit 1
- ☐ UO Unit ____
- ☐ AUO Station ____
- ☐ STA (STA Function)

____ Off-going - Name

____ On-coming - Name

Part 1 - Completed by off-going shift / Reviewed by on-coming shift: RCS Cb = 1396 ppm

- Abnormal equipment lineup / conditions:

  1A-A Containment Spray pump is out-of-service for motor winding inspection. LCO 3.6.6.was entered 2 hours ago. The IA-A Containment Spray pump is expected to be returned to service in 4 hours. A Severe Thunderstorm Warning has been issued for Rhea, Meigs, and McMinn Counties for the next 2 hours

- SI/Test in progress/planned: (including need for conduct of evolution briefings)

- Major Activities/Procedures in progress/planned:

  1A-A Containment Spray pump is out-of-service for motor winding inspection. LCO 3.6.6.was entered 2 hours ago. The IA-A Containment Spray pump is expected to be returned to service in 4 hours. Chemistry has requested that letdown flow be maintained at 75 gpm during the power escalation. A Severe Thunderstorm Warning has been issued for Rhea, Meigs, and McMinn Counties for the next 2 hours. The unit is at 30% RTP, BOL. Control Bank D rods are at 154 steps. Train A/Channel 1 Work Week. Currently performing GO-4, Section 5.2, Step 11. Continue power increase to 100%. Reactor Engineering has provided a reactivity plan for the power maneuver.

-

- Radiological changes in plant during shift:

Part 2 - Completed by on-coming shift prior to assuming duties

- ☐ Review station rounds / Abnormal reading (AUOs only)
- ☐ Review Narrative Logs (previous day and carry-over items)
- ☐ Current qualification status
- ☐ Review the current controlling Reactivity Management Plans (N/A for AUOs)
- ☐ Review current TS/TRM/ODCM/FPR Required Actions (N/A for AUOs)
- ☐ Walkdown MCR Control Boards with off-going Operator (N/A for AUOs, as applicable for SM/STAs)
- ☐ SR/PER reviews complete for previous shift (SM/US/STA)

Relief Time: ____ Relief Date: ____

Part 3 - Completed by on-coming shift. These items may be reviewed after assuming duties:

- ☐ Review Operator Workarounds, Burdens and Challenges (applicable Unit/Station)
- ☐ Review applicable ODMI actions (first shift of shift week)
- ☐ Review changes in Standing / Shift Orders (since last shift worked)
- ☐ Review changes to TACFs issued (since last shift worked) (N/A for AUOs)
- ☐ Review Control Room Deficiencies (first shift of shift week) (N/A for AUOs)
- ☐ Review Component Deviation Log (N/A for AUOs)

SHIFT TURNOVER CHECKLIST

Page 1 of 2

SHIFT TURNOVER CHECKLIST

Page 1 of 1

- ☐ SM
- ☐ US/MCR — Unit 1
- ☒ UO — Unit ______
- ☐ AUO — Station ______
- ☐ STA (STA Function)

______ Off-going - Name

______ On-coming - Name

Part 1 - Completed by off-going shift / Reviewed by on-coming shift: RCS Cb = 1396 ppm

- Abnormal equipment lineup / conditions:

  1A-A Containment Spray pump is out-of-service for motor winding inspection. LCO 3.6.6.was entered 2 hours ago. The IA-A Containment Spray pump is expected to be returned to service in 4 hours. A Severe Thunderstorm Warning has been issued for Rhea, Meigs, and McMinn Counties for the next 2 hours

- SI/Test in progress/planned: (including need for conduct of evolution briefings)

- Major Activities/Procedures in progress/planned:

  1A-A Containment Spray pump is out-of-service for motor winding inspection. LCO 3.6.6.was entered 2 hours ago. The IA-A Containment Spray pump is expected to be returned to service in 4 hours. Chemistry has requested that letdown flow be maintained at 75 gpm during the power escalation. A Severe Thunderstorm Warning has been issued for Rhea, Meigs, and McMinn Counties for the next 2 hours. The unit is at 30% RTP, BOL. Control Bank D rods are at 154 steps. Train A/Channel 1 Work Week. Currently performing GO-4, Section 5.2, Step 11. Continue power increase to 100%. Reactor Engineering has provided a reactivity plan for the power maneuver.

-
- Radiological changes in plant during shift:

Part 2 - Completed by on-coming shift prior to assuming duties

- ☐ Review station rounds / Abnormal reading (AUOs only)
- ☐ Review Narrative Logs (previous day and carry-over items)
- ☐ Current qualification status
- ☐ Review the current controlling Reactivity Management Plans (N/A for AUOs)
- ☐ Review current TS/TRM/ODCM/FPR Required Actions (N/A for AUOs)
- ☐ Walkdown MCR Control Boards with off-going Operator (N/A for AUOs, as applicable for SM/STAs)
- ☐ SR/PER reviews complete for previous shift (SM/US/STA)

Relief Time: ______________ Relief Date: ______________

Part 3 - Completed by on-coming shift. These items may be reviewed after assuming duties:

- ☐ Review Operator Workarounds, Burdens and Challenges (applicable Unit/Station)
- ☐ Review applicable ODMI actions (first shift of shift week)
- ☐ Review changes in Standing / Shift Orders (since last shift worked)
- ☐ Review changes to TACFs issued (since last shift worked) (N/A for AUOs)
- ☐ Review Control Room Deficiencies (first shift of shift week) (N/A for AUOs)
- ☐ Review Component Deviation Log (N/A for AUOs)

TVA

Watts Bar Nuclear Plant

Unit 1

General Operating Instructions

GO-4

Normal Power Operation

Revision 0060

Quality Related

Level of Use: Continuous Use

Effective Date: 02-16-2011

Responsible Organization: OPS, Operations

Prepared By: Scott Garner

Approved By: Brian McIlnay

Revision Log

Rev or Change Number	Effective Date	Affected Page Numbers	Description of Revision/Change
54	02/22/10	2, 7	Added precaution to give guidance on TRO notification requirements. (SERC Mitigation Plan)
55	03/09/10	2, 7, 8, 13	Added additional precautions from SERC Mitigation Plan.
56	05/06/10	2, 25	Non-intent change. Added chemistry hold at 50% IAW CM-1.02 Rev 9, Secondary Chemistry Strategic Plan.
57	08/25/10	2, 6-8, 10, 15, 16, 18, 19, 21, 24-25, 27, 28, 30-33, 35, 36, 39-40, 43-46, 48, 49, 52, 54-56, 58	Changed power level where IMP-OUT is considered based on operator comments and reordered steps accordingly [PER 232422-001]. Added symbol (ρ) prior to actions that directly affect reactivity. Updated Source Note identification, updated SELD notification, added end of section steps, and made minor editorial changes IAW with Writers Guide, procedure upgrades IAW ODM-23.
58	09/24/10	2, 5, 19, 22, 46, 49, 50	Added startup of #3 HD Tank to the 40-45% power level. Moved shutdown of #3 HD Tank pumps and bypass of tank to 40% power level. Consolidated notes as a result of changes. This is interim action for PER244876. Added verification of runback light prior to stopping first #3 HDT pump based on existing note. Updated SPP titles.
59	11/17/10	2, 22	Revised start of #3 HDT pumping forward to place two pumps in service.
60	02/16/11	2, 11, 13, 18, 20, 28, 31, 33, 34, 36, 41, 51, 54, 56, 58	Minor/editorial change: Added note to P&L and prior to each power acension step concerning #1 bearing higher than normal temperature. [PER 293256] Added end of section notices and updated shop names.

Facility: **NRC Exam 1 June 2011**	Scenario No.: **3**	Op Test No.: **1**	
Examiners: ______		Operators:	______ **SRO**
______			______ **RO**
______			______ **BOP**

Initial Conditions: 100% power, MOL conditions. RCS boron concentration is 747 ppm. Control Bank D rods are at 220 steps.

Turnover: 1A-A Motor Driven Auxiliary Feedwater pump is out of service for pump impeller repairs. LCO 3.7.5.b was entered 4 hours ago. Expected return to service is in 36 hours. A Reactivity Plan has been provided by Reactor Engineering. Chemistry has requested that letdown flow be maintained at 75 gpm during the power reduction. A Severe Thunderstorm Warning has been issued for Rhea, Meigs, and McMinn Counties for the next 2 hours

Event No.	Malf. No.	Event Type*	Event Description
1	n/a	R-RO N-SRO/BOP	Power reduction to 95% to remove 1C Condensate Booster Pump from service using GO-4, "Normal Power Operations," Section 5.3, "Unit Shutdown from100% to 30% Reactor Power."
2	cv31a	C-RO TS-SRO	1A-A Centrifugal Charging Pump shaft shears. Requires entry into AOI-20, "Malfunction of Pressurizer Level Control System." Requires a Tech Spec evaluation.
3	cv20 0	C-RO	1-PIC-62-81, LETDOWN PRESS CONTROL, fails closed. Requires entry into ARI 110-B LO PRESS LTDN FLOW/PRESS HI. Requires manual operation of 1-PIC-62-81, LETDOWN PRESS CONTROL to maintain pressure.
4	fw05a fw54 rp03	C-BOP TS-SRO	1A Main Feedwater Pump trips due to low bearing oil pressure. Auto turbine runback fails to occur. Requires entry into AOI-16, "Loss of Normal Feedwater." Requires Tech Spec evaluation of Axial Flux Difference. Standby Main Feedwater Pump motor overload and pump trip after auto start signal is received.
5	fw09 15	C-BOP	Condenser vacuum drops due to a breach in the condenser. Requires entry into AOI-11, "Loss of Condenser Vacuum." Requires a reactor trip and turbine trip.
6	fw50b fw22c	M-All	1B-B Motor Driven Auxiliary Feedwater pump trips on instantaneous overcurrent due to bearing wear. Turbine driven auxiliary feedwater pump is steam-bound. Pump will be vented and returned to service after the crew has implemented FR-H.1, "Loss of Secondary Heat Sink."

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

Scenario 3 - Summary

Initial Condition	100% power, MOL conditions. RCS boron concentration is 747 ppm. Control Bank D rods are at 220 steps.

Turnover	1A-A Motor Driven Auxiliary Feedwater pump is out of service for pump impeller repairs. LCO 3.7.5.b was entered 4 hours ago. Expected return to service is in 36 hours. A Reactivity Plan has been provided by Reactor Engineering. Chemistry has requested that letdown flow be maintained at 75 gpm during the power reduction. A Severe Thunderstorm Warning has been issued for Rhea, Meigs, and McMinn Counties for the next 2 hours

Event 1	Power reduction to 95% to remove 1C Condensate Booster Pump from service using GO-4, "Normal Power Operations," Section 5.3, "Unit Shutdown from100% to 30% Reactor Power," beginning at Step 13.
Event 2	1A-A Centrifugal Charging Pump shaft shears. Requires entry into AOI-20, "Malfunction of Pressurizer Level Control System." Requires a Tech Spec evaluation and entry into LCO 3.5.2, ECCS – Operating. Requires Tech Requirement evaluation and entry into TR 3.1.4, Charging Pumps – Operating.
Event 3	1-PIC-62-81, LETDOWN PRESS CONTROL, fails closed. Requires entry into ARI 110-B LO PRESS LTDN FLOW/PRESS HI. Requires manual operation of 1-PIC-62-81, LETDOWN PRESS CONTROL to maintain pressure.
Event 4	1A Main Feedwater Pump trips due to low bearing oil pressure. Auto turbine runback fails to occur. Standby Main Feedwater Pump motor overload and pump trip after auto start signal is received. Requires entry into AOI-16, "Loss of Normal Feedwater," and a load reduction to less than 800 MWe. Requires Tech Spec evaluation of and entry into LCO 3.2.3, "Axial Flux Difference."
Event 5	Condenser vacuum drops due to a breach in the condenser. Requires entry into AOI-11, "Loss of Condenser Vacuum." Requires a reactor trip and turbine trip.
Event 6	1B-B Motor Driven Auxiliary Feedwater pump trips on instantaneous overcurrent due to bearing wear. Turbine driven auxiliary feedwater pump is steam-bound. Pump will be vented and returned to service after the crew has implemented FR-H.1, "Loss of Secondary Heat Sink."

Scenario 3 - Critical Task Summary

Critical Task 1	Initiate actions to establish the minimum required feedwater flow rate to the SGs before SG dryout.
Critical Task 2	Stop Reactor Coolant pumps in FR-H.1 prior to SG dryout.

Watts Bar Nuclear Plant
06-2011 NRC Examination Scenario 3
Simulator Console Operators Instructions

SIMULATOR SETUP INFORMATION

1. ENSURE NRC Examination Security has been established.
2. RESET to Initial Condition 344 by performing the following actions:
   a. Select ICManager on the THUNDERBAR menu (right hand side of Instructor Console Screen).
   b. Locate IC# 344.
   c. Right "click" on IC# 344.
   d. Select Reset on the drop down menu.
   e. Right "click" on RESET.
   f. Enter the password for IC 344.
   g. Select "Yes" on the INITIAL CONDITION RESET pop-up window.
   h. Perform SWITCH CHECK.
3. SELECT Director on the THUNDERBAR menu (right hand side of Instructor Console Screen).
4. ENSURE the following information appears on the Director Screen:

	Key	Description	Type	Event	Delay	Inserted	Ramp	Initial	Final	Value
	fw50b	afw pump b bearing wear	O		00:00:00	00:00:00	00:00:00		20	20
	hs-3-355	Intentionally left blank	M		00:00:00	00:00:00	00:00:00		close	close
	hs-3-355-1	hs-3-355 indicating lights	O		00:00:00	00:00:00	00:00:00		Off	Off
	hs-3-118a	hs-3-118a auxiliary feedwater pump a-a motor sw	O		00:00:00	00:00:00	00:00:00		ptlock	ptlock
	hs-3-355-2	hs-3-355 indicating lights	O		00:00:00	00:00:00	00:00:00		Off	Off

SIMULATOR SETUP INFORMATION

	Key	Description	Type	Event	Delay	Inserted	Ramp	Initial	Final	Value
	fw22c	airbound tdafw pump	M		00:00:00	00:00:00	00:00:00		Active	Active
	rp03	turbine runback signal failure (defeat)	m		00:00:00	00:00:00	00:00:00		Active	Active
	hs-3-118a-1	01160 aux fw pmp a-a motor sw(green)	O		00:00:00	00:00:00	00:00:00		Off	Off
	cv31a	charging pump a sheared shaft	M	2	00:00:00		00:00:00		Active	InActive
	cv20	fail fcv-62-81 to any position	M	3	00:00:00		00:00:00		0	0.44708
	fw54	sby fw pump bearing wear	M	4	00:00:00		00:00:30		30	0
	fw05a	turbine driven feed pump a trip	M	4	00:00:00		00:00:00		Active	InActive
	fw09	loss of vacuum	M	5	00:00:00		00:05:00		3	0

5. **Place simulator in RUN and acknowledge any alarms.**

6. **Place Hold Notice tags on 1-HS-3-118A, 1A-A Motor Driven Auxiliary Feedwater Pump and 1-HS-3-355, MD AFWP 1A RECIRC VALVE handswitches.**

8. **ENSURE the "Train A Week - Channel 1" sign is placed on 1-M-30.**

9. **Place simulator in FREEZE.**

10. **ENSURE Watts Bar Nuclear Plant Unit 1 Reactivity Briefing Book (Simulator Copy) MOL (Middle Of Life) is updated and on the desk, and that the MOL placards are on 1-M-6, below the Boric Acid and Primary Water Integrators. ENSURE Reactivity Plan for power maneuver is available to the crew.**

11. **WHEN prompted by the Chief Examiner, place the Simulator in RUN.**

Exam Event No.	Simulator Event No.	Description/Role Play
1		Power reduction to 95% to remove 1C Condensate Booster Pump from service. ***ROLE PLAY: NONE***
2		1A-A Centrifugal Charging Pump shaft shears. ***ROLE PLAY: When contacted as the Auxiliary Building AUO, acknowledge the request to investigate the cause of the loss of charging flow. After 1 minute, report back that the 1A-A CCP shaft is broken and there is extensive damage to the pump.*** ***ROLE PLAY: When contacted as the Auxiliary Building AUO, acknowledge the request to check 1B-B CCP is ready to be started. Report that the 1B-B CCP is ready for a start.*** ***ROLE PLAY: When contacted as the Auxiliary Building AUO, acknowledge the request to check 1B-B CCP is running normally after being started. Report that all pump parameters are normal.*** ***ROLE PLAY: If contacted as the Control Building AUO, acknowledge request to check 1B-B CCP closing spring charged.*** ***ROLE PLAY: If contacted as Work Control, acknowledge request to prepare a troubleshooting and repair package for the 1A-A CCP.***
IMPORTANT: When RO takes manual control of 1-PCV-62-81 in the following event, immediately delete the malfunction (cv20) to permit manual control.		
3		1-PCV-62-81, LETDOWN PRESS CONTROL, fails closed.. ***ROLE PLAY: When contacted as the Auxiliary Building AUO, acknowledge the request to investigate 1-PCV-82-81 locally. Report back that there are no obvious problems at the controller and that the valve appears to be responding to manual signals.***

Exam Event No.	Simulator Event No.	Description/Role Play
4		1A Main Feedwater Pump trips due to low bearing oil pressure. ***ROLE PLAY: When contacted as the Turbine Building AUO, acknowledge the request to investigate the cause of the 1A MFP trip. Report that there is a small oil leak that is contained, and that Fire Operations has been notified of the oil.*** ***ROLE PLAY: When contacted as the Support AUO, acknowledge the request to investigate the cause of the Standby MFP trip. Report that the Standby MFP tripped on instantaneous overcurrent, and that there are scorch marks on the motor.*** ***ROLE PLAY: If contacted as Work Control, acknowledge request to prepare a troubleshooting and repair package for the 1A Main Feedwater Pump, and the Standby Main Feedwater pump..***
5		Condenser vacuum drops due to a breach in the condenser. ***ROLE PLAY: When contacted as the Turbine Building AUO, acknowledge the request to ensure the vacuum breaker is closed. Report that the vacuum breaker is closed.*** ***ROLE PLAY: Report the failure of a weld seam in the condenser, which cannot be isolated.***

Exam Event No.	Simulator Event No.	Description/Role Play
6		1B-B Motor Driven Auxiliary Feedwater pump trips on instantaneous overcurrent due to bearing wear. Turbine Driven AFW pump is air bound. Pump will be returned to operable status when the crew has implemented FR-H.1, "Loss of Secondary Heat Sink," and established feed-and-bleed. ***ROLE PLAY: When contacted as the Auxiliary Building AUO that the TDAFW pump is steam bound. The AUO is standing by with a copy of SOI-3.02, "Auxiliary Feedwater System," Section 8.7, "Venting of AFW Pumps" to vent the TDAFW pump.*** ***3 minutes after the crew has stopped the RCPs per Step 9 of FR-H.1, remove malfunction fw22c, and inform the crew that the TDAFW pump has been vented.*** ***ROLE PLAY: When contacted as the Control Building AUO, acknowledge the request to check the 1B-B Motor Driven AFW Pump breaker for cause of the trip. Report back that the breaker tripped on instantaneous overcurrent.*** ***ROLE PLAY: When contacted as the Auxiliary Building AUO, acknowledge request to check condition of the 1B-B AFW pump. Report that the pump motor has scorch marks and there is the smell of burnt insulation around the motor. There is no smoke or fire.***

Op Test No.: NRC	Scenario # 3	Event # 1			Page 1 of 34		

Event Description: Power reduction to 95% to remove 1C Condensate Booster Pump from service using GO-4, "Normal Power Operations," Section 5.3, "Unit Shutdown from 100% to 30% Reactor Power," beginning at Step 13.

Time	Position	Applicant's Actions or Behavior

EXAMINER: The following actions are taken from GO-4, "Normal Power Operations," Section 5.3, "Unit Shutdown from 100% to 30% Reactor Power," beginning at Step 13. The SRO may direct that a boration be started prior to the beginning of GO-4 actions.

EXAMINER: The SRO may elect to perform the shutdown using MANUAL rod control. SOI-85.01, "Control Rod Drive and Indication System," Section 5.6, "Manual Rod Control With Reactor At Power," is includes as Attachment 1.

SOI-62.02 — **The following actions are taken from SOI-62.02, "Boron Concentration Control," Section 6.7, "Minor Boration."**

NOTES

1) Section 6.7, may be reproduced, laminated, displayed, reused, etc. as desired.
2) Minor Boration is defined as the addition of Boric Acid done several times each shift early in core life, to compensate for burnable poison burn-up, and maintain Tavg on program.

Time	Position	Applicant's Actions or Behavior
	RO	[1] **ENSURE** 1-HS-68-341H, BACKUP HEATER C [1-M-4], is ON, to equalize RCS-Pzr CB. ***RO determines that that the GREEN indicating light is DARK and the RED indicating light is LIT on 1-HS-68-341H, BACKUP HEATER C.***
	RO	[2] **ADJUST** 1-FC-62-139, BA TO BLENDER [1-M-6], for desired flow rate. ***RO may elect to maintain the flow rate already established in the makeup control system.***
	RO	[3] **ADJUST** 1-FQ-62-139, BA BATCH COUNTER [1-M-6], for required quantity. ***From the TI-7.012 "Reactivity Control Plan" provided, RO determines that 100 gallons of boron are required for the power reduction to 95%.***
	RO	[4] **PLACE** 1-HS-62-140B, VCT MAKEUP MODE [1-M-6], in BOR. ***RO rotates 1-HH-62-140B, VCT MAKEUP MODE from the AUTO position two positions to the right to the BOR position.***
	RO	[5] **TURN** 1-HS-62-140A, VCT MAKEUP CONTROL [1-M-6], to START. [5.1] **CHECK** Red light is LIT. ***RO rotates 1-HS-62-140A VCT MAKEUP CONTROL to the right to the START position, and allows the switch to return to the mid position. RO observes the RED indicating light LIT in 1-HS-62-140A.***

Op Test No.:	NRC	Scenario #	3	Event #	1	Page	2 of 34

Event Description: Power reduction to 95% to remove 1C Condensate Booster Pump from service using GO-4, "Normal Power Operations," Section 5.3, "Unit Shutdown from 100% to 30% Reactor Power," beginning at Step 13.

Time	Position	Applicant's Actions or Behavior
	RO	[6] **MONITOR** the following parameters:
	RO	[7] WHEN Boration is COMPLETE, THEN PLACE 1-HS-62-140B, VCT MAKEUP MODE, in AUTO. ***RO rotates 1-HH-62-140B, VCT MAKEUP MODE from the BOR position two positions to the left to the AUTO position.***
	RO	[8] TURN 1-HS-62-140A, VCT MAKEUP CONTROL, to START. [8.1] CHECK Red light is LIT. ***When the boration stopped automatically, 1-HS-62-140A VCT MAKEUP CONTROL received a STOP signal. To enable AUTO makeup, 1-HS-62-140A VCT MAKEUP must be rotated the right to the START position.***
	RO	[9] RETURN 1-FC-62-139, BA TO BLENDER [1-M-6], to desired flow rate. ***IF RO may elected to maintain the flow rate already established in the makeup control system, then no adjustment will be made.***

Step [6] parameters:

Instrument	Location	Parameters
1-PI-62-122	1-M-6	VCT PRESS
1-LI-62-129A	1-M-6	VCT LEVEL
1-FI-62-139	1-M-6	BA TO BLENDER FLOW
1-FQ-62-139	1-M-6	BA BATCH COUNTER
1-FI-62-142	1-M-6	PW TO BLENDER FLOW
1-FQ-62-142	1-M-6	PW BATCH COUNTER
1-LI-62-238	1-M-6	BAT A LEVEL
1-LI-62-242	1-M-6	BAT C LEVEL

Op Test No.:	NRC	Scenario #	3	Event #	1	Page	3 of 34

Event Description: Power reduction to 95% to remove 1C Condensate Booster Pump from service using GO-4, "Normal Power Operations," Section 5.3, "Unit Shutdown from 100% to 30% Reactor Power," beginning at Step 13.

Time	Position	Applicant's Actions or Behavior
GO-4		**The following actions are taken from GO-4, "Normal Power Operations," Section 5.3, "Unit Shutdown from 100% to 30% Reactor Power," beginning at Step 13.**
	BOP	[13] **INITIATE** load reduction by PERFORMING the following on the Turbine EHC panel: [13.1] **IF** during any of the following steps the REFERENCE changes in an undesired manner **THEN ADJUST VPL** to stop turbine load rise. **OR** **PUSH** TURBINE MANUAL to place the turbine control mode in manual mode and proceed to section 5.6. **ADJUST** REFERENCE CONTROL ∇ (lower) button to set desired load in SETTER display. ***The BOP will depress the REFERENCE CONTROL ∇ (lower) button and lower the SETTER display by 1%.*** [13.2] **SET** LOAD RATE as required. [13.3] (ρ) **PUSH** GO button. [13.4] **MONITOR** Generator Megawatts DROPPING. [13.6] **CHECK** that load change has **STOPPED** when reference display equals setter, **OR** **IF** desired to stop the load change, **THEN STOP** the load change by **DEPRESSING** the HOLD pushbutton [13.6] **WHEN** desired to resume the load change, **THEN** (ρ) **PRESS** the GO push button and continue to monitor load. [13.7] **ADJUST** VALVE POSITION LIMIT to ≤ 5% above the Gov Control Indication or as needed. [13.8] **REPEAT** Steps 5.3[13.1] to 5.3[13.4] to achieve desired load. ***Given a LOAD REDUCTION rate of 10% in one hour, the steps will be repeated approximately once every 6 minutes.***
CAUTION Do not exceed load rate of 5%/minute, or 10% step change		
	RO	[14] **MONITOR** the following during the load reduction: [14.1] TAVG following TREF program. [14.2] All RPIs, Step Counters, Loop ΔT, and NIS for correct power distribution, quadrant power tilts, rod insertion, rod misalignment, inoperable RPIs, and inoperable rods. [C.6]
Cue Console Operator to insert Event 2.		

Op Test No.:	NRC	Scenario #	3	Event #	2	Page	4 of 34

Event Description: 1A-A Centrifugal Charging Pump shaft shears. Requires entry into AOI-20, "Malfunction of Pressurizer Level Control System." Requires a Tech Spec evaluation.

Time	Position	Applicant's Actions or Behavior
Indications: 101-E RCP SEAL SUPPLY FLOW LO 108-A CHARGING FLOW HI/LO 110-A REGEN HX LTDN TEMP HI 237-D RCP THRM BAR RET HDR TEMP HI Seal injection flow dropping on all RCPs (1-FI-62-1A, 1-FI-62-14A, 1-FI-62-27A, and 1-FI-62-40A.) Charging flow dropping on 1-FI-62-93A, CHARGING FLOW. PZR level dropping.		
	RO	Diagnoses and announces loss of charging flow, with the 1A-A CCP in service.
	RO	May isolate letdown and charging due to the loss of charging flow.
	RO	May dispatch an Assistant Unit Operator to determine the cause of the loss of charging flow.
	RO	May dispatch an Assistant Unit Operator to determine that 1B-B CCP is ready to be started.
	SRO	May enter and direct actions of ARI 108-A, CHARGING FLOW HI/LO.
	SRO	Enters and directs actions of AOI-20, "Malfunction of Pressurizer Level Control System."
ARI 108-A		**The following actions are taken from CHARGING FLOW HI/LO.**
	RO	**[1] IF** ALL the following conditions exist: • Any RCP Thermal Barrier Out–Of–Service, • In–Service Charging pump trips, • RCP seal injection flow required, **THEN** IMMEDIATELY **START** available charging pump to restore seal flow.
	RO	**[2] CHECK** 1-FI-62-93A [1-M-5] to determine if flow is high or low. ***RO determines that 1-FI-62-93A, CHARGING FLOW indicates zero flow.***
	RO	**[3] CHECK** PZR level indication on 1-M-4. ***RO determines that 1-LI-68-339A, PZR LEVEL, 1-LI-68-335A, PZR LEVEL, AND 1-LI-68-320, PZR LEVEL are trending down.***

Op Test No.:	NRC	Scenario #	3	Event #	2	Page	5	of	34

Event Description: 1A-A Centrifugal Charging Pump shaft shears. Requires entry into AOI-20, "Malfunction of Pressurizer Level Control System." Requires a Tech Spec evaluation.

Time	Position	Applicant's Actions or Behavior
	SRO	[4] **IF** PZR level control system malfunction, **THEN GO TO** AOI-20, MALFUNCTION OF PRESSURIZER LEVEL CONTROL CHANNEL. ***SRO determines that AOI-20, "Malfunction of Pressurizer Level Control System" will be implemented to recover from the loss of charging.***
	RO	**[5] IF** charging flow is low, **THEN CHECK** letdown temperature and **CONSIDER** increasing charging flow, or **ISOLATE** letdown.
	RO	**[6] IF** charging is lost, **THEN IMMEDIATELY ISOLATE** letdown.
	SRO	**[7] DETERMINE** cause of problem and **INITIATE** corrective action.
	SRO	**[8] REFER TO** SOI-62.01, CVCS - CHARGING AND LETDOWN.

Op Test No.:	NRC	Scenario #	3	Event #	2	Page	6	of 34

Event Description: 1A-A Centrifugal Charging Pump shaft shears. Requires entry into AOI-20, "Malfunction of Pressurizer Level Control System." Requires a Tech Spec evaluation.

Time	Position	Applicant's Actions or Behavior

AOI-20 — **The following actions are taken from AOI-20, "Malfunction Of Pressurizer Level Control System."**

CAUTION

Charging and letdown must be in service together. If letdown isolates or charging is lost, the other must be isolated.

Time	Position	Applicant's Actions or Behavior
	RO	1. **CHECK** pzr level program signal NORMAL: • 1-LR-68-339 (green pen).

NOTE

1-XS-68-339E selects one channel to control level to program and one backup channel for control interlocks.

Time	Position	Applicant's Actions or Behavior
	RO	2. **CHECK** if 1-XS-68-339E is selected to FAILED channel (control or backup): • LI-68-339, OR • LI-68-320, OR • LI-68-335. ***RO determines that 1-LI-68-339A, PZR LEVEL, 1-LI-68-335A, PZR LEVEL, AND 1-LI-68-320, PZR LEVEL are trending down, and all instruments indicating properly.***
	RO	2. **RESPONSE NOT OBTAINED:** **IF** pzr level is low **OR** dropping, **THEN ** GO TO** Step 12.
	RO	12. **CHECK** any charging pump RUNNING.
	RO	12. **RESPONSE NOT OBTAINED:** **PERFORM** the following: a. **ISOLATE** letdown: • **CLOSE** letdown orifice(s). • **CLOSE** 1-FCV-62-69. • **CLOSE** 1-FCV-62-70. ***RO observes that 1-FCV-62-69, 1-FCV-62-70, and all of the letdown orifice isolation valves are CLOSED.*** b. **RESTORE** charging and letdown: • **REFER TO** Attachment 1.

Op Test No.: NRC	Scenario # 3	Event # 2			Page 7	of 34	
Event Description:	1A-A Centrifugal Charging Pump shaft shears. Requires entry into AOI-20, "Malfunction of Pressurizer Level Control System." Requires a Tech Spec evaluation.						

Time	Position	Applicant's Actions or Behavior
		EXAMINER: The following actions are taken from AOI-20, Malfunction of Pressurizer Level Control System," Attachment 1,"Alignment of Charging and Letdown."
	RO	1. **IF** charging **NOT** established, **THEN PERFORM** the following: a. **CLOSE** 1-FCV-62-89, CHRG HDR-RCP SEALS FLOW CONTROL. ***1-HIC-62-89A, CHG HDR - RCP SEALS FLOW CONTROL was CLOSED in a previous step. RO may rotate the knob to the left to confirm valve is closed.*** b. **ENSURE** Charging Pump running. ***When contacted as the Auxiliary Building AUO, the Console Operator will acknowledge the request to investigate the cause of the loss of charging flow. After 1 minute, the Console Operator will report back that the 1A-A CCP shaft is broken and there is extensive damage to the pump.*** ***If contacted as the Auxiliary Building AUO to determine that 1B-B CCP is ready to be started, the Console Operator will repeat back the request, and then inform the RO that the 1B-B CCP is ready for a start.*** ***RO starts 1B-B CCP by rotating 1-HS-62-104A, CCP B-B (ECCS) to the START position. After the starting logic time delay is satisfied, the RED indicating light on 1-HS-62-104A, CCP B-B (ECCS) will be LIT. RO will observe 1-EI-62-104A, CCP B-B AMPS and/or 1-PI-62-92A, CHARGING HDR PRESS to ensure charging is in service.*** ***If contacted as the Auxiliary Building AUO, the Console Operator will repeat back the request to check out the 1B-B CCP after start, and then inform the RO that 1B-B CCP local checks are normal.*** c. **OPEN** 1-FCV-62-90 and 1-FCV-62-91, CHARGING LINE ISOL. ***RO restores charging by rotating 1-HS-62-90A, CHARGING LINE ISOL and 1-HS-62-91, CHARGING LINE ISOL to the OPEN position.*** d. **ENSURE** 1-FCV-62-85, NORM CHARGING TO LOOP 1, or 1-FCV-62-86, ALT CHARGING TO LOOP 4, OPEN. ***RO observes 1-FCV-62-86, ALT CHARGING TO LOOP 4 is open by RED indicating light LIT.*** e. **ADJUST** 1-FCV-62-93 to maintain seal injection flow between 8 and 13 gpm for each RCP.

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Event Description: 1A-A Centrifugal Charging Pump shaft shears. Requires entry into AOI-20, "Malfunction of Pressurizer Level Control System." Requires a Tech Spec evaluation.

Time	Position	Applicant's Actions or Behavior
	RO	2. **ENSURE** letdown isol valves OPEN: • 1-FCV-62-69, CVCS LETDOWN ISOLATION. ***1-HS-62-69, RCS LETDOWN FRM LOOP 3 IN CNTMT is rotated to the right to the OPEN position and held until the RED indicating light is LIT and the GREEN indicating light is DARK.*** • 1-FCV-62-70, CVCS LETDOWN ISOLATION. ***1-HS-62-70, RCS LETDOWN FRM LOOP 3 IN CNTMT is rotated to the right to the OPEN position and held until the RED indicating light is LIT and the GREEN indicating light is DARK.*** • 1-FCV-62-77, CVCS LP LETDOWN ISOLATION. ***1-HS-62-69, LP LETDOWN ISOL CIV-ϕA GREEN indicating light is DARK, and RED indicating light is LIT.***
	RO	3. **PLACE** 1-HIC-62-78A, LETDOWN HX OUTLET TEMP TCV-70-192 CNTL, in MANUAL at 25% OPEN. ***1-HIC-62-78A, LETDOWN HX OUTLET TEMP TCV-70-192 CNTL is placed in MANUAL by lifting the toggle switch from the AUTO position, the toggle is pushed to the right to open the valve to 25% (as read on the controller.)***
	RO	4. **PLACE** 1-HIC-62-81A, LETDOWN PRESS CONTROL, in MANUAL at 40-50% OPEN if using 75 gpm orifice (20-30% OPEN if using 45 gpm orifice). ***1-HIC-62-81A, LETDOWN PRESS CONTROL is placed in MANUAL by lifting the toggle switch from the "AUTO" position, the toggle is pushed to the right to open the valve to 40-50% (as read on the controller).***
	RO	5. **THROTTLE OPEN** 1-FCV-62-89 and **ESTABLISH** 75 gpm or greater charging flow while maintaining seal injection flow between 8 and 13 gpm for each RCP using 1-FCV-62-93. ***RO establishes 75 gpm charging flow on 1-FI-62-93A, and 8 to 13 gpm on 1-FI-62-1A, RCP 1 SEAL SUP FLOW, 1-FI-62-14A, , RCP 2 SEAL SUP FLOW, 1-FI-62-27A, RCP 3 SEAL SUP FLOW, and 1-FI-62-40A, RCP 4 SEAL SUP FLOW.***
	RO	6. **OPEN** letdown orifices as needed: • 1-FCV-62-72 (45 gpm). • 1-FCV-62-73 (75 gpm). • 1-FCV-62-74 (75 gpm). • 1-FCV-62-76 (5 gpm). ***RO selects either 1-HS-62-73A. LETDOWN ORIFICE B 75 GPM - CIV-ϕA, or 1-FCV-62-74, LETDOWN ORIFICE C 75 GPM - CIV-ϕA and rotates the selected handswitch to the right to the OPEN position.***

Op Test No.:	NRC	Scenario #	3	Event #	2	Page	9	of	34

Event Description: 1A-A Centrifugal Charging Pump shaft shears. Requires entry into AOI-20, "Malfunction of Pressurizer Level Control System." Requires a Tech Spec evaluation.

Time	Position	Applicant's Actions or Behavior
	RO	7. **ADJUST** 1-HIC-62-81A, LETDOWN PRESS CONTROL, for desired press, (320 psig at normal letdown temp), and **PLACE** in AUTO. ***1-HIC-62-81A, LETDOWN PRESS CONTROL toggle switch is moved to the right to close the valve and raise pressure to 320 psig. 1-HIC-62-81A is placed in AUTO by pushing the toggle switch down to the AUTO position.***
	RO	8. **PLACE** 1-HIC-62-78A, LETDOWN HX OUTLET TEMP TCV-70-192 CNTL, in AUTO. ***1-HIC-62-78A, LETDOWN HX OUTLET TEMP TCV-70-192 CNTL, is placed in AUTO by pushing the toggle switch down to the AUTO position.***
	RO	9. **RETURN** pzr level to program. ***RO makes periodic adjustments to 1-HIC-62-93A, CHARGING FLOW PZR LEVEL CONTROL and 1-HIC-62-89A, CHG HDR - RCP SEALS FLOW CONTROL to return PZR level to program level.***
	RO	10. **RETURN** 1-HIC-62-93A, CHARGING FLOW PZR LEVEL CONTROL, in AUTO. ***1-HIC-62-93A, CHARGING FLOW PZR LEVEL CONTROL, is placed in AUTO by pushing the toggle switch down to the AUTO position.***

Op Test No.:	NRC	Scenario #	3	Event #	2	Page	10 of 34

Event Description: 1A-A Centrifugal Charging Pump shaft shears. Requires entry into AOI-20, "Malfunction of Pressurizer Level Control System." Requires a Tech Spec evaluation.

Time	Position	Applicant's Actions or Behavior
EXAMINER: The applicants will return to AOI-20, Malfunction of Pressurizer Level Control System," Step 12 RESPONSE NOT OBTAINED after completion of Attachment 1.		
	SRO	12. **RESPONSE NOT OBTAINED:** c. ** **GO TO** Step 18.
	SRO	18. **NOTIFY** Work Control to initiate corrective action, if necessary. ***When contacted as Work Control, the Console Operator will acknowledge the request for a troubleshooting and repair package 1A-A CCP.***
	SRO	19. **EVALUATE** system alignment/status: • **REVIEW** actions performed in this Instruction. • **REFER TO** SOI-62.01, CVCS - Charging and Letdown.
	SRO	**Evaluates Technical Specifications:** 3.5 Emergency Core Cooling Systems (ECCS) ***LCO 3.5.2, ECCS - Operating Action A. One or more trains inoperable. AND At least 100% of the ECCS flow equivalent to a single OPERABLE ECCS train available, restore train(s) to operable status within 72 hours.***
	SRO	**Evaluates Technical Requirements:** 3.1 Reactivity Control Systems ***TR 3.1.4 Charging Pumps, Operating Condition A. One required charging pump inoperable, A.1 Restore required charging pump to OPERABLE status within 72 hours OR A.2.1 Be in MODE 3 within 78 hours AND A.2.2 Borate to a SDM equivalent to > 1% Δk/k at 200°F within 78 hours. AND A.2.3 Restore required charging pump to OPERABLE status within 246 hours.***
	SRO	20. **RETURN TO** instruction in effect.
Cue Console Operator to insert Event 3.		
IMPORTANT: When RO takes manual control of 1-HIC-62-81 in the following event, console operator must immediately delete the malfunction (cv20) to permit manual control.		

Op Test No.:	NRC	Scenario #	3	Event #	3	Page	11	of	34

Event Description: 1-PCV-62-81, LETDOWN PRESS CONTROL, fails closed. Requires entry into ARI 110-B LO PRESS LTDN FLOW/PRESS HI. Requires manual operation of 1-HIC-62-81, LETDOWN PRESS CONTROL to maintain pressure.

Time	Position	Applicant's Actions or Behavior
Indications: 110-B, LO PRESS LTDN FLOW/PRESS HI. 247-A, LTDN HX RET FLOW LO		
	RO	Announces rising pressure on 1-PI-62-81, and diagnoses the failure of 1-PIC-62-81A LETDOWN PRESSURE CONTROL to control in AUTOMATIC.
	SRO	Enters and directs actions of ARI 110-B, LO PRESS LTDN FLOW/PRESS HI.
ARI 110-B		**The following actions are taken from ARI 110-B, LO PRESS LTDN FLOW/PRESS HI.**
	RO	[1] **CHECK** letdown flow, 1-FI-62-82, and letdown pressure, 1-PI-62-81 [1-M-6]. ***RO observes letdown flow lowering on 1-FI-62-82 and letdown pressure is rising on 1-PI-62-81.***
NOTE If 1-PCV-62-81 has failed, SOI-62.01 may be referenced to bypass the valve.		
	RO	[2] **ENSURE** 1-PCV-62-81 is maintaining 320 to 350 psig on 1-PI-62-81. ***RO places 1-HIC-62-81A, LETDOWN PRESS CONTROL, in MANUAL and returns letdown pressure to approximately 320 psig by opening the valve slowly.*** ***If contacted as the Auxiliary Building AUO, the Console Operator acknowledges the request to locally inspect 1-PCV-62-81. Report back that there are no obvious problems at the controller and that the valve appears to be responding to manual signals.***
	RO	[3] **ENSURE** proper orifice(s) are aligned to supply letdown flow 45 to 120 gpm. ***With letdown flow at 75 gpm, the RO ensures that either 1-FCV-62-73 or 1-FCV-62-74 is open.***
	SRO	[4] **IF** conditions persist, **THEN**, **CONSIDER** taking normal Charging and Letdown out of service and placing excess letdown in service per SOI-62.01, *CVCS - CHARGING AND LETDOWN*. ***SRO determines that letdown pressure can be maintained with 1-HIC-62-81A in MANUAL, and does not isolate charging and letdown.***

Op Test No.: NRC Scenario # 3 Event # 4

Event Description: 1A Main Feedwater Pump trips due to low bearing oil pressure. Auto turbine runback fails to occur. Requires entry into AOI-16, "Loss of Normal Feedwater." Requires Tech Spec evaluation of Axial Flux Difference. Standby Main Feedwater Pump trips after start due to a motor overload, due to seized bearings.

Time	Position	Applicant's Actions or Behavior
Indications: 50-A, MFPT 1A ABNORMAL 51-A, TRIPPED 59-A, STANDBY MFP FLOW LO 14-D, M-1 THRU M-6 MOTOR OVERLOAD 14-E, M-1 THRU M-6 MOTOR TRIPOUT		
	BOP	Diagnoses and announces the trip of the 1A Main Feedwater Pump.
	BOP	Diagnoses auto turbine runback failure and manually runback the turbine using main turbine valve position limiter.
	BOP	Diagnoses and announces the trip of the Standby MFW Pump.
	BOP	May place 1-FIC-3-70 MFWP A RECIRC CONTROL in MANUAL and close the valve.
	RO	May dispatch an AUO to determine the cause of the 1A MFP trip.
	RO	May dispatch the Control Building AUO to check the Standby Main Feedwater Pump breaker (1D 6.9 KV Unit Board) for relay operation.
	SRO	Enters and directs actions of AOI-16, "Loss of Normal Feedwater."
	SRO	When received, enters and directs actions of ARI 87-B ROD INSERTION LIMIT LO-LO.
AOI-16		**The following actions are taken from AOI-16, "Loss of Normal Feedwater," Section 3.5. "MFWP TRIP greater than or equal to 800 MWe (67% Turbine Load)."**
	SRO	1. (ρ) **IF** loss of S/G level is imminent, **THEN TRIP** reactor, and **GO TO** E-0, Reactor Trip or Safety Injection.
	BOP	2. **CHECK** turbine load less than or equal to 1000 MWe (85%). ***If not previously performed BOP will manually runback turbine to <1000 MWE (85%) using valve position limiter and may continue to <800 MWE (67%) since Standby Main Feedwater pump is also tripped.***
	BOP	3. **PLACE** tripped MFP recirc valve controller in MANUAL, and **CLOSE** recirc valve. ***BOP places 1-FIC-3-70, MFWP A RECIRC CONTROL in MANUAL by sliding the control from the "A" position to the "M" position, then depressing the WHITE CLOSE pushbutton.***
	BOP	4. **CHECK** turbine load less than 800 MWe (67%).

Op Test No.:	NRC	Scenario #	3	Event #	4	Page	13	of 34

Event Description: 1A Main Feedwater Pump trips due to low bearing oil pressure. Auto turbine runback fails to occur. Requires entry into AOI-16, "Loss of Normal Feedwater." Requires Tech Spec evaluation of Axial Flux Difference. Standby Main Feedwater Pump trips after start due to a motor overload, due to seized bearings.

Time	Position	Applicant's Actions or Behavior
	BOP	4. **RESPONSE NOT OBTAINED:** **ENSURE** Standby MFWP running.- ***BOP determines that the Standby MFP is tripped.*** (ρ) **IF** Standby MFWP NOT available, **THEN REDUCE** turbine load to less than 800 MWe with valve position limiter. ***BOP reduces turbine load to less than 800 MWe by depressing the VALVE POSITION LIMITER, "VVE POS ▼" pushbutton on EHC CONTROL 1-XX-47-1000.***
	BOP	5. **ENSURE** MFWP speed rising to control S/G Δ-P and levels on program ***BOP observes 1-SI-46-20B, MFPT B SPEED rising.***
CAUTION Continued load reductions below 800 MWe should be done using normal turbine controls at less than or equal to 5% min.		
	BOP	6. **ENSURE** adequate feed flow for existing conditions: • Feed flow greater than or equal to steam flow. • S/G levels returning to program.
	RO	7. **ENSURE** T-avg and T-ref within 3°.
CAUTION Runback may result in exceeding Tech Spec 3.2.3 limits on Axial Flux Difference (AFD).		
	SRO	8. **MONITOR** AFD within limits of LCO 3.2.3.
	SRO	8. **RESPONSE NOT OBTAINED:** (ρ) **INITIATE** boration to return AFD within limits. ***Based on the power reduction, LCO 3.2.3, Axial Flux Difference (AFD) Condition A, must be entered. With AFD not within limits, reduce THERMAL POWER to< 50% RTP within 30 minutes.***
SOI-62.02		**The following actions are taken from SOI-62.02, "Boron Concentration Control," Section 6.7, Minor Boration."**
NOTES 1) Section 6.7, may be reproduced, laminated, displayed, reused, etc. as desired. 2) Minor Boration is defined as the addition of Boric Acid done several times each shift early in core life, to compensate for burnable poison burn-up, and maintain Tavg on program.		

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Event Description: 1A Main Feedwater Pump trips due to low bearing oil pressure. Auto turbine runback fails to occur. Requires entry into AOI-16, "Loss of Normal Feedwater." Requires Tech Spec evaluation of Axial Flux Difference. Standby Main Feedwater Pump trips after start due to a motor overload, due to seized bearings.

Time	Position	Applicant's Actions or Behavior
	RO	[1] **ENSURE** 1-HS-68-341H, BACKUP HEATER C [1-M-4], is ON, to equalize RCS-Pzr CB. ***RO determines that that the GREEN indicating light is DARK and the RED indicating light is LIT on 1-HS-68-341H, BACKUP HEATER C.***
	RO	[2] **ADJUST** 1-FC-62-139, BA TO BLENDER [1-M-6], for desired flow rate. ***RO may elect to maintain the flow rate already established in the makeup control system.***
	RO	[3] **ADJUST** 1-FQ-62-139, BA BATCH COUNTER [1-M-6], for required quantity. ***From the TI-7.012 "Reactivity Control Plan" provided, RO determines that.***
	RO	[4] **PLACE** 1-HS-62-140B, VCT MAKEUP MODE [1-M-6], in BOR. ***RO rotates 1-HH-62-140B, VCT MAKEUP MODE from the AUTO position two positions to the right to the BOR position.***
	RO	[5] **TURN** 1-HS-62-140A, VCT MAKEUP CONTROL [1-M-6], to START. [5.1] **CHECK** Red light is LIT. ***RO rotates 1-HS-62-140A VCT MAKEUP CONTROL to the right to the START position, and allows the switch to return to the mid position. RO observes the RED indicating light LIT in 1-HS-62-140A.***
	RO	[6] **MONITOR** the following parameters: (see table below)
	RO	[7] WHEN Boration is COMPLETE, THEN PLACE 1-HS-62-140B, VCT MAKEUP MODE, in AUTO. ***RO rotates 1-HS-62-140B, VCT MAKEUP MODE from the BOR position two positions to the left to the AUTO position.***

Instrument	Location	Parameters
1-PI-62-122	1-M-6	VCT PRESS
1-LI-62-129A	1-M-6	VCT LEVEL
1-FI-62-139	1-M-6	BA TO BLENDER FLOW
1-FQ-62-139	1-M-6	BA BATCH COUNTER
1-FI-62-142	1-M-6	PW TO BLENDER FLOW
1-FQ-62-142	1-M-6	PW BATCH COUNTER
1-LI-62-238	1-M-6	BAT A LEVEL
1-LI-62-242	1-M-6	BAT C LEVEL

Op Test No.:	NRC	Scenario #	3	Event #	4	Page	15	of 34

Event Description: 1A Main Feedwater Pump trips due to low bearing oil pressure. Auto turbine runback fails to occur. Requires entry into AOI-16, "Loss of Normal Feedwater." Requires Tech Spec evaluation of Axial Flux Difference. Standby Main Feedwater Pump trips after start due to a motor overload, due to seized bearings.

Time	Position	Applicant's Actions or Behavior
	RO	[8] TURN 1-HS-62-140A, VCT MAKEUP CONTROL, to START. [8.1] CHECK Red light is LIT. ***When the boration stopped automatically, 1-HS-62-140A VCT MAKEUP CONTROL received a STOP signal. To enable AUTO makeup, 1-HS-62-140A VCT MAKEUP must be rotated the right to the START position.***
	RO	[9] RETURN 1-FC-62-139, BA TO BLENDER [1-M-6], to desired flow rate. ***IF RO may elected to maintain the flow rate already established in the makeup control system, then no adjustment will be made.***

Op Test No.:	NRC	Scenario #	3	Event #	4	Page	16	of	34

Event Description: 1A Main Feedwater Pump trips due to low bearing oil pressure. Auto turbine runback fails to occur. Requires entry into AOI-16, "Loss of Normal Feedwater." Requires Tech Spec evaluation of Axial Flux Difference. Standby Main Feedwater Pump trips after start due to a motor overload, due to seized bearings.

Time	Position	Applicant's Actions or Behavior
AOI-16		**The following are the remaining actions of AOI-16, "Loss of Normal Feedwater," Section 3.5, "MFWP TRIP greater than or equal to 800 MWe (67% Turbine Load)."**
	BOP	9. **IF** feed flow greater than 40%, **THEN ENSURE** tripped MFWP turbine condenser valves CLOSED: • Pump A, 1-FCV-2-205 and -210, OR ***BOP observes that 1-HS-2-205 MFPT "A" CONDENSER CNDS OUTLET GREEN indicating light is LIT, RED indicating light is DARK. BOP observes that 1-HS-2-210 MFPT "A" CONDENSER CNDS INLET GREEN indicating light is LIT, RED indicating light is DARK.*** • Pump B, 1-FCV-2-211 and -216.
	BOP	10. **MONITOR** reg valves controlling S/G levels on program.
	BOP	11. **LOCALLY MAINTAIN** oil temp between 110 to 130°F on running Standby MFP using 1-THV-24-948 ***Standby MFP tripped, step is not applicable.***
	BOP	12. **IF** C-7 LOSS OF LOAD STM DUMP INTERLOCK annunciator LIT [66E], **THEN** a. **ENSURE** steam dump valves have zero demand. ***BOP observes 1-XI-1-33 STEAM DUMP DEMAND is indicating zero.*** b. **RESET** loss-of-load interlock with steam dump mode switch. ***BOP rotates 1-HS-1-103D, STEAM DUMP DEMAND, from the T AVG position to the left to the RESET position. BOP observes Window 66E, C-7 LOSS OF LOAD STM DUMP INTERLOCK is clear.***
	SRO	13. **ENSURE** Condensate System Pumps in service as necessary: • **REFER TO** GO-4, Normal Power Operation.
	SRO	14. **IF** reactor power dropped by greater than or equal to 15% in one hour, **THEN NOTIFY** Chemistry to initiate power change sampling requirements. ***When contacted by the SRO, the Console Operator will repeat back request to perform power change sampling.***
	BOP	15. **CHECK** VALVE POS LIMIT LIT.

Op Test No.:	NRC	Scenario #	3	Event #	4	Page	17	of 34

Event Description: 1A Main Feedwater Pump trips due to low bearing oil pressure. Auto turbine runback fails to occur. Requires entry into AOI-16, "Loss of Normal Feedwater." Requires Tech Spec evaluation of Axial Flux Difference. Standby Main Feedwater Pump trips after start due to a motor overload, due to seized bearings.

Time	Position	Applicant's Actions or Behavior
	BOP	16. **RETURN** valve position limiter to normal: a. **ENSURE** turbine in IMP OUT b. (ρ) **REDUCE** turbine load setpoint using REFERENCE CONTROL ∇ (lower) AND GO button until VALVE POS LIMIT LIGHT not LIT, c. **SET** valve position limiter to 95%.
	SRO	17. **INITIATE** repairs on failed pump. ***When contacted as the Turbine Building AUO, the Console Operator acknowledges the request to investigate the cause of the 1A MFP trip. Reports that there is a small oil leak that is contained, and that Fire Operations has been notified of the oil.*** ***When contacted as the Support AUO, the Console Operator will acknowledge the request to investigate the cause of the Standby MFP trip. Reports that the Standby MFP tripped on instantaneous overcurrent, and that there are scorch marks on the motor.***
	SRO	18. **RETURN TO** Instruction in effect.

Op Test No.:	NRC	Scenario #	3	Event #	4	Page	18 of 34

Event Description: 1A Main Feedwater Pump trips due to low bearing oil pressure. Auto turbine runback fails to occur. Requires entry into AOI-16, "Loss of Normal Feedwater." Requires Tech Spec evaluation of Axial Flux Difference. Standby Main Feedwater Pump trips after start due to a motor overload, due to seized bearings.

ARI 87-B

The following actions are taken from ARI 87-B, ROD INSERTION LIMIT LO-LO.

NOTES

1) Tech Specs require SDM to be verified greater than or equal to 1.6% Δk/k within one hour OR initiation of boration to restore SDM to within limit within one hour. Tech Specs also require restoration of rods to within limits within two hours.
2) At 25% power or below, control banks C and D RIL computer setpoint will be conservative due to the calculated curve in the RIL computer. To make an accurate determination of actual RIL limits, the COLR may be used as a backup source. The ICS computer also emulates the curve which is built into the RIL computer.

Time	Position	Applicant's Actions or Behavior
	SRO/RO	[1] **IF** low-low rod insertion limit has been exceeded1, **THEN** [1.1] **STOP** all dilutions of RCS. [1.2] **SELECT** manual rod control, and **RESTORE** Tavg to Tref, if necessary. ***SRO directs the RO to place 1-RBSS, ROD BANK SELECT in MAN and to perform controlled rod withdrawals to return rods above the insertion limits.*** [1.3] **INITIATE** SDM determination. ***When SRO contacts the STA to perform the Shutdown Margin determination, the Console Operator will repeat back the request.*** [1.4] **RESTORE** rods to within limits within 2 hours. [1.5] **GO TO** AOI-34, IMMEDIATE BORATION. ***Since a boration is already in progress to recover AFD to within limits, the SRO may enter AOI-34, IMMEDIATE BORATION and determine that the actions called for are in progress.***
	RO	[2] **USE** CERPI screens [1-M-4] or ICS Computer to determine cause of alarm.
	RO	[3] **IF** ΔT channel has failed, **THEN PLACE** ΔT defeat switch (1-XS-68-2D) to the affected loop, and **PULL OUT** to defeat channel output. ***RO determines that the cause of the alarm is NOT the failure of a ΔT channel.***
	SRO	**Evaluates Technical Specifications:** 3.1.7 Control Bank Insertion Limits Control banks shall be within the insertion, sequence, and overlap limits specified in the COLR. ***Condition A Control bank insertion limits not met, verify SDM is ≥ 1.6% -k/k within 1 hour, OR Initiate boration to restore SDM to within limits within 1 hour AND restore control bank(s) to within limits within 2 hours.***

Op Test No.:	NRC	Scenario #	3	Event #	4	Page	19	of	34

Event Description: 1A Main Feedwater Pump trips due to low bearing oil pressure. Auto turbine runback fails to occur. Requires entry into AOI-16, "Loss of Normal Feedwater." Requires Tech Spec evaluation of Axial Flux Difference. Standby Main Feedwater Pump trips after start due to a motor overload, due to seized bearings.

Time	Position	Applicant's Actions or Behavior
	SRO	**Crew Brief** would typically be conducted for this event as time allows prior to the next event.
	SRO	**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).
Cue Console Operator to insert Event 5.		

Op Test No.:	NRC	Scenario #	3	Event #	5	Page	20	of 34

Event Description: Condenser vacuum drops due to a breach in the condenser. Requires entry into AOI-11, "Loss of Condenser Vacuum." When conditions degrade, requires a reactor trip and turbine trip.

Time	Position	Applicant's Actions or Behavior

Indications:
45-D, HOTWELL LEVEL HI/LO
46-C, CONDSER VACUUM LO
Condenser pressure rising on 1-P/TR-2-2, COND TEMP & PRESS.
Hotwell level rising on1-LR-2-12, HOTWELL LEVEL - INCHES

Time	Position	Applicant's Actions or Behavior
	BOP	Diagnoses and announces rising trend in condenser backpressure.
	SRO	Enters and directs actions of AOI-11, "Loss of Condenser Vacuum."
AOI-11		**The following actions are taken from, "Loss of Condenser Vacuum."**

CAUTION

If steam dumps are lost due to condenser backpressure, a turbine/reactor trip from high power may result in secondary and primary safety valve actuation.

NOTE

Reference Appendix A as required for Condenser Vacuum LO-LO and LO Alarms setpoints if ICS graph from Turn On code AOI11 NOT available.

Time	Position	Applicant's Actions or Behavior
	BOP	1. **MONITOR** condenser backpressure is, and will remain, less than 0.1 in. below the Lo-Lo Alarm using ICS Turn On code AOI11. Other evaluation points available: a. ICS Pt. - P2265A (C-Zone) b. ICS Pt. - P1133A (C-Zone) c. ICS Pt. - P2264A (B-Zone) d. ICS Pt. - P2263A (A-Zone) e. Cond Back Press Rate of Rise f. Environmental Conditions
	BOP	1. **RESPONSE NOT OBTAINED:** **LOWER** turbine load to maintain condenser backpressure 0.1 in. below the Lo-Lo Alarm: **REFER TO:** • AOI-39, Rapid Load Reduction, **OR** • GO-4, Normal Power Operations **MAINTAIN** T-avg and T-ref within 3°F. **IF** condenser backpressure continues to increase OR cannot be reduced below the Lo-Lo Alarm within 5 minutes, **THEN:** • **IF** greater than 50% power, **THEN MANUALLY TRIP** the Reactor **AND ENTER** E-0, Reactor Trip or Safety Injection. • **IF** less than or equal to 50% power, **THEN MANUALLY TRIP** the Turbine **AND GO TO** AOI-17, Turbine Trip.

Op Test No.: NRC	Scenario # 3	Event # 5	Page 21 of 34

Event Description: Condenser vacuum drops due to a breach in the condenser. Requires entry into AOI-11, "Loss of Condenser Vacuum." When conditions degrade, requires a reactor trip and turbine trip.

Time	Position	Applicant's Actions or Behavior

AOI-39

The following actions are taken from AOI-39, "Rapid Load Reduction." Once the load reduction actions are begun, it is expected that AOI-11, "Loss of Condenser Vacuum" actions will continue.

CAUTION

Over boration may result in excessive rod withdrawal, T-avg lower than desired, and AFD oscillations.

NOTE

- Rod Control should remain in automatic for T-avg Control
- Reactivity Briefing Sheet, "Thumb Rules" (page 3), lists boration flows and volumes for different reduction rates.
- Effect of boration will lag behind turbine load reduction and can be compensated for by temporarily increasing boric acid flow rate above recommended rate.

Time	Position	Applicant's Actions or Behavior
	RO	1. **INITIATE** a manual boration: a. **DETERMINE** recommended boration flow rate and volume from Reactivity Briefing Sheet: b. **INITIATE** normal boration: 1) **ADJUST** BA flow controller, 1-FC-62-139, to desired flow rate. 2) **ADJUST** BA batch counter 1-FQ-62-139 to required quantity. 3) **PLACE** mode selector 1-HS-62-140B to BOR. 4) **PLACE** VCT makeup control 1-HS-62-140A, to START. 5) **VERIFY** desired boric acid flow indicated on 1-FI-62-139.

CAUTION

- **Condenser Backpressure limits are on page 5.**
- **TURBINE MANUAL Operation requires continuous operator monitoring and control.**
- **LOSS OF CONDENSER VACUUM may be made worse if steam dumps are actuated. AOI-11 requires T-ave and T-ref be maintained within 3°F.**

NOTE

If the initiating condition is corrected, the power reduction may be terminated

Time	Position	Applicant's Actions or Behavior
	BOP	2. **ESTABLISH** a turbine load reduction rate less than or equal to 5%/min: a. **PLACE** turbine in IMP IN b. **SET** a desired load in the SETTER with the REFERENCE CONTROL. c. **SET** the LOAD RATE at less than or equal to 5%/min. d. **DEPRESS** GO pushbutton.

NOTE

AFD green target band can be monitored using ICS Turn On code DOGHOUSE.

Op Test No.:	NRC	Scenario #	3	Event #	5	Page	22	of	34

Event Description: Condenser vacuum drops due to a breach in the condenser. Requires entry into AOI-11, "Loss of Condenser Vacuum." When conditions degrade, requires a reactor trip and turbine trip.

Time	Position	Applicant's Actions or Behavior
	RO	3. **MONITOR** rod position: • Rods above Lo-Lo insertion limit • AFD within Target Band
	SRO	4. **REFER TO** EPIP-1, Emergency Plan Classification Flowchart.
	SRO	5. **NOTIFY** the Load Coordinator of the required load reduction and expected ramp rate.

Op Test No.:	NRC	Scenario #	3	Event #	5	Page	23	of	34

Event Description: Condenser vacuum drops due to a breach in the condenser. Requires entry into AOI-11, "Loss of Condenser Vacuum." When conditions degrade, requires a reactor trip and turbine trip.

Time	Position	Applicant's Actions or Behavior
AOI-11		**The following actions are taken from AOI-11, "Loss of Condenser Vacuum."**
	BOP	2. **ENSURE** condenser vacuum breaker CLOSED. ***When the BOP dispatches the Turbine Building AUO to ensure that the vacuum breaker is closed, the Console Operator will acknowledge the report and confirm that the vacuum breaker is closed.*** ***As the Turbine Building AUO, report the failure of a weld seam in the condenser, which cannot be isolated.***
CAUTION **If loss of vacuum is due to undesirable atmospheric conditions for cooling tower operation, then use of Supplemental Condenser Circulating Water (SCCW) or operating unit at reduced load may be required.**		
	BOP	3. **ENSURE** adequate number of CCW pumps in service.
	BOP	4. **ENSURE** condenser vacuum pumps in service.
	BOP	5. **EVALUATE** use of SCCW if time permits.
	BOP	6. **CHECK** gland seal steam pressure approximately 115 psig, 1-PI-47-187, STEAM SEAL SUP PRESS [1-M-2].
	BOP	7. **CHECK** cooling tower basin level NORMAL (164-E, DARK [1-M-15]).
	BOP	8. **CHECK** condenser air in-leakage less than 30 SCFM [computer point F2700A].
NOTE: Condenser water box ΔT below normal indicates tube fouling or Amertap system failure. ΔT and tube ΔP above normal, indicates tube sheet fouling.		
EXAMINER: At this point in AOI-11,"Loss of Condenser Vacuum," the vacuum leak will worsen, requiring a reactor trip to be initiated. After the trip, entry conditions for FR-H.1, "Loss of Secondary Heat Sink," will be reached.		

Op Test No.:	NRC	Scenario #	3	Event #	6	Page	24	of	34

Event Description: 1B-B Motor Driven Auxiliary Feedwater pump trips on instantaneous overcurrent due to bearing wear. Turbine Driven AFW pump is air bound. Pump will be returned to operable status when the crew has implemented FR-H.1, "Loss of Secondary Heat Sink," initiated venting the pump.

Time	Position	Applicant's Actions or Behavior

E-0 — **The following actions are taken from E-0, "Reactor Trip or Safety Injection."**

NOTE

Steps 1 thru 4 are **IMMEDIATE ACTION STEPS.**

Status Trees / SPDS should be monitored when transitioned to another instruction.

Time	Position	Applicant's Actions or Behavior
	RO	1. **ENSURE** reactor trip: • Reactor trip and bypass breakers OPEN. ***RO checks 1-52RTB, RX TRIP BKR A RED indicating light LIT on panel 1-M-4.*** ***RO checks 1-52RTB, RC TRIP BKR B RED indicating light LIT on panel 1-M-4*** ***RO checks 1-52BYA, BYPASS BKR A lights DARK*** ***RO checks 1-52BYB, BYPASS BKR B lights dark*** • RPIs at bottom of scale. ***RO observes 1-MON 85 5000/1 CERPI Monitor 1 and 1-MON-85 5000/2 CERPI MONITOR 2 for indication that all SHUTDOWN and CONTROL bank rods are inserted.*** • Neutron flux DROPPING. ***RO observes neutron flux trending down on 1-NR-92-145, NEUTRON FLUX LEVEL RECORDER. May also observe levels decreasing on 1-NI-92-135A, CH I NEUTRON MON % PWR, and 1-NI-92-136A, CH II NEUTRON MON % PWR.***
	RO	2. **ENSURE** Turbine Trip: • All turbine stop valves CLOSED. ***RO observes that indicating lights on 1-XX-47-1000 EHC CONTROL for individual throttle and governor valves are GREEN.***
	RO	3. **CHECK** 6.9 kV shutdown boards: a. At least one board energized from: • CSST (offsite), OR • D/G (blackout). ***When observed by the RO during IMMEDIATE OPERATOR ACTIONS, both shutdown boards are energized, based on 1-EI-57-39, 6.9 SDB 1A-A VOLTS indicating approximately 7000 volts and 1-EI-57-66, 6.9 SDB 1B-B VOLTS indicating approximately 7000 volts.***

Op Test No.:	NRC	Scenario #	3	Event #	6	Page	25	of 34

Event Description: 1B-B Motor Driven Auxiliary Feedwater pump trips on instantaneous overcurrent due to bearing wear. Turbine Driven AFW pump is air bound. Pump will be returned to operable status when the crew has implemented FR-H.1, "Loss of Secondary Heat Sink," initiated venting the pump.

Time	Position	Applicant's Actions or Behavior
	RO	4. **CHECK** SI actuated: a. Any SI annunciator LIT. b. Both trains SI **ACTUATED**. • 1-XX-55-6C • 1-XX-55-6D
	RO	**4. <u>RESPONSE NOT OBTAINED:</u>** **DETERMINE** if SI required: a. **IF** ANY of the following exists: • S/G press less than 675 psig, OR • RCS press less than 1870 psig, OR • Cntmt press greater than 1.5 psig **THEN ACTUATE** SI manually. **IF** SI **NOT** required, **THEN GO TO** ES-0.1, Reactor Trip Response. ***SRO determines that conditions do not require a Safety Injection and transitions to ES-0.1, "Reactor Trip Response."***

Op Test No.:	NRC	Scenario #	3	Event #	6	Page	26 of 34

Event Description: 1B-B Motor Driven Auxiliary Feedwater pump trips on instantaneous overcurrent due to bearing wear. Turbine Driven AFW pump is air bound. Pump will be returned to operable status when the crew has implemented FR-H.1, "Loss of Secondary Heat Sink," initiated venting the pump.

Time	Position	Applicant's Actions or Behavior

ES-0.1 **The following steps are taken from ES-0.1, "REACTOR TRIP RESPONSE."**

CAUTION

Plant conditions, AFW pump start signals and flow requirements should be evaluated as time allows.

Time	Position	Applicant's Actions or Behavior
	SRO	1. **MONITOR** SI actuation criteria: • **IF** SI actuation occurs during the performance of this Instruction, **THEN ** GO TO** E-0, Reactor Trip or Safety Injection.
	BOP	2. **CHECK** Generator PCBs OPEN.
	RO	3. **MONITOR** RCS temperature stable at or trending to 557°F using: • RCS Loop T-avg with any RCP running. OR • RCS Loop T-cold with RCPs out-of-service.
	BOP	4. **ENSURE** AFW operation: a. AFW established: • Both MD AFW pumps RUNNING. • TD AFW pump RUNNING. • LCVs in AUTO or controlled in MANUAL.
	SRO/BOP	a. **RESPONSE NOT OBTAINED** **ESTABLISH** feed flow from AFW or MFW as necessary. ***Determines that AFW flow is not established, and that due to the loss of condenser vacuum that MFW cannot be restored.***
	BOP	b. Heat sink available: • Total feed flow greater than 410 gpm, **OR** • At least one S/G NR level greater than 29%.
	SRO	b. **RESPONSE NOT OBTAINED** **IF** heat sink can **NOT** be established, **THEN ** GO TO** FR-H.1, Loss Of Secondary Heat Sink.

Op Test No.: NRC	Scenario # 3	Event # 6	Page 27 of 34

Event Description: 1B-B Motor Driven Auxiliary Feedwater pump trips on instantaneous overcurrent due to bearing wear. Turbine Driven AFW pump is air bound. Pump will be returned to operable status when the crew has implemented FR-H.1, "Loss of Secondary Heat Sink," initiated venting the pump.

Time	Position	Applicant's Actions or Behavior

FR-H.1 — **The following steps are taken from FR-H.1, "Loss Of Secondary Heat Sink."**

CAUTION

- **If total feed flow CAPABILITY of 410 gpm is available, this Instruction should NOT be performed.**
- **If an Intact S/G is available, feed flow should NOT be reestablished to any faulted S/G.**

Time	Position	Applicant's Actions or Behavior
	SRO	1. **CHECK** if secondary heat sink is required: a. RCS pressure greater than any Intact S/G pressure. b. RCS temperature greater than 375°F [360°F ADV].
	SRO	2. **ENSURE** at least one charging pump RUNNING.

CAUTION

RCS bleed and feed criteria must be monitored for immediate response if the criteria is exceeded.

Time	Position	Applicant's Actions or Behavior
	SRO	3. **DETERMINE** if RCS bleed and feed required: a. **CHECK** RCS bleed and feed required: • Any THREE S/G WR levels less than or equal to 26% [36% ADV]. OR • RCS pressure greater than or equal to 2335 psig.

EXAMINER: The following RESPONSE NOT OBTAINED step is included here since conditions are not expected to require feed and bleed actions at this point.

Time	Position	Applicant's Actions or Behavior
	SRO	3.a. **RESPONSE NOT OBTAINED** a. **MONITOR** RCS bleed and feed criteria: **WHEN** criteria are met, **THEN PERFORM** Substep 3b. **GO TO** step 4.

EXAMINER: If/when conditions degrade to the point that feed and bleed criteria are met, the crew will return to Step 3.b, and complete the actions of Step 3.b. Feed and bleed actions are contained on pages 32-33.

Time	Position	Applicant's Actions or Behavior
		3. **DETERMINE** if RCS bleed and feed required: b. **STOP** all RCPs, **AND** ** **GO TO** Cautions prior to Step 18 to initiate RCS bleed and feed.
	BOP	4. **ENSURE** S/G blowdown ISOLATED.
	BOP	5. **MONITOR** CST volume greater than 200,000 gal.

Op Test No.:	NRC	Scenario #	3	Event #	6	Page	28 of 34

Event Description: 1B-B Motor Driven Auxiliary Feedwater pump trips on instantaneous overcurrent due to bearing wear. Turbine Driven AFW pump is air bound. Pump will be returned to operable status when the crew has implemented FR-H.1, "Loss of Secondary Heat Sink," initiated venting the pump.

Time	Position	Applicant's Actions or Behavior
		NOTE If the use of condensate flow is anticipated, then a higher pzr level will better accommodate the level shrink from S/G cooldown and depressurization.
	RO	6. **CONTROL** pzr level between 29% and 63% [47% and 58% ADV].
	BOP	7. **ESTABLISH** MD AFW pump flow: ***When contacted as the Control Building AUO, the Console Operator will acknowledge the request to check the 1B-B Motor Driven AFW Pump breaker for cause of the trip. Reports back that the breaker tripped on instantaneous overcurrent.*** ***When contacted as the Auxiliary Building AUO, the Console Operator will acknowledge request to check condition of the 1B-B AFW pump. Reports that the pump motor has scorch marks and there is the smell of burnt insulation around the motor. There is no smoke or fire.***
	BOP	8. **ESTABLISH** TD AFW pump flow: ***When contacted as the Auxiliary Building AUO, the Console Operator will report that the TDAFW pump is steam bound.*** ***If requested to vent the TD AFW pump report that the AUO is standing by with a copy of SOI-3.02, "Auxiliary Feedwater System," Section 8.7, "Venting of AFW Pumps" to vent the TDAFW pump.***
		EXAMINER: Based on reports from the field, the TDAFW pump is steam bound. The crew will request venting of the TDAFW pump. Approximately 3 minutes after the crew implements Step 9, the TDAFW, the Console Operator will remove malfunction fw22c and the Aux Building (or other assigned AUO) will report back to the control room that venting was successful. The applicants will then return to and implement actions of Step 8.
		CRITICAL TASK: **Stop Reactor Coolant pumps in FR-H.1 prior to SG dryout.**
	RO	9. **STOP** all four RCPs. ***RO places all 4 Reactor Coolant pump switches to stop when required by FR-H.1.***
	BOP	10. **IF** Secondary pumps will be used to feed S/Gs, **THEN REFER TO** Appendix A (FR-H.1), Establishing MFW following Reactor Trip, while continuing this Instruction.

Op Test No.:	NRC	Scenario #	3	Event #	6	Page	29	of 34

Event Description: 1B-B Motor Driven Auxiliary Feedwater pump trips on instantaneous overcurrent due to bearing wear. Turbine Driven AFW pump is air bound. Pump will be returned to operable status when the crew has implemented FR-H.1, "Loss of Secondary Heat Sink," initiated venting the pump.

Time	Position	Applicant's Actions or Behavior
CAUTION **• If offsite power is lost after SI reset, manual action will be required to restart the SI pumps and RHR pumps due to loss of SI start signal.** **• If plant conditions degrade after automatic SI is blocked, manual actuation may be required.**		
NOTE After the low steamline pressure SI signal is blocked, main steamline isolation will occur if the high steam pressure rate setpoint is exceeded.		
	RO	11. **BLOCK** SI signals: a. **INITIATE** RCS depressurization to less than 1912 psig: **IF** letdown in service, **THEN ALIGN** aux spray USING Appendix B (FR-H.1), ALIGN AUX SPRAY. b. **BLOCK** auto SI actuation signals [68-B], and [69-B]: 1) **NOTIFY** IMs to block auto SI USING IMI-99.040, AUTO SI Block. 2) **WHEN** RCS pressure is less than 1962 psig (P-11), **THEN** • **BLOCK** low pzr pressure SI. • **BLOCK** low steam pressure SI. c. **ENSURE** high cntmt pressure SI signal CLEARED [78-G]. d. **CHECK** SI actuated. e. **RESET** SI, **AND CHECK** the following: • SI ACTUATED permissive DARK. • AUTO SI BLOCKED permissive LIT. f. **MAINTAIN** RCS pressure less than 1912 psig.
EXAMINER: The following steps are taken from FR-H.1, "LOSS OF SECONDARY HEAT SINK," Appendix B, "Align Aux Spray." The applicants may be performing this step when the report is received from the field that the TDAFW Pump venting was successful, or may encounter conditions requiring establishment of feed and bleed.		
	RO	1. **ENSURE** at least one charging pump running.
	RO	2. **IF** charging is not aligned, **THEN ALIGN** charging: a) **CLOSE** RCP seal flow control 1-FCV-62-89. b) **OPEN** charging isolation 1-FCV-62-90 and 1-FCV-62-91. c) **ENSURE** charging 1-FCV-62-85 or 1-FCV-62-86 OPEN.
CAUTION **If RCS is on cold leg recirc, seal return isolation valves should not be opened (prevents sump inventory from diverting to VCT).**		

Op Test No.:	NRC	Scenario #	3	Event #	6	Page	30	of 34

Event Description: 1B-B Motor Driven Auxiliary Feedwater pump trips on instantaneous overcurrent due to bearing wear. Turbine Driven AFW pump is air bound. Pump will be returned to operable status when the crew has implemented FR-H.1, "Loss of Secondary Heat Sink," initiated venting the pump.

Time	Position	Applicant's Actions or Behavior
		d) **OPEN** seal return 1-FCV-62-61 and 1-FCV-62-63.
	RO	3. **ENSURE** BIT outlet valves 1-FCV-63-25 AND 1-FCV-63-26 CLOSED.
NOTE Aux spray flow can be maximized by closing the normal pzr spray valve(s).		
	RO	4. **CONTROL** aux spray flow: a) **OPEN** aux spray 1-FCV-62-84. b) **CLOSE** charging 1-FCV-62-85 and 1-FCV-62-86. c) **MODULATE** Pzr Spray valves as needed to control Pzr pressure. d) **ADJUST** aux spray flow rate with 1-FCV-62-93 and 1-FCV-62-89 as needed.
NOTE • Cycling reactor trip breakers to allow MFW Isolation reset is required if SI, HI-HI S/G level, or Valve Vault Room Flooding has occurred. • If any valid SI signal has occurred since SI reset, cycling reactor trip breakers will initiate SI.		
EXAMINER: Since condenser vacuum cannot be established, the SRO may state that the following steps cannot be accomplished and continue through the procedure.		
	BOP	12. **PREPARE** for MFW startup: a. **PLACE** MFW pump controllers in MANUAL, **AND SET** to zero. b. **PLACE** MFW reg valve controllers in MANUAL, **AND SET** to zero. c. **PLACE** MFW reg bypass valve controllers in MANUAL, **AND SET** to zero. d. **CHECK** FW bypass isolation valves OPEN.
NOTE If the standby feed pump will be used, only the hotwell pumps should be started to prevent an overpressure condition.		
	BOP	13. **ESTABLISH** feedwater flow: a. **START** secondary plant pumps as necessary: 1) Hotwell pumps. 2) Condensate booster pumps. 3) Cond DI booster pumps. b. **CHECK** MSIVs OPEN. c. **ESTABLISH** MFW pump flow: 1) **START** MFW pump turbine or standby feed pump. 2) **CONTROL** MFW pump and bypass reg valve(s) to restore S/G level(s).

Op Test No.: NRC Scenario # 3 Event # 6

Event Description: 1B-B Motor Driven Auxiliary Feedwater pump trips on instantaneous overcurrent due to bearing wear. Turbine Driven AFW pump is air bound. Pump will be returned to operable status when the crew has implemented FR-H.1, "Loss of Secondary Heat Sink," initiated venting the pump.

Time	Position	Applicant's Actions or Behavior
	SRO	14. **CHECK** secondary heat sink restored: a. NR level in at least one S/G greater than 29% [39% ADV].
	SRO	14. **RESPONSE NOT OBTAINED:** a. IF feed flow established to at least one S/G: • S/G Wide Range level rising, OR • Incore T/C dropping. **THEN MAINTAIN** flow to restore NR level to greater than 29% [39% ADV]. IF feed flow NOT established to at least one S/G, THEN ** **GO TO** Step 15.
	BOP	15. **ESTABLISH** condensate flow: a. **ENSURE** condensate aligned to S/Gs: 1) **OPEN** MFW pump bypass valve 1-FCV-3-86. 2) **THROTTLE OPEN** bypass reg valves. b. **DEPRESSURIZE** at least one S/G at maximum rate (25% demand) USING steam dump to condenser UNTIL condensate flow established. c. **WHEN** condensate flow is established, **THEN STOP** S/G depressurization **AND MAINTAIN** S/G press (using steam dump or PORV) low enough to ensure condensate flow is maintained.
	BOP	16. **CHECK** secondary heat sink restored: a. NR level in at least one S/G greater than 29% [39% ADV] a. **IF** feed flow established to at least one S/G, • S/G Wide Range level rising, **OR** • Incore T/C dropping. **THEN MAINTAIN** flow to restore NR level to greater than 29% [39% ADV]. **IF** feed flow **NOT** established to at least one S/G, **THEN** ** **GO TO** Step 17. b. **RETURN TO** Instruction in effect.
	BOP	17. **DETERMINE** if RCS bleed and feed required: a. **MONITOR** RCS bleed and feed criteria: • Any THREE S/G WR levels less than or equal to 26% [36% ADV]. **OR** • RCS pressure greater than or equal to 2335 psig.

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Event Description: 1B-B Motor Driven Auxiliary Feedwater pump trips on instantaneous overcurrent due to bearing wear. Turbine Driven AFW pump is air bound. Pump will be returned to operable status when the crew has implemented FR-H.1, "Loss of Secondary Heat Sink," initiated venting the pump.

Time	Position	Applicant's Actions or Behavior
		CAUTION • Step 18 Through 20 must be performed quickly in order to establish RCS heat removal by RCS bleed and feed. • Termination of bleed and feed is required prior to transitioning out of FR-H.1 when heat sink is restored.
	RO	18. **ACTUATE** SI.
	RO	19. **ENSURE** at least one of the following RCS feed paths: • At least one charging pump injecting thru BIT, **OR** • At least one SI Pump running with its injection valves open.
		CAUTION • When the reactor vessel head vent block valve is opened, the throttle valve will cycle open and closed. • Slowly opening (5 seconds stroke time) the head vent valve will prevent water hammer and pipe damage.
	RO	20. **ENSURE** adequate RCS bleed path: a. **ENSURE** all pzr PORVs and pzr PORV block valves OPEN.
		EXAMINER: Approximately 3 minutes after the crew implements Step 9, the TDAFW, the Console Operator will remove malfunction fw22c and the Aux Building (or other assigned AUO) will report back to the control room that venting was successful. The applicants will then return to Step 8 to begin feeding SGs with the TDAFW pump. The actions of Step 8 are contained on page 34.
		CAUTION WHEN feedwater source is AVAILABLE, THEN feed rate will be controlled by Steps 30 and 31.
		NOTE The details of Steps 4 through 15 may be referred to as necessary to establish feed flow in the following step but procedure performance must continue to terminate RCS bleed and feed.
	RO	21. **RESET** SI, **AND CHECK** the following: • SI ACTUATED permissive DARK. • AUTO SI BLOCKED permissive LIT.
	BOP	22. **RESET** Containment Isolation Phase A and Phase B.

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Event Description: 1B-B Motor Driven Auxiliary Feedwater pump trips on instantaneous overcurrent due to bearing wear. Turbine Driven AFW pump is air bound. Pump will be returned to operable status when the crew has implemented FR-H.1, "Loss of Secondary Heat Sink," initiated venting the pump.

Time	Position	Applicant's Actions or Behavior
	BOP	23. **ENSURE** cntmt air in service: a. Aux air press greater than 75 psig [M-15]. b. Cntmt air supply valves OPEN [M-15]: • 1-FCV-32-80. • 1-FCV-32-102. • 1-FCV-32-110.
		24. **PERFORM** Steps 1 through 6 of E-0, REACTOR TRIP OR SAFETY INJECTION, while continuing with this Instruction.
		25. **MAINTAIN** RCS bleed and feed paths: • **MAINTAIN** charging pump injection thru BIT. • **MAINTAIN** SI pump flow. • **MAINTAIN** both pzr PORVs and block valves OPEN.

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Event Description: 1B-B Motor Driven Auxiliary Feedwater pump trips on instantaneous overcurrent due to bearing wear. Turbine Driven AFW pump is air bound. Pump will be returned to operable status when the crew has implemented FR-H.1, "Loss of Secondary Heat Sink," initiated venting the pump.

Time	Position	Applicant's Actions or Behavior

EXAMINER: The following contains the actions of FR-H.1, "Loss of Secondary Coolant," Step 8. These actions will be taken by the crew after the TDAFW pump has been vented.

CRITICAL TASK:

Initiate actions to establish the minimum required feedwater flow rate to the SGs before SG dryout.

Time	Position	Applicant's Actions or Behavior
	BOP	8. **ESTABLISH** TD AFW pump flow: a. **CHECK** TD AFW pump AVAILABLE. ***SRO receives report from the AUO and determines that the TD AFW pump is now available.*** b. **ENSURE** turbine steam supply valves OPEN: • Either 1-FCV-1-15 or 1-FCV-1-16. ***BOP determines either 1-HS-1-15A, SG 1 STEAM SUPPLY TO T-D AFW PMP GREEN indicating light is DARK, RED indicating light is DARK or 1-HS-1-16A, SG 4 STEAM SUPPLY TO T-D AFW PMP GREEN indicating light is DARK, RED indicating light is DARK*** • 1-FCV-1-17 and 1-FCV-1-18 ***BOP determines that both 1-HS-1-17A, STEAM HDR TO T-D AFW PMP, GREEN indicating light is DARK, RED indicating light is DARK or both 1-HS-1-18A, STEAM HDR TO T-D AFW PMP, GREEN indicating light is DARK, GREEN indicating light is DARK, RED indicating light is DARK.*** • Trip and throttle valve. After receiving the c. **ENSURE** TD AFW LCVs OPEN. d. **CHECK** TD AFW pump speed NORMAL. e. **CHECK** TD AFW pump flow greater than 410 gpm.

EXAMINER: After AFW flow is established, TERMINATE the scenario.

END OF SCENARIO

Scenario 3
Attachment 1

SOI-85.01, "Control Rod Drive And Indication System."

Section 5.6, "Manual Rod Control With Reactor At Power."

Date ________ **Initials**

5.6 Manual Rod Control With Reactor At Power

NOTE

The manipulation of Control Rod position to maintain required parameter(s) is a continuous action by a Licensed Reactor Operator. The following is exempt from the "Continuous Use" requirements of SPP-2.2.

[1] **ENSURE** ROD BANK SELECT SWITCH (1-RBSS) in MANUAL. ________

[2] **POSITION** Control Rods as necessary to maintain Tavg with Tref using 1-FLRM, IN-HOLD-OUT SWITCH (maximum Tavg-Tref deviation < 3.0°F). ________

[3] **WHEN** AUTOMATIC Rod control is desired, **THEN**

ENSURE Tavg is within 1.0°F of Tref to avoid immediate rod movement on transfer. ________

CAUTION

Allowing at least 5 minutes between any rod control input (i.e., T-avg, T-ref, or NIS) change and placing rods in AUTO, will help prevent undesired control rod movement.

[4] **ENSURE** zero demand on control rod position indication [1-M-4]. ________

[5] **PLACE** ROD BANK SELECT SWITCH (1-RBSS) in AUTO. ________

[6] **WHEN** Rod Control is in AUTO, **THEN**

ENSURE the following: ________

A. Tavg and Tref within +/- 1.5°F ________

B. Step counters and RPIs within 12 steps ________

C. Bank Overlap maintained ________

D. Power distribution within limits, AFD/QPTR ________

SHIFT TURNOVER CHECKLIST
Page 1 of 2

SHIFT TURNOVER CHECKLIST

Page 1 of 1

- ☐ SM
- ☒ US/MCR Unit 1
- ☐ UO Unit ____
- ☐ AUO Station ____
- ☐ STA (STA Function)

____________________ Off-going - Name

____________________ On-coming - Name

Part 1 - Completed by off-going shift / Reviewed by on-coming shift: RCS Cb = 747 ppm

- Abnormal equipment lineup / conditions:
  1A-A Motor Driven Auxiliary Feedwater pump is out of service for pump impeller repairs. LCO 3.7.5.b was entered 4 hours ago. Expected return to service is in 36 hours. The 1C Condensate Booster Pump needs to be removed from service for repairs. A Severe Thunderstorm Warning has been issued for Rhea, Meigs, and McMinn Counties for the next 2 hours.

- SI/Test in progress/planned: (including need for conduct of evolution briefings)

- Major Activities/Procedures in progress/planned:
  Following turnover, reduce power to 95% to remove 1C Condensate Booster Pump from service. Power is currently 100%. Control Bank D rods are at 220 steps. Train A/Channel I Work Week. A Reactivity Plan has been provided by Reactor Engineering. Chemistry has requested that letdown flow be maintained at 75 gpm during the power reduction.

-
- Radiological changes in plant during shift:

Part 2 - Completed by on-coming shift prior to assuming duties

- ☐ Review station rounds / Abnormal reading (AUOs only)
- ☐ Review Narrative Logs (previous day and carry-over items)
- ☐ Current qualification status
- ☐ Review the current controlling Reactivity Management Plans (N/A for AUOs)
- ☐ Review current TS/TRM/ODCM/FPR Required Actions (N/A for AUOs)
- ☐ Walkdown MCR Control Boards with off-going Operator (N/A for AUOs, as applicable for SM/STAs)
- ☐ SR/PER reviews complete for previous shift (SM/US/STA)

Relief Time: ____________ Relief Date: ____________

Part 3 - Completed by on-coming shift. These items may be reviewed after assuming duties:

- ☐ Review Operator Workarounds, Burdens and Challenges (applicable Unit/Station)
- ☐ Review applicable ODMI actions (first shift of shift week)
- ☐ Review changes in Standing / Shift Orders (since last shift worked)
- ☐ Review changes to TACFs issued (since last shift worked) (N/A for AUOs)
- ☐ Review Control Room Deficiencies (first shift of shift week) (N/A for AUOs)
- ☐ Review Component Deviation Log (N/A for AUOs)

SHIFT TURNOVER CHECKLIST
Page 1 of 2

SHIFT TURNOVER CHECKLIST

Page 1 of 1

- ☐ SM
- ☐ US/MCR Unit 1
- ☒ UO Unit
- ☐ AUO Station
- ☐ STA (STA Function)

Off-going - Name

On-coming - Name

Part 1 - Completed by off-going shift / Reviewed by on-coming shift: RCS Cb = 747 ppm

- Abnormal equipment lineup / conditions:
  1A-A Motor Driven Auxiliary Feedwater pump is out of service for pump impeller repairs. LCO 3.7.5.b was entered 4 hours ago. Expected return to service is in 36 hours. The 1C Condensate Booster Pump needs to be removed from service for repairs. A Severe Thunderstorm Warning has been issued for Rhea, Meigs, and McMinn Counties for the next 2 hours.
- SI/Test in progress/planned: (including need for conduct of evolution briefings)
- Major Activities/Procedures in progress/planned:
  Following turnover, reduce power to 95% to remove 1C Condensate Booster Pump from service. Power is currently 100%. Control Bank D rods are at 220 steps. Train A/Channel I Work Week. A Reactivity Plan has been provided by Reactor Engineering. Chemistry has requested that letdown flow be maintained at 75 gpm during the power reduction.
-
- Radiological changes in plant during shift:

Part 2 - Completed by on-coming shift prior to assuming duties

- ☐ Review station rounds / Abnormal reading (AUOs only)
- ☐ Review Narrative Logs (previous day and carry-over items)
- ☐ Current qualification status
- ☐ Review the current controlling Reactivity Management Plans (N/A for AUOs)
- ☐ Review current TS/TRM/ODCM/FPR Required Actions (N/A for AUOs)
- ☐ Walkdown MCR Control Boards with off-going Operator (N/A for AUOs, as applicable for SM/STAs)
- ☐ SR/PER reviews complete for previous shift (SM/US/STA)

Relief Time: ____________ Relief Date: ____________

Part 3 - Completed by on-coming shift. These items may be reviewed after assuming duties:

- ☐ Review Operator Workarounds, Burdens and Challenges (applicable Unit/Station)
- ☐ Review applicable ODMI actions (first shift of shift week)
- ☐ Review changes in Standing / Shift Orders (since last shift worked)
- ☐ Review changes to TACFs issued (since last shift worked) (N/A for AUOs)
- ☐ Review Control Room Deficiencies (first shift of shift week) (N/A for AUOs)
- ☐ Review Component Deviation Log (N/A for AUOs)

TVA

Watts Bar Nuclear Plant

Unit 1

General Operating Instructions

GO-4

Normal Power Operation

Revision 0060

Quality Related

Level of Use: Continuous Use

Effective Date: 02-16-2011

Responsible Organization: OPS, Operations

Prepared By: Scott Garner

Approved By: Brian McIlnay

Revision Log

Rev or Change Number	Effective Date	Affected Page Numbers	Description of Revision/Change
54	02/22/10	2, 7	Added precaution to give guidance on TRO notification requirements. (SERC Mitigation Plan)
55	03/09/10	2, 7, 8, 13	Added additional precautions from SERC Mitigation Plan.
56	05/06/10	2, 25	Non-intent change. Added chemistry hold at 50% IAW CM-1.02 Rev 9, Secondary Chemistry Strategic Plan.
57	08/25/10	2, 6-8, 10, 15, 16, 18, 19, 21, 24-25, 27, 28, 30-33, 35, 36, 39-40, 43-46, 48, 49, 52, 54-56, 58	Changed power level where IMP-OUT is considered based on operator comments and reordered steps accordingly [PER 232422-001]. Added symbol (ρ) prior to actions that directly affect reactivity. Updated Source Note identification, updated SELD notification, added end of section steps, and made minor editorial changes IAW with Writers Guide, procedure upgrades IAW ODM-23.
58	09/24/10	2, 5, 19, 22, 46, 49, 50	Added startup of #3 HD Tank to the 40-45% power level. Moved shutdown of #3 HD Tank pumps and bypass of tank to 40% power level. Consolidated notes as a result of changes. This is interim action for PER244876. Added verification of runback light prior to stopping first #3 HDT pump based on existing note. Updated SPP titles.
59	11/17/10	2, 22	Revised start of #3 HDT pumping forward to place two pumps in service.
60	02/16/11	2, 11, 13, 18, 20, 28, 31, 33, 34, 36, 41, 51, 54, 56, 58	Minor/editorial change: Added note to P&L and prior to each power acension step concerning #1 bearing higher than normal temperature. [PER 293256] Added end of section notices and updated shop names.

Table of Contents

1.0 INTRODUCTION

1.1 Purpose

This instruction provides actions to perform power ascension from 30% to 100% Reactor power, power reduction from 100% to 30% Reactor power, and power coast down operations.

1.2 Scope

This GO contains the following operations:

5.1 General

5.2 Unit Startup from 30% to 100% Reactor Power

5.3 Unit Shutdown from 100% to 30% Reactor Power

5.4 Power Coastdown at End of Life (EOL)

5.5 Frequency Variation Response

2.0 REFERENCES

2.1 Performance References

A. CM-3.01, System Chemistry Specifications

B. CM-5.02, Hideout Return Sampling and Analysis

C. GO-5, Unit Shutdown from 30% Reactor Power to Hot Standby

D. 0-SI-0-3, Weekly Log

E. 1-PI-OPS-1-MCR, Plant Instruction - Main Control Room

F. 1-SI-0-20, Hot Channel Factor Determination

G. 1-SI-0-21, Excore QPTR

H. 1-SI-68-28, Primary Radiochemistry Requirements

I. 1-SI-68-30, Reactor Coolant System Total Flow Measurement Using Elbow Tap Differential Pressures

J. 1-SI-92-1, NIS Daily Comparison

2.1 Performance References (continued)

K. 1-SI-92-5, Hourly Axial Flux Difference Inspection

L. SOI-2 & 3.01, Condensate And Feedwater System

M. SOI-5 & 6.01, Extraction Steam, Heater Drains, and Vent System

N. SOI-27.01, Condenser Circulating Water System

O. SOI-44.01, HTHW Building Heating System

P. SOI-47.02, Turbo-Generator Startup Operation

Q. SOI-58.01, Bus Duct Cooling System

R. NPG-SPP-01.2, Administration of Site Technical Procedures

S. Nuclear Operating Book

T. TI-45, Determination of Preconditioned Reactor Power

U. AOI-17.0, Turbine Trip

V. E-0, Reactor Trip or Safety Injection

2.2 Developmental References

A. WBN Technical Specifications

B. GOI-7, Generic Equipment Operating Guidelines

C. SPP-10.4, Reactivity Management Program

D. Westinghouse Nuclear Fuel Division, MFRD-01-222, Limitations and Conditions for Westinghouse Fuel Operations, Revision 6, Dated January 2002 (RIMS L36020111801).

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

3.0 PRECAUTIONS AND LIMITATIONS

3.1 PRECAUTIONS

NOTES

1) If a precaution cannot be complied with, the SM shall initial, date, and write a brief explanation of why the precaution could **NOT** be complied with. Precautions that contain must, shall, or will, must be adhered to.

A. During changes in Reactor power, all rod position indicators (RPIs), Step Counters, and NIS should be periodically monitored for the following conditions: [C.6]

1. Correct Power Distribution
2. Quadrant Power Tilts
3. Rod Insertion
4. Rod misalignment
5. Inoperable RPIs
6. Inoperable rods.

B. Plant Instruction 1-PI-OPS-1-MCR is applicable at all times and, during changes in reactor power, additional emphasis should be given to indication of reactor thermal power level using the guidance given in 1-PI-OPS-1-MCR. [C.8]

C. Maximum Pzr-RCS C_B difference is 50 ppm and is maintained by use of Pzr heaters and spray.

D. If a Turbine load rise is blocked by the Load Limiter, load must be reduced by using the load reference setter until the VALVE POS LIMIT light is out, then the load limiter setpoint raised using caution to observe that load does not change, then load rise may be resumed.

3.1 PRECAUTIONS (continued)

E. Turbine is normally operated in IMP OUT control below 30% turbine load. IMP IN operation above 30% turbine load is permissible as long as the unit remains stable (e.g. no instabilities due to IMP IN operation.)

F. Full flow Cond DI polishing is maintained during power ascension if system parameters allow.

G. During operation above 50% power, every effort must be made to maintain condenser air in-leakage less than 5 cfm.

H. After refueling, NIS indications may be inaccurate until calibrated at higher power levels. NIS calibration procedures will adjust PRM trip setpoints lower than normal to ensure excore detectors protect against an overpower condition.

I. Reactor Engineering should be contacted for guidance on core operating recommendations during unusual power maneuvers at End of Life (EOL).

J. To ensure that NIS reactor power level indications remain within 0 to 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 (i.e., the performance of 1-SI-92-1.) This power level check does not preclude the operating crews from making prompt changes in response to changing plant conditions or needs. Applicable ICS computer point(s) should be used as an indication of true reactor power when greater than 30% power. [C.7]

K. When reducing power for compliance to LCO 3.7.1, Reactor Engineering shall be notified to revise neutron flux high reactor trip set points to a value less than or equal to the applicable value specified in Tech Spec Table 3.7.1-1.

L. Drift of governor valve position has been experienced while the valve position limiter (VPL) was on the governor controller. VPL light (on 1-XX-47-2000) has been LIT and has extinguished without operator action. [C.10]

M. In Mode 1, entry into Tech Spec 3.3.2 condition J may be suspended for up to 4 hours when placing the second Turbine Driven Main Feedwater Pump (TDMFWP) in service or removing one of two Turbine Driven Main Feedwater Pumps (TDMFWP) from service. Refer to Tech Spec 3.3.2 table 3.3.2-1.

N. Operation of main generator without automatic voltage control could impact grid voltage requirements. The Transmission Operator (SELD) and Operations Duty Specialist (ODS) should be notified within 30 minutes if the generator is in service without automatic voltage regulator.

O. Main Generator operation without Automatic Voltage control requires that Narrative Log entries be made (time, date, reason & duration)..

3.1 PRECAUTIONS (continued)

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

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

R. 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.

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

T. Plant operations shall immediately inform the BA or TO of the inability to perform directives so that the TVA Reliability Entities may implement alternate remedial actions.

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

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

1. 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.

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

3. 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.

V. The Greek symbol (ρ) denotes those steps with actions that directly affect reactivity.

3.2 LIMITATIONS

A. Turbine loading rates are obtained per SOI-47.02.

B. "Pre-conditioned" power levels and maximum allowable rates of power changes are specified by TI-45, "Determination of Preconditioned Reactor Power".

C. If power is reduced, TI-45, Determination of Preconditioned Reactor Power, should be consulted for applicable restrictions.

D. Declared fuel defects as determined by the Fuel Reliability Assessment Team or Shift Manager, have more limiting ramp rates as specified by TI-45.

E. Mode 1, greater than or equal to 50% Reactor power, the indicated Axial Flux Difference (AFD) shall be maintained within the acceptable operating region of Nuclear Operating Book (NOB), Sheet A-1, Target Band vs. Power Level (TS 3.2.3).

F. Mode 1, greater than or equal to 50% Reactor power and AFD monitor Alarm inoperable, AFD must be logged every hour by initiating 1-SI-92-5 (SR 3.2.3.1).

G. Mode 1, greater than 50% Reactor power and the Quadrant Power Tilt Ratio (QPTR) Alarm inoperable, QPTR must be calculated every 12 hours by initiating 1-SI-0-21 (SR 3.2.4.1).

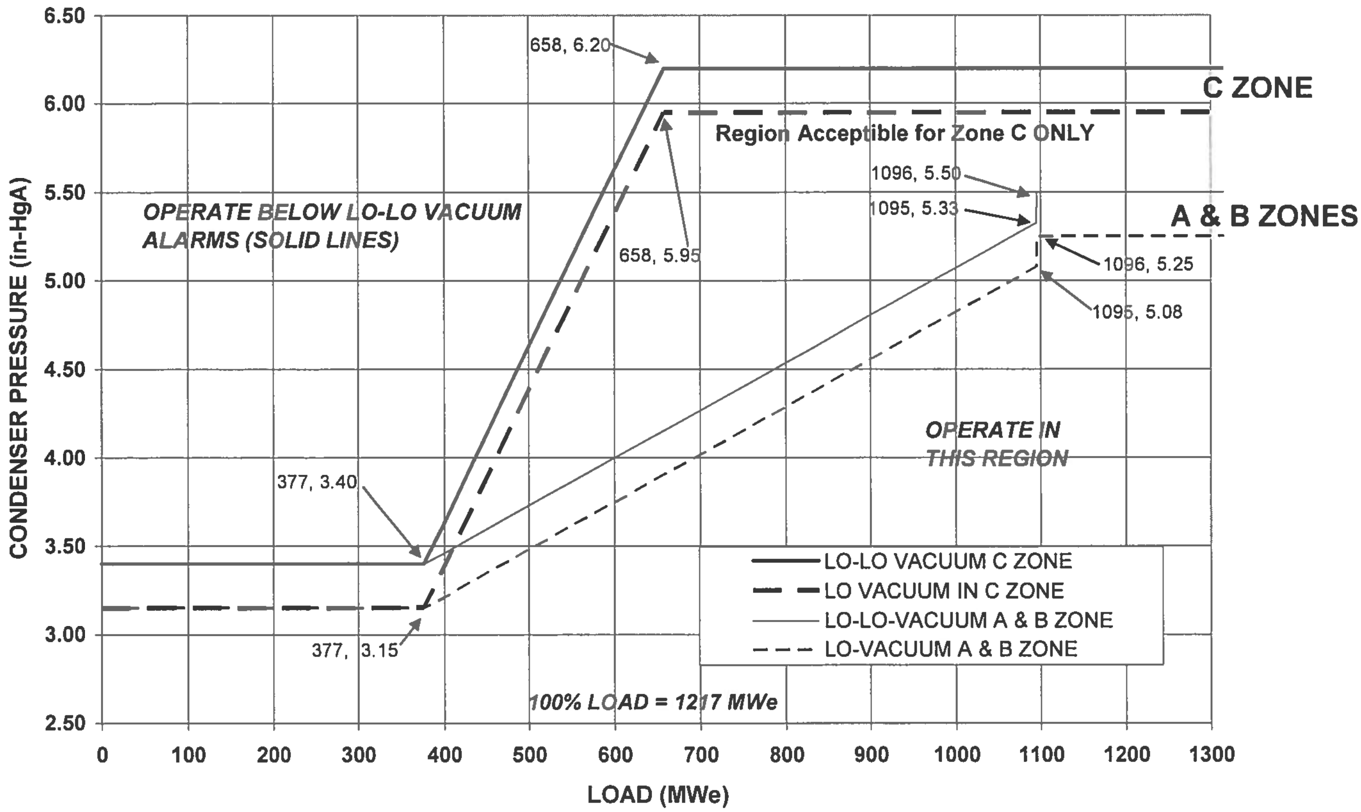
H. For a change in the rated thermal power greater than or equal to 15% in one hour, Chemistry shall check Reactor coolant DE I-131 specific activity by initiating 1-SI-68-28 (SR 3.4.16.2).

I. During power changes, letdown shall be maximized to minimize the risk of Crud Induced Power Shift (CIPS).

3.2 LIMITATIONS (continued)

J. To prevent high vibratory stresses and fatigue damage to the last stage LP Turbine blades, do not operate Turbine, even for brief periods, outside the following limits:

'A & B' and 'C' CONDENSER VACUUM LO-LO AND LO ALARMS



K. Generator may be operated without a bus duct cooler up to 60% Turbine load.

L. Reactor thermal power limits:

1. Reactor thermal power SHALL **NOT** exceed 100% RTP as defined in 1-PI-OPS-1-MCR

2. Plant Instruction 1-PI-OPS-1-MCR provides guidance on monitoring/trending NIS and reactor thermal power. [C.8].

3.2 LIMITATIONS (continued)

M. To support shutdown for refueling - achieving adequate inventory in the BATs is a long lead item that should be considered prior to initiating shutdown.

N. During power ascension, #1 bearing has experienced higher than normal metal temperature but never exceeded the alarm set point. The cause of the elevated temperature is due to the partial arc admission design of the HP turbine and the less than optimal alignment between the HP turbine and the “A” LP turbine. Although this condition is expected, operators should closely monitor #1 bearing metal temperature during power ascensions and take appropriate corrective actions as required. Contact the Predictive Maintenance Group for additional guidance.

Date________ **Initials**

4.0 PREREQUISITES

STARTUP No. ________

NOTES

1) Throughout this Instruction where an IF/THEN statement occurs, the step should be marked N/A if the stated condition does not exist.

2) Prerequisites may be complied in any order. If a prerequisite cannot be complied with, the SM shall initial, date, and write a brief explanation. Prerequisites that contain must, shall, or will, cannot be N/A'd.

3) This instruction may be entered from a partial shutdown or startup, N/A sections **NOT** applicable and annotate reason.

[1] **REVIEW** of Precautions and Limitations Section 3.0 **COMPLETE** ________

[2] Turbine-Generator load between 25% and 28%. ________

[3] T_{AVG} being maintained in the operational band. ________

[4] SG level controls being maintained in AUTO. ________

[5] Holdup Tank AVAILABLE to accommodate RCS letdown. ________

[6] Steam Dump in the T_{AVG} mode. ________

[7] 6.9kV Unit and RCP boards have been transferred to the USSTs. ________

[8] EHC System should be in OPER AUTO (pushbutton LIT). ________

[9] Generator pressurized with H2 per Capability Curve in SOI-47.02. ________

[10] System Load Coordinator has been NOTIFIED. ________

[11] Radiation Protection has been NOTIFIED. ________

[12] Chemistry has been NOTIFIED. ________

Date________ **Initials**

5.0 INSTRUCTIONS

5.1 General

NOTES
1) Section 5 steps must be performed sequentially, unless specifically stated otherwise. Prior SM approval must be obtained to deviate.
2) During normal operation, Radiation Protection should be notified of power changes.

[1] **IF** at End of Life (EOL), and required to initiate power coast down, **THEN**

GO TO Section 5.4, Power Coastdown at End of Life. _________

[2] **IF** performing Startup**, THEN**

ENSURE Section 4.0 Prerequisites COMPLETE. _________

End of Section

Date________ **Initials**

5.2 Unit Startup from 30% to 100% Reactor Power

NOTES

1) After any significant lube oil perturbation (such as a reactor trip or plant startup), it is expected that contaminants in the lube oil system will rise and cause material to be collected in the MTOT strainer and increase the ΔP across the Turbo TOC filters.

2) The following step may be performed anytime after the generator is synchronized to the grid and should be performed as soon as manpower allows. At the Shift Manager's discretion, this step may be N/A'd if the lube oil system was **NOT** shutdown during this outage.

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

4) 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.

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

6) 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.

7) Operation of main generator without automatic voltage control could impact grid voltage requirements. Refer to SOI-47.02 for MVAR limits.

8) Main Generator operation outside of the Voltage Schedule 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.

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

[1] **ENSURE** NAUO performs the following:

[1.1] **INSPECT** the MTOT strainer AND CHANGE basket if necessary. ________

[1.2] **CHECK** the Turbo TOC filters' ΔP AND **IF** any filter(s) need to be changed as required by SOI-20-01, **THEN**

ENSURE WO is initiated to change filter(s) **AND** **ENSURE** maintenance is notified. ________

Date________ **Initials**

5.2 Unit Startup from 30% to 100% Reactor Power (continued)

[2] **CHECK** SG and Feedwater secondary chemistry specifications are WITHIN LIMITS. ________

CAUTION

After refueling, NIS indications may be inaccurate until calibrated at higher power. DO **NOT** raise power greater than 75% until Reactor Engineering ensures power range setpoints have been set to the full power values.

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

ENSURE applicable portions of the PETs are **COMPLETE** for operation greater than 30% power. ________ Rx Engr.

[4] **ENSURE** the remaining pumps are ALIGNED and READY for service: ________

A. Condensate Booster Pumps per SOI-2 & 3.01. ☐

B. Hotwell Pump per SOI-2 & 3.01 ☐

C. #3 HD Pumps per SOI-5 & 6.01 ☐

D. #7 HD Pumps per SOI-5 & 6.01 ☐

NOTE

All MSR TCVs must be closed prior to opening any MSR preheat valves, i.e. no TCV dogged open.

[5] **IF** Moisture Separator Reheaters are not in service, **THEN**

PLACE (MSRs) in service per SOI-1.04. ________

Date________ Initials

5.2 Unit Startup from 30% to 100% Reactor Power (continued)

NOTES

1) TI-45, Determination of Preconditioned Reactor Power, identifies ramp rates, specific power levels where **HOLD** times are required, and limits on control rod withdrawal.

2) Power escalation ramp rates and hold times should be per the most conservative of either the fuel pre-conditioning guidelines of TI-45 or the Turbine loading recommendations of SOI-47.02.

[6] **PERFORM** 1-SI-92-1 between approximately 30% and 35% Reactor Power to ensure all Power Range Monitors are equal to or greater than calorimetric power. [C.7] _________

[7] **LOG** the following: _________

A. Turbine Load Rate limit. ☐

B. Control rod withdrawal rate limit. ☐

NOTE

The Conditioned Power Level (CPL) needs to be tracked for ramp rate considerations.

[8] **DETERMINE** the CPL and ramp rate restrictions from TI-45, Determination of Preconditioned Reactor Power, AND **RECORD** section reviewed / restrictions in narrative log: _________

RECORD section reviewed / restrictions in table below:

	DATA FROM TI-45	PERF INITIAL	VERIF INITIAL
Applicable TI-45 Section Reviewed:			IV
Ramp rate restrictions:			IV

[9] **ENSURE** letdown flow is maximized. _________

Date________ **Initials**

5.2 Unit Startup from 30% to 100% Reactor Power (continued)

CAUTION

Raising feedwater flow to >40% will cause the non-reset MFP turbine condenser inlet and outlet valves to close.

NOTES

1) Turbine maybe operated in IMP IN above 30% turbine load as long as IMP IN does NOT cause unit instability. IMP IN will control turbine load as a percentage of impulse pressure that correlates to % load vs. % of valve opening in IMP OUT. This will allow for a more linear load ascension

2) Turbine load change may be stopped by depressing the HOLD push button, using VPL, or by depressing the MANUAL push button

[10] **IF** desired to operate in IMP IN, **THEN**

[10.1] **OBTAIN** Unit SRO concurrence to operate in IMP IN. ________ Unit SRO

[10.2] **PLACE** Turbine in IMP IN. ________

Date________ **Initials**

5.2 Unit Startup from 30% to 100% Reactor Power (continued)

[11] **INITIATE** power rise to between 45 and 49% by performing the following:

[11.1] **IF** during any of the following steps the REFERENCE changes in an undesired manner, **THEN**

ADJUST VPL to stop turbine load rise

OR

PUSH TURBINE MANUAL to place the turbine control mode in manual mode and PROCEED to section5.6

[11.2] **ENSURE** power escalation limits of TI-45 or SOI-47.02 are **NOT** exceeded.

[11.3] **SET** VALVE POSITION LIMIT to 60% or as desired ≤ 5% above Gov Control Indication.

[11.4] **SET** LOAD RATE at predetermined value.

[11.5] **PUSH** REFERENCE CONTROL Δ (raise) button to set desired load in SETTER display.

NOTES

1) RCS should be diluted to raise T_{AVG}, then Turbine load raised along with T_{AVG}. Control rods will be used along with dilution to maintain ΔI and if needed for temperature.

2) During power ascension, #1 bearing has experienced higher than normal metal temperature but never exceeded the alarm set point. The cause of the elevated temperature is due to the partial arc admission design of the HP turbine and the less than optimal alignment between the HP turbine and the "A" LP turbine. Although this condition is expected, operators should closely monitor #1 bearing metal temperature during power ascensions and take appropriate corrective actions as required. Contact the Predictive Maintenance Group for additional guidance.

[11.6] (ρ) **PUSH** GO button.

[11.7] **MONITOR** Generator Megawatts RISING.

Date________ **Initials**

5.2 Unit Startup from 30% to 100% Reactor Power (continued)

[11.8] **CHECK** that load rise has **STOPPED** when reference display equals setter

OR

IF desired to stop the load change, **THEN** **STOP** the load change by depressing the HOLD pushbutton

[11.9] **WHEN** desired to resume the load change, **THEN**

(ρ) **PRESS** the GO push button and continue to monitor load.

[11.10] **REPEAT** Steps 5.2[11.2] through 5.2[11.9] to bring load to between 45 and 49%, **WHILE CONTINUING** this instruction during load rise.

Date________ Initials

5.2 Unit Startup from 30% to 100% Reactor Power (continued)

NOTES

1) T_{AVG} is programmed from 557°F at no load, to 586.2°F at 100% at a rate of 0.29 °F/% power.

2) Pzr level is programmed at 25% to 60% as a function of T_{AVG}.

3) Instrument Maintenance (IM) support is required if controller adjustments are needed.

[12] **MONITOR** the following as load is raised: ________

- **COMPARE** T_{AVG}, ΔT, and NIS to check indications are consistent with expected values. [C.1] ☐
- RCP seal flow between 8 and 13 gpm per pump. ☐
- Pzr level on program. ☐
- All RPIs, Step Counters, Loop ΔT, and NIS for correct power distribution, quadrant power tilts, rod insertion, rod misalignment, inoperable RPIs, and inoperable rods. [C.6] ☐
- MFW Regs operating properly in auto (within 5% from 0 deviation is acceptable). ☐
- IF MFW Regs not maintaining SG level in the 5% band, **THEN**

  ENSURE Instrument Maintenance (IM) is notified. ☐
- Feedwater Heater, MSR Drain Tank, and Heater Drain Tank level controllers are adjusted to maintain levels normal. ________

NOTE

MFP suction pressure should be maintained greater than 175 psig.

[13] **WHEN** required to support MFP suction pressure, **THEN**

PERFORM the following per SOI-2 & 3.01:

[13.1] **START** the third HW Pump. ________

[13.2] **START** 1 CBP. ________

Date________ **Initials**

5.2 Unit Startup from 30% to 100% Reactor Power (continued)

CAUTION

Exceeding 40% Turbine Load before properly addressing the status of the MFPT Condenser Valves may cause feedwater/condensate oscillations and result in a plant transient.

[14] **PERFORM** the following **PRIOR** to attaining 40% Turbine Load, to ASSESS and CONTROL the desired status of the MFP Turbine Condenser valves:

[14.1] **RECORD** the position of the following valves:

		POSITION			
NOMENCLATURE	**LOCATION**	**OPEN √**	**CLOSE √**	**UNID**	**PERF INITIAL**
MFPT A CONDENSER CNDS INLET	1-M-2			1-FCV-2-210	
MFPT A CONDENSER CNDS OUTLET	1-M-2			1-FCV-2-205	
MFPT B CONDENSER CNDS INLET	1-M-2			1-FCV-2-211	
MFPT B CONDENSER CNDS OUTLET	1-M-2			1-FCV-2-216	

NOTE

In Mode 1, entry into Tech Spec 3.3.2 condition J may be suspended for up to 4 hours when placing the second Turbine Driven Main Feedwater Pumps (TDMFWP) in service. Refer to Tech Spec 3.3.2 table 3.3.2-1.

[14.2] **IF** all the valves in Step 5.2[14.1] are OPEN, **THEN PERFORM** one of the following actions (**N/A** Option **NOT** used):

- **ENSURE** BOTH MFP Turbine Trip Circuits **RESET.** ________

OR

- **SLOWLY CLOSE** THE MFPT INLET and OUTLET CONDENSER CNDS valves LOCALLY for the MFP which is **NOT** pumping forward. ________

Date________ Initials

5.2 Unit Startup from 30% to 100% Reactor Power (continued)

NOTE

Due to the difference in established range for the pressure transmitters which control AMSAC auto arm/block functions (i.e., 1-PT-1-314 and 315) and other turbine impulse pressure transmitters (e.g., 1-PT-1-72 or 73), AMSAC may remain blocked above an indicated turbine load corresponding to a reactor power of 40%. Turbine load may need to be adjusted to accommodate this difference and allow AMSAC arming.

[15] **WHEN** reactor power is approximately 40%, **THEN**

PERFORM the following:

[15.1] **CHECK** AMSAC ARMED by 1-HS-3-264A, AMSAC TEST/BLOCK pushbutton ARMED 40% light LIT. ________

NOTE

With verbal approval from Operations Superintendent, placing #7 Heater Drain System pumping forward may be deferred until power is approximately 60%, if system conditions warrant.

[15.2] **OBTAIN** Chemistry concurrence that #7 HD Tank chemistry is in LIMITS, **THEN**

START #7 HD Pump to pump forward per SOI-5 & 6.01. ________

[15.3] **CLOSE** operating MFP Turbine drains (**N/A** pump **NOT** operating):

Description	Handswitch	Position	Initials
MFPT A DRAIN VLVS	1-HS-46-14	CLOSED	
MFPT B DRAIN VLVS	1-HS-46-41	CLOSED	

Date________ **Initials**

5.2 Unit Startup from 30% to 100% Reactor Power (continued)

NOTE

Step 5.2[16] applicable following Refueling Outage or as requested by System Engineering, otherwise **N/A**.

[16] **ENSURE** CUNO filters have been cleaned by maintenance by contacting System Engineering after long cycle cleanup or prior to startup of MFPs. ________

[17] **WHEN** between 40 and 45% power, **THEN**

[17.1] **RETURN** # 3 HD Tank to normal per SOI-5 & 6.01, Section 8.6. ________

[17.2] **START** the first and second #3 HD Pumps to pump forward per SOI-5 & 6.01. ________

[17.3] **ENSURE** MFW Regs respond, and stabilize in the acceptable band. ________

[17.4] **CHECK** 1-LCV-6-106A controlling properly. ________

NOTES

1) With verbal approval from Operations Superintendent, placing the second MFP in service may be deferred until approximately 60% power.

2) In Mode 1, entry into Tech Spec 3.3.2 condition J may be suspended for up to 4 hours when placing the second Turbine Driven Main Feedwater Pumps (TDMFWP) in service. Refer to Tech Spec 3.3.2 table 3.3.2-1.

[17.5] **PLACE** the second MFP in service per SOI-2 & 3.01. ________

[17.6] **CLOSE** the second MFP Turbine drains (N/A other MFP):

Description	Handswitch	Position	Initials
MFPT A DRAIN VLVS	1-HS-46-14	CLOSED	
MFPT B DRAIN VLVS	1-HS-46-41	CLOSED	

Date________ **Initials**

5.2 Unit Startup from 30% to 100% Reactor Power (continued)

NOTES

1) Step 5.2[18] may be performed at any time when both MFPTs are in service and in AUTO.

2) With both MFPTs in AUTO it may be necessary to adjust the MFPT speed control bias on one of the MFPTs to prevent them from fighting each other (oscillating).

[18] **IF** MFPTs begin oscillating, **THEN**

SLOWLY ADJUST one MFPT speed control bias in the POSITIVE direction (greater than 50), UNTIL MFPTs stop oscillating. ________

Date________ **Initials**

5.2 Unit Startup from 30% to 100% Reactor Power (continued)

[19] **WHEN** Reactor power is 45%, **THEN** **PERFORM** the following:

[19.1] **ENSURE** Turbine Throttle Valve leakoffs **LOCKED OPEN:**

NOMENCLATURE	LOCATION	POSITION	UNID	PERF INITIAL	VERIF INITIAL
HP TURBINE STEAM SEAL LEAKOFF	T3H/755 Under Skirt	LOCKED OPEN	1-LOV-47-0727		CV
HP TURBINE STEAM SEAL LEAKOFF	T3J/755	LOCKED OPEN	1-LOV-47-0728		CV
HP TURBINE STEAM SEAL LEAKOFF	T3H/755 Under Skirt	LOCKED OPEN	1-LOV-47-0729		CV
HP TURBINE STEAM SEAL LEAKOFF	T3J/755	LOCKED OPEN	1-LOV-47-0730		CV

[19.2] **IF** excessive flow is noted from any of leakoff valves, **THEN**

[19.2.1] **ENSURE** #7 HD Tank pressure is less than #6 heater shell pressure, and initiate a WO for the applicable Throttle valve. _________

[19.2.2] **ENSURE** 1-PCV-47-193, GLAND SEAL STEAM CNDS SPILLOVER PRESS CNTL, operating in conjunction with 1-PCV-47-189, HP STEAM SEAL SUPPLY, to MAINTAIN Steam Seals at between 16 to 20 psia. _________

[19.3] **ENSURE** the following as system parameters permit**:** _________

[19.3.1] 3 HW Pumps RUNNING. ☐

[19.3.2] CBP(s) RUNNING (when required). ☐

[19.3.3] 2 MFPs RUNNING (only 1 required if approved by Operations Superintendent). ☐

[19.3.4] 2 #3 HD Pumps RUNNING. ☐

[19.4] **START** the 2nd #7 HD Pump per SOI-5 & 6.01. _________

Date________ **Initials**

5.2 Unit Startup from 30% to 100% Reactor Power (continued)

NOTE
Seasonal temperatures dictate whether all CCW Pumps are required (N/A if **NOT** required).

[19.5] **PLACE** remaining CCW Pumps in service to maintain maximum condenser vacuum per SOI-27.01. ________

[19.6] **CHECK** Generator H2 pressure sufficient for anticipated load per SOI-47.02, Appendix E, Capability Curve. ________

[20] **MAINTAIN** less than 50% power UNTIL notified by Chemistry that SG and condensate/feedwater limits for exceeding 50% are satisfied. ________

NOTE
During steady state operation and planned load changes, indicated Axial Flux Difference (AFD) should be maintained within the Target Band of Nuclear Operating Book (NOB), Sheet A-1, Target Band vs. Power Level.

[21] **BEFORE** exceeding 50% Reactor power, **PERFORM** 1-SI-0-21 to: [C.9]

[21.1] **CHECK** AFD within limits. ________

[21.2] **CHECK** QPTR within limits. ________

Date________ **Initials**

5.2 Unit Startup from 30% to 100% Reactor Power (continued)

NOTES

1) TI-45, Determination of Preconditioned Reactor Power, identifies ramp rates, specific power levels where **HOLD** times are required, and control rod withdrawal limits.
2) Power escalation ramp rates and hold times should be per the most conservative of either the fuel pre-conditioning guidelines of TI-45 or the Turbine loading recommendations of SOI-47.02.
3) Turbine load change may be stopped by depressing the HOLD push button, using VPL, or by depressing the MANUAL push button
4) The Conditioned Power Level (CPL) and needs to be tracked for ramp rate considerations.

[22] **DETERMINE** the CPL and ramp rate restrictions from TI-45, Determination of Preconditioned Reactor Power, AND **RECORD** section reviewed / restrictions in narrative log: _______

RECORD section reviewed / restrictions in table below:

	DATA FROM TI-45	PERF INITIAL	VERIF INITIAL
Applicable TI-45 Section Reviewed:			IV
Ramp rate restrictions:			IV

[23] **CONTINUE** ascension to 90% power (70 to 74% if following refueling) by performing the following: _______

[23.1] **IF** during any of the following steps the REFERENCE changes in an undesired manner, **THEN**

ADJUST VPL to stop turbine load rise

OR

PUSH TURBINE MANUAL to place the turbine control mode in manual mode and **PROCEED** to section 5.6.

[23.2] **ADJUST** VALVE POSITION LIMIT to 90% or ≤ to 5% above the Gov Control Indication .

[23.3] **SET** LOAD RATE at predetermined value.

Date________ **Initials**

5.2 Unit Startup from 30% to 100% Reactor Power (continued)

[23.4] **PUSH** REFERENCE CONTROL Δ (raise) button to set desired load in SETTER display.

NOTES

1) RCS should be diluted to raise T_{AVG}, then Turbine load raised along with T_{AVG}. Control rods will be used along with dilution to maintain ΔI and if needed for temperature.

2) During power ascension, #1 bearing has experienced higher than normal metal temperature but never exceeded the alarm set point. The cause of the elevated temperature is due to the partial arc admission design of the HP turbine and the less than optimal alignment between the HP turbine and the "A" LP turbine. Although this condition is expected, operators should closely monitor #1 bearing metal temperature during power ascensions and take appropriate corrective actions as required. Contact the Predictive Maintenance Group for additional guidance.

[23.5] (ρ) **PUSH** GO button.

[23.6] **MONITOR** Generator Megawatts RISING.

[23.7] **CHECK** that load rise has **STOPPED** when reference display equals setter

OR

IF desired to stop the load change **THEN** **STOP** the load change by **DEPRESSING** the HOLD pushbutton.

[23.8] (ρ) **WHEN** desired to resume the load change, **THEN** **PRESS** the GO push button and continue to monitor load.

[24] **WHEN** power is 48%, **THEN**

CHECK Permissive 70-C, P-8 LO PWR-FLOW TRIP BLOCKED, **NOT** LIT. ________

[25] **WHEN** power reaches 50%, **THEN**

[25.1] **RECORD** the time. ________

TIME ______________

Date________ **Initials**

5.2 Unit Startup from 30% to 100% Reactor Power (continued)

[25.2] **CHECK** AFD monitor alarm **NOT** in alarm state by the plant process computer. [83D Alarms] ________

[26] **WHEN** power is greater than 50%, **THEN**

CHECK the following:

[26.1] Permissive 69-E, P-9 RX TRIP FROM TURB TRIP BLOCKED, **NOT** LIT. ________

[26.2] Alarm 83-B, POWER RANGE UPR DETECTOR FLUX DEVN, **NOT** LIT. ________

[26.3] Alarm 83-C, POWER RANGE LWR DETECTOR FLUX DEVN, **NOT** LIT. ________

[26.4] Alarm 83-D, PLANT COMPUTER GENERATED ALARM (SEE ICS), **NOT** LIT. ________

[27] **IF** condenser air in-leakage exceeds 10 cfm, **THEN**

[27.1] **INITIATE** immediate corrective measures, and ________

[27.2] **ENSURE** Operations Superintendent or Plant Manager is notified. ________

[28] **PERFORM** 1-SI-92-1 at approximately 55% Reactor Power to ensure all Power Range Monitors are equal to or greater than calorimetric power. [C.7] ________

[29] **EVALUATE** Placing Building Heat in service from #3 Extraction Steam using SOI-44.01. ______

Date________ **Initials**

5.2 Unit Startup from 30% to 100% Reactor Power (continued)

CAUTION
#3 and #7 Heater drains must be pumping forward before exceeding 60% Turbine load.

[30] **PERFORM** the following:
BEFORE Turbine load is above 60%,

[30.1] **ENSURE** all steps that were deferred for heater drains are **COMPLETE:**

[30.1.1] #3 HD Pump, Section 5.2[17.2], **COMPLETE**. ________

[30.1.2] #7 HD Pump, Section 5.2[15.2] **COMPLETE**. ________

[30.2] **ENSURE** at least 1 Bus Duct Cooler in service per SOI-58.01. ________

NOTES
1) Cond Demin Pumps may need to be started at lower power if #7 HD Pumps amps are swinging, or if MFP suction pressure needs to be raised by approximately 40 psig.
2) Operating Cond Demin Pumps at elevated system header pressure may cause 1-LCV-6-106A to control outside its optimum range and create system swings.
3) Two Cond Demin pumps must be started at the same time.

[31] **WHEN** system header pressure dictates (e.g., NPSH to MFP), **THEN**

START two Cond Demin Pumps per SOI-2&3.01. ________

NOTE
In Mode 1, entry into Tech Spec 3.3.2 condition J may be suspended for up to 4 hours when placing the second Turbine Driven Main Feedwater Pumps (TDMFWP) in service. Refer to Tech Spec 3.3.2 table 3.3.2-1.

[32] **ENSURE** 2 TDMFPs in service (or 1 TDMFP and one SMFP in service), BEFORE raising power above 60%. ________

Date________ **Initials**

5.2 Unit Startup from 30% to 100% Reactor Power (continued)

CAUTION

Operating above 85% turbine load with less than three #3 pumps running will limit the #3 HDT level control valve, 1-LCV-6-106A, to its preset throttled position of approximately 30% and illuminate the blue light on the panel above the 1-LCV-6-106A Reset switch. This condition may also result in a turbine runback.

[33] **WHEN** 70% Turbine load is reached, **THEN**

PERFORM the following:

[33.1] **PLACE** third #3 HD Pump in service per SOI-5 & 6.01. _________

[33.2] **ENSURE** MFW Regs respond, and stabilize in the acceptable band. _________

[33.3] **CHECK** 1-LCV-6-106A controlling properly. _________

[33.4] **IF** required,
THEN
PLACE third CBP in service. _________

[33.5] **IF** necessary, **START** the third Cond Demin Pump. _________

[34] **ENSURE** applicable portions of the PETs are COMPLETE for power operation above 75% power. _________
RXE

[35] **IF** Power Range high-flux trip setpoints were reduced following refueling **OR** activities occurred which could cause expected NIS response to be non-conservative, **THEN**

ENSURE Power Range high-flux trip setpoints are adjusted in accordance with the applicable system 92 SIs.

___________	___________	___________
IM	Date	Time

[36] **PERFORM** 1-SI-92-1 at approximately 75% Reactor Power to ensure all Power Range Monitors are equal to or greater than calorimetric power. [C.7] _________

Date________ **Initials**

5.2 Unit Startup from 30% to 100% Reactor Power (continued)

[37] **ENSURE** both Stator Water Heat Exchangers are in service prior to exceeding 75% power [C.7] _________

NOTE

The numbers below the pressure indication for 1-PIS-47-13 correspond to four relays (LEDs) that enable the runback logic. The numbers 1, 2, 3, 4 should be illuminated indicating all four relays are enabled.

[38] **CHECK** HP Turbine Impulse Pressure / Turbine Runback LEDs (1, 2, 3, 4) lit on panel L-262A, 1-PIS-47-13 , TB 729 column T3/J. _________

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

CONTINUE ascension to 90% RTP by performing the following: _________

NOTE

1) Power escalation should be per the most conservative of either the fuel pre-conditioning guidelines of TI-45 or the Turbine loading recommendations of SOI-47.02 **.**

2) Turbine load change may be stopped by depressing the HOLD push button, using VPL, or by depressing the MANUAL push button

[39.1] **IF** during any of the following steps the REFERENCE changes in an undesired manner, **THEN**

ADJUST VPL to stop turbine load rise.

OR

PUSH TURBINE MANUAL to place the turbine control mode in manual mode and **PROCEED** to section 5.6

[39.2] **SET** VALVE POSITION LIMIT at 95% or as desired above the Gov Control Indication.

[39.3] **SET** LOAD RATE at predetermined value.

[39.4] **PUSH** REFERENCE CONTROL Δ (raise) button to set desired load in SETTER display.

Date________ Initials

5.2 Unit Startup from 30% to 100% Reactor Power (continued)

NOTES

1) RCS should be diluted to raise T_{AVG}, then Turbine load raised along with T_{AVG}. Control rods will be used along with dilution to maintain ΔI and if needed for temperature.
2) During power ascension, #1 bearing has experienced higher than normal metal temperature but never exceeded the alarm set point. The cause of the elevated temperature is due to the partial arc admission design of the HP turbine and the less than optimal alignment between the HP turbine and the "A" LP turbine. Although this condition is expected, operators should closely monitor #1 bearing metal temperature during power ascensions and take appropriate corrective actions as required. Contact the Predictive Maintenance Group for additional guidance.

[39.5] (ρ) **PUSH** GO button.

[39.6] **MONITOR** Generator Megawatts RISING.

[39.7] **CHECK** that load rise has **STOPPED** when reference display equals setter

OR

IF desired to stop the load change **THEN**
STOP the load change by depressing the HOLD pushbutton.

[39.8] **WHEN** desired to resume the load change, **THEN**

PRESS the GO push button and continue to monitor load.

[40] **BEFORE** raising above 80% power, **THEN**

ENSURE the following:

[40.1] 1-LCV-6-106A controlling properly. ________

[40.2] 1-LCV-6-105A and 105B are **NOT** open. ________

Date________ **Initials**

5.2 Unit Startup from 30% to 100% Reactor Power (continued)

> **NOTE**
>
> After operations less than 85% Reactor power for more than 2 weeks, Reactor Engineering evaluation of Hot Channel Factors per 1-SI-0-20 is required, before exceeding 90% power.

[41] **IF** evaluation of Hot Channel Factors is required, **THEN**

ENSURE 1-SI-0-20, COMPLETE. ________ RXE

> **NOTE**
>
> Turbine is normally operated in IMP OUT control below 30% turbine load. IMP IN operation above 30% turbine load is permissible as long as the unit remains stable (e.g. no instabilities due to IMP IN operation).

[42] **IF** desired to limit instabilities due to IMP IN operation at loads greater than 90%, **THEN**

[42.1] **OBTAIN** Unit SRO concurrence to operate in IMP OUT. ________ Unit SRO

[42.2] **PLACE** Turbine in IMP OUT. ________

> **NOTE**
>
> Performing NIS check and adjustment relatively close to 100% power may eliminate the need to RE-PERFORM these actions upon reaching 100% power.

[43] **WHEN** power is at or above 95%, **THEN**

PERFORM the following

[43.1] **ADJUST** PR NIS per 1-SI-92-1, NIS Daily Comparison. ________

[43.2] **ENSURE** Instrument Maintenance (IM) performs 1-SI-68-30 within 24 hours after power stabilizes at 90% or above (N/A if **NOT** applicable). ________

Date________ **Initials**

5.2 Unit Startup from 30% to 100% Reactor Power (continued)

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

A. Feedwater heaters. ________

B. MSR drain tanks ________

[44] **IF** this a startup following a refueling, **THEN**

HOLD power between 94 and 98% to complete post-refueling testing. ________

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

ENSURE applicable portions of the PETs are COMPLETE for full power operation. ________ RXE

NOTES

1) TI-45, Determination of Preconditioned Reactor Power, identifies ramp rates, specific power levels where **HOLD** times are required, and control rod withdrawal limits.
2) Power escalation ramp rates and hold times should be per the most conservative of either the fuel pre-conditioning guidelines of TI-45 or the Turbine loading recommendations of SOI-47.02
3) Turbine load change may be stopped by depressing the HOLD push button, using VPL, or by depressing the MANUAL push button

[46] **CONTINUE** ascension to 100% power by performing the following: ________

[46.1] **IF** during any of the following steps the REFERENCE changes in an undesired manner, **THEN**

ADJUST VPL to stop turbine load rise

OR

PUSH TURBINE MANUAL to place the turbine control mode in manual mode and **PROCEED** to section5.6

[46.2] **CHECK** VALVE POS LIMIT light is **NOT** LIT.

Date________ **Initials**

5.2 Unit Startup from 30% to 100% Reactor Power (continued)

[46.3] **SET** VALVE POSITION LIMIT at 100% or ≤ to 5% above the Gov Control Indication .

[46.4] **SET** LOAD RATE at predetermined value.

[46.5] **PUSH** REFERENCE CONTROL Δ (raise) button to set desired load in SETTER display.

NOTE

The Conditioned Power Level (CPL) needs to be tracked for ramp rate considerations.

[47] **DETERMINE** the CPL and ramp rate restrictions from TI-45, Determination of Preconditioned Reactor Power, AND **RECORD** section reviewed / restrictions in narrative log: ________

RECORD section reviewed / restrictions in table below:

	DATA FROM TI-45	PERF INITIAL	VERIF INITIAL
Applicable TI-45 Section Reviewed:			IV
Ramp rate restrictions:			IV

NOTES

1) RCS should be diluted to raise T_{AVG}, then Turbine load raised along with T_{AVG}. Control rods will be used along with dilution to maintain ΔI and if needed for temperature.

2) During power ascension, #1 bearing has experienced higher than normal metal temperature but never exceeded the alarm set point. The cause of the elevated temperature is due to the partial arc admission design of the HP turbine and the less than optimal alignment between the HP turbine and the "A" LP turbine. Although this condition is expected, operators should closely monitor #1 bearing metal temperature during power ascensions and take appropriate corrective actions as required. Contact the Predictive Maintenance Group for additional guidance.

[47.1] **IF** returning to this step from AOI-11, Loss of Condenser Vacuum, **ENSURE** Operations manager approval is obtained prior to increasing load. ________

[47.2] (ρ) **PUSH** GO button.

[47.3] **MONITOR** Generator Megawatts RISING.

Date________ **Initials**

5.2 Unit Startup from 30% to 100% Reactor Power (continued)

[47.4] **CHECK** that load rise has **STOPPED** when reference display equals setter

OR

IF desired to stop the load change, **THEN**

STOP the load change by depressing the HOLD pushbutton

[47.5] **WHEN** desired to resume the load change, **THEN**

(p) **PRESS** the GO push button and **CONTINUE** to monitor load.

NOTE
Guidance given in 1-PI-OPS-1-MCR, Plant Instruction - Main Control Room, should be used for Reactor power indication.

[47.6] **MONITOR** NIS, ΔT and ICS calorimetric computer points as applicable.

NOTE
Operation with the VALVE POS LIMIT light LIT is **NOT** desired. However, operation with VALVE POS LIMIT light LIT is acceptable if unsatisfactory load swings are experienced.

[48] **IF** desired to place Turbine on the Valve Position Limiter, as the unit approaches full power, and Turbine load set for 100% power, **THEN**

[48.1] **SLOWLY** and CAUTIOUSLY **PULSE** the VALVE POSITION LIMIT in the LOWER direction while monitoring Megawatts for a drop and the VALVE POS LIMIT light to ILLUMINATE ________

[48.2] **WHEN** VALVE POS LIMIT light ILLUMINATES, **THEN**

STOP limiter adjustment. ________

Date________ **Initials**

5.2 Unit Startup from 30% to 100% Reactor Power (continued)

[49] **WHEN** unit stabilizes at desired Reactor power, **THEN**

[49.1] **ENSURE** Load Coordinator is notified that power escalation is complete. ________

[49.2] **ENSURE** RADIATION PROTECTION is notified that the power escalation is complete. ________

[49.3] **ENSURE** Chemistry is notified that power escalation is complete. ________

CAUTION

Do not raise limiter position, except as noted below in step 5.2[49.4], UNLESS Turbine control is positively controlling Turbine.

[49.4] **PERFORM** the following if the limiter limits Reactor power to less than 100%:

[49.4.1] **ADJUST** the SETTER/REFERENCE controls to reduce Turbine load UNTIL VALVE POS LIMIT light is **NOT** LIT. ________

[49.4.2] **RAISE** the VALVE POSITION LIMIT to allow load rise using the SETTER/REFERENCE controls, not to exceed 100% RTP as defined in 1-PI-OPS-1-MCR. ________

Date________ **Initials**

5.2 Unit Startup from 30% to 100% Reactor Power (continued)

CAUTION
Power SHALL **NOT** exceed an 8-hour average of 100% RTP (as defined in 1-PI-OPS-1-MCR)

NOTES
1) Plant Instruction 1-PI-OPS-1-MCR is applicable at all times for determination of reactor thermal power, and for limitations regarding the trending of reactor thermal power [C.8].
2) Maintaining reactor thermal power within limits is a continuous action by a Licensed Reactor Operator. Step 5.2[50.1] is exempt from the "Continuous Use" requirements as described in SPP-2.2, "Administration Of Site Technical Procedure

[50] **OBSERVE** the following restrictions and guidelines: WHILE operating at full power,

[50.1] **MAINTAIN** reactor thermal power within the limits provided in 1-PI-OPS-1-MCR. ________

NOTE
Rod control should be maintained in auto to allow proper response to load reductions and runbacks.

[50.2] **MAINTAIN** Control Bank D greater than 200 steps during steady state operation, and AFD within the target band of NOB, Sheet A-1 to optimize core power distribution. ________

Date________ **Initials**

5.2 Unit Startup from 30% to 100% Reactor Power (continued)

NOTE

IF the turbine control is transferred from IMP OUT to IMP IN, when the turbine is at or near 100% load, THEN the potential exists for the turbine controller to raise load greater than 100%. (this can cause difficulty in controlling the Reactor at power levels near the 8 hour limit of 3459 MWT) IF the controller sets load above 100%, it will not allow load to be dropped below 100% (Hi load Limit) while in IMP IN. The operator must GO TO IMP OUT and lower unit load before attempting to return to IMP IN.

[50.3] **IF** desired to operate in IMP IN **AND** conditions permit (e.g. unit stable & governor valve tracking meter at null zero mid position)**, THEN**

[50.3.1] **OBTAIN** Unit SRO concurrence to operate in IMP IN. ________ Unit SRO

[50.3.2] **PLACE** Turbine in IMP IN. ________

NOTE

Operation with the VALVE POS LIMIT light LIT is **NOT** desired. However, operation with VALVE POS LIMIT light LIT is acceptable if unsatisfactory load swings are experienced.

CAUTION

The potential for rapid load adjustments should be thoroughly considered prior to VPL adjustment when the VPL light (on 1-XX-47-2000) is LIT.

[50.4] **IF** desired to use the VPL for load control, **THEN**

PERFORM one of the following (**N/A** option **NOT** used):

[50.4.1] **ADJUST** Turbine load to desired setting, and **LOWER** VPL setting as required, **OR** ________

[50.4.2] **ADJUST** VPL to desired setting, and **RAISE** Turbine load. ________

Date________ **Initials**

5.2 Unit Startup from 30% to 100% Reactor Power (continued)

NOTE

Adjustment of VPL and/or Turbine load to maintain "signal overlap" is expected to minimize load variation.

[50.5] **WHEN** the VPL light (on 1-XX-47-2000) is LIT, **THEN** Turbine load may be adjusted by performing either of the following (N/A option **NOT** used):

[50.5.1] **ADJUST** VPL to desired setting to change Turbine load, **OR** ________

[50.5.2] **ADJUST** Turbine load to desired setting. ________

End of Section

Date TODAY **Initials**

5.3 Unit Shutdown from 100% to 30% Reactor Power

SHUTDOWN No. 72

[1] Operations Superintendent has authorized load reduction. TBD

[2] **REVIEW** of Precautions and Limitations Section 3.0 COMPLETE. TBD

[3] **IF** reducing power for compliance to LCO 3.7.1**, THEN**: TBD

[3.1] **ENSURE** Reactor Engineering revises neutron flux high reactor trip setpoints per Tech Spec 3.7.1. TBD

[3.2] **MAINTAIN** power less than revised trip setpoint as allowed by Tech Spec 3.7.1. TBD

[4] **ENSURE** RADIATION PROTECTION is notified of impending load reduction. TBD

[5] **ENSURE** Chemistry evaluates status and flowrate of the following for the impending load reduction: TBD

- Steam Generator Blowdown.
- Condensate Polishers.

[6] **ENSURE** COND DI Operator is notified of load reduction and to remove beds as needed. TBD

[7] **ENSURE** Load Coordinator is notified of impending load reduction. TBD

[8] **ENSURE** letdown flow is maximized. TBD

Date________ Initials

5.3 Unit Shutdown from 100% to 30% Reactor Power (continued)

NOTES

1) For a change in the rated thermal power greater than or equal to 15% in 1 hour, Chemistry shall check Reactor Coolant DE I-131 specific activity by initiating 1-SI-68-28 (SR 3.4.16.2).

2) QPTR alarms should be expected during significant load reductions, and the required LCO entries should **NOT** be considered as unplanned.

3) For core operating recommendations for situations such as End of Life or unusual power maneuvers, contact Reactor Engineering.

4) Turbine load change may be stopped by depressing the HOLD push button, using VPL, or by depressing the MANUAL push button.

5) TI-45, Determination of Preconditioned Reactor Power, identifies rate of power decreases when plant conditions and/or operating limitations do not require a faster reduction in power.

6) The Conditioned Power Level (CPL) needs to be tracked for ramp rate considerations.

[9] **DETERMINE** the CPL and ramp rate restrictions from TI-45, Determination of Preconditioned Reactor Power, AND **RECORD** section reviewed / restrictions in narrative log: TBD ________

RECORD section reviewed / restrictions in table below:

	DATA FROM TI-45	PERF INITIAL	VERIF INITIAL
Applicable TI-45 Section Reviewed:	5.5	TBD	DBT IV
Ramp rate restrictions:	-10%/hr	TBD	DBT IV

Date________ **Initials**

5.3 Unit Shutdown from 100% to 30% Reactor Power (continued)

NOTE

Controlling load reductions, Rod position and boron concentration will ensure Axial Flux remains within allowed limits. (For example, Boric acid addition can be set up to control rate of Rod insertion during a downpower to control ΔI within the required limits)

[10] **REVIEW** the following to ensure Axial Flux requirements are understood: TBD ________

- Axial Flux Target Band from Nuclear Operating Book ☒
- Guidance for controlling Axial Flux in Reactivity Briefing Sheet. ☒
- Reactor Engineering operating recommendations (if available) ☒

[11] **MAINTAIN** Axial Flux within 3% of the AFD target from 100% to 40% by **ADJUSTING:** TBD ________

- Boron Concentration per SOI-62.02. ☒
- Load rate. ☒
- Control Rod Position. ☒

NOTES

1) Turbine may be operated in IMP IN above 30% turbine load as long as IMP IN does **NOT** cause unit instability. IMP IN will control turbine load as a percentage of impulse pressure that correlates to % load vs. % of valve opening in IMP OUT. This will allow for a more linear load change.

2) Turbine load change may be stopped by depressing the HOLD push button, using VPL, or by depressing the MANUAL push button

[12] **IF** desired to operate in IMP IN, **THEN**

[12.1] **OBTAIN** Unit SRO concurrence to operate in IMP IN. MIC ________ Unit SRO

[12.2] **PLACE** Turbine in IMP IN. TBD ________

Date________ **Initials**

5.3 Unit Shutdown from 100% to 30% Reactor Power (continued)

[13] **INITIATE** load reduction by PERFORMING the following on the Turbine EHC panel: ________

[13.1] **IF** during any of the following steps the REFERENCE changes in an undesired manner, **THEN**

ADJUST VPL to stop turbine load rise

OR

PUSH TURBINE MANUAL to place the turbine control mode in manual mode and **PROCEED** to section 5.6

ADJUST REFERENCE CONTROL ∇ (lower) button to set desired load in SETTER display.

[13.2] **SET** LOAD RATE as required.

[13.3] (ρ) **PUSH** GO button.

[13.4] **MONITOR** Generator Megawatts DROPPING.

[13.5] **CHECK** that load change has **STOPPED** when reference display equals setter

OR

IF desired to stop the load change, **THEN**

STOP the load change by **DEPRESSING** the HOLD pushbutton

[13.6] **WHEN** desired to resume the load change, **THEN**

(ρ) **PRESS** the GO push button and continue to monitor load.

[13.7] **ADJUST** VALVE POSITION LIMIT to ≤ 5% above the Gov Control Indication or as needed.

[13.8] **REPEAT** Steps 5.3[13.1] to 5.3[13.4] to achieve desired load.

Date________ **Initials**

5.3 Unit Shutdown from 100% to 30% Reactor Power (continued)

CAUTION
Do **NOT** exceed load rate of 5%/minute, or 10% step change

[14] **MONITOR** the following during the load reduction: ________

[14.1] T_{AVG} following T_{REF} program.

[14.2] All RPIs, Step Counters, Loop ΔT, and NIS for correct power distribution, quadrant power tilts, rod insertion, rod misalignment, inoperable RPIs, and inoperable rods [C.6]

NOTE
If the Unit Shutdown was initiated to enter a Refueling Outage, the following step may be N/A'd.

[15] **PERFORM** 1-SI-92-1 at approximately 80% Reactor Power to ensure all Power Range Monitors are equal to or greater than calorimetric power. [C.7] ________

NOTES
1) Shutdown of Cond Demin Pumps and #3 HD Pumps is based on header pressure, and the ability of the HD Pumps to pump forward. 2) Operating Cond Demin Pumps at elevated system header pressure may cause 1-LCV-6-106A to control outside its optimum range and create system swings.

[16] **WHEN** system header pressure dictates (e.g., NPSH to MFP), **THEN**

REMOVE the following from service: ________

[16.1] One of the three CBPs per SOI-2 & 3.01. ________

[16.2] One of the three Cond Demin Pumps at below 80% feedwater flow per SOI-2 & 3.01. ________

[16.3] **CHECK** 1-LCV-6-106A controlling properly. ________

Date________ **Initials**

5.3 Unit Shutdown from 100% to 30% Reactor Power (continued)

NOTES

1) In Mode 1, entry into Tech Spec 3.3.2 condition J may be suspended for up to 4 hours when removing one of the two Turbine Driven Main Feedwater Pumps (TDMFWP) from service. Refer to Tech Spec 3.3.2 table 3.3.2-1.
2) One MFP may be removed from service below 60%.
3) Operation between 45% and 60% power, with only on MFP in service, must be approved by Operations Superintendent.
4) Runback circuitry being armed is verified on 1-L-262 on 1-PIS-47-13, HP TURBINE IMPULSE STEAM PRESSURE [729/T3J].
5) HDT Runback is armed when Relay No. 2 is lit and MFP Trip Runback is armed when Relay No. 3 is lit. There is a 3-second time delay after the #3 HDT Runback logic is made before the Runback is initiated.
6) If holding less than 60% power, Cond Demin Pumps may be left running.

[17] **WHEN** system header pressure dictates (e.g., NPSH to MFP), **THEN**

REMOVE the following equipment from service:

[17.1] **SIMULTANEOUSLY STOP** both operating Cond Demin Pumps per SOI-2 & 3.01. ________

[17.2] **VERIFY** 1-PIS-47-13, Relay No.2 is **NOT** LIT [1-L-262], **THEN** **STOP** one #3 HD Pump. ________

[18] **WHEN** 65% power is reached, **THEN**

STOP one of the two #7 HD Pumps. ________

NOTE

If the Unit Shutdown was initiated to enter a Refueling Outage, the following step may be N/A'd.

[19] **PERFORM** 1-SI-92-1 at approximately 60% Reactor Power to ensure all Power Range Monitors are equal to or greater than calorimetric power. [C.7] ________

Date________ **Initials**

5.3 Unit Shutdown from 100% to 30% Reactor Power (continued)

[20] **IF** #3 Extraction Steam in service to Auxiliary Steam Header, **THEN**

- **PLACE** Auxiliary Boiler in service per SOI-12.01 ________

  OR

- **REMOVE** Building Heat System from service using SOI-44.01. ________

[21] **WHEN** 50% power is reached, **THEN**

CHECK Permissive 69-E, P-9 RX TRIP FROM TURB TRIP BLOCKED, LIT. ________

[22] **WHEN** 48% Reactor power is reached, **THEN**

CHECK Permissive 70-C, P-8 LO PWR-FLOW TRIP BLOCKED, LIT. ________

Date________ **Initials**

5.3 Unit Shutdown from 100% to 30% Reactor Power (continued)

[23] **WHEN** 45% power is reached**, THEN**

REMOVE the following equipment from service: ________

[23.1] **IF** condenser vacuum will permit, **THEN**

REDUCE the number of CCW Pumps per SOI-27.01. ________

NOTE

In Mode 1, entry into Tech Spec 3.3.2 condition J may be suspended for up to 4 hours when removing one of two Turbine Driven Main Feedwater Pumps (TDMFWP) from service. Refer to Tech Spec 3.3.2 table 3.3.2-1.

[23.2] **IF** 2 MFPs are in service, **THEN**

SHUTDOWN one MFP per SOI-2 & 3.01**.** ________

[23.3] **STOP** the 2nd #7 HD Pump, AND

PLACE both #7 HD Pumps handswitches in P-T-L. ________

[23.4] **CLOSE** the #7 HD Pumps discharge valves [1-M-2]:

Description	Handswitch	Initials
#7 HD PMPS TO HTR STRING'A'	1-HS-6-143A	
#7 HD PMPS TO HTR STRING'B'	1-HS-6-163A	
#7 HD PMPS TO HTR STRING'C'	1-HS-6-184A	

Date________ **Initials**

5.3 Unit Shutdown from 100% to 30% Reactor Power (continued)

CAUTION

#3 HDT should be placed on full bypass before planned tripping of main turbine to prevent back filling of #2 heaters. Backfilling could result in auto isolation of all three #2 heaters on Hi HI level.

[24] **WHEN** 40% power is reached, **THEN**

REMOVE the following equipment from service:

[24.1] **STOP** the remaining #3 HD Pumps, and place handswitch in PULL-TO-LOCK:

Description	Handswitch	Position	Initials
#3 HEATER DRAIN PMP A	1-HS-6-112A	P-T-L	
#3 HEATER DRAIN PMP B	1-HS-6-117A	P-T-L	
#3 HEATER DRAIN PMP C	1-HS-6-122A	P-T-L	

[24.2] **CLOSE** the #3 HD Pumps discharge valves. [1-M-2]

Description	Handswitch	Initials
#3 HD PMPS TO HTR STRING'A'	1-HS-6-108A	
#3 HD PMPS TO HTR STRING'B'	1-HS-6-109A	
#3 HD PMPS TO HTR STRING'C'	1-HS-6-110A	

[24.3] **PLACE** #3 HDT in Full Bypass Operation in accordance with SOI-5 & 6.01, Section 8.6 ________

NOTE

If the Unit Shutdown was initiated to enter a Refueling Outage, the following step may be N/A'd.

[25] **PERFORM** 1-SI-92-1 at approximately 40% Reactor Power to ensure all Power Range Monitors are equal to or greater than calorimetric power. [C.7] ________

Date________ **Initials**

5.3 Unit Shutdown from 100% to 30% Reactor Power (continued)

NOTE
AMSAC is blocked if below 40% power for greater than 360 sec.

[26] **WHEN** less than 40% power, **THEN**

CHECK 1-HS-3-264A, AMSAC TEST/BLOCK pushbutton, AMSAC BLOCK <40%, light LIT. ________

[27] **COORDINATE** with Chemistry to establish SG monitoring per CM-5.02, Hideout Return Sampling and Analysis. ________

[28] **WHEN** 30% power is reached, **THEN**

PERFORM the following:

[28.1] **ENSURE** Turbine is operating in IMP OUT. ________

[28.2] **STOP** 1 of the two operating CBPs per SOI-2 & 3.01. ________

[28.3] **STOP** 1 of the three operating HW Pumps. ________

[29] **IF** Reactor and Turbine shutdown or low power operation is required, **THEN**

GO TO GO-5, Unit Shutdown from 30% Reactor Power to Hot Standby. ________

End of Section

Date________ **Initials**

5.4 Power Coastdown at End of Life

NOTE[C.2]

This section provides instructions for core burnup cycle length extension using power coastdown.
Reactor power and turbine power slowly coasts down from full power at a predicted rate with T_{AVG} and T_{REF} being maintained on program. Core cycle may be extended for 30 days or more.
Coastdown enables the plant to reach the refueling date with a core burnup within the prescribed burnup window if the normal cycle length is insufficient for the calendar refueling date.

[1] **REVIEW** of Precautions and Limitations Section 3.0 COMPLETE. ________

[2] **ENSURE** Reactor Engineering is contacted for predicted reactor power reduction vs. Time (EFPD) during coastdown. ________

[3] **ENSURE** RCS C_B is less than or equal to 50 ppm. ________

[4] **ENSURE** Holdup Tanks and Waste Gas Decay Tanks have sufficient capacity to hold excess water from dilution. ________

[5] **ENSURE** RADIATION PROTECTION is notified of power coastdown. ________

[6] **ENSURE** Chemistry is notified of power coastdown. ________

[7] **ENSURE** COND DI Operator is notified of power coastdown and to remove beds as needed. ________

[8] **ENSURE** Load Coordinator is notified of power coastdown. ________

[9] **ENSURE** letdown flow is maximized. ________

Date________ **Initials**

5.4 Power Coastdown at End of Life (continued)

CAUTIONS

1) Reactor power changes should be limited to 1%/hour to avoid Xenon peaking which could force plant shutdown.

2) Do **NOT** perform unnecessary power maneuvers or testing, e.g., turbine valve test, which could result in uncontrollable Xenon oscillation.

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

4) Secondary plant runbacks such as MFP trip or #3 HD Tank runback require Unit shutdown if Reactor power is not promptly returned to pre-transient level due to the resulting severe Xenon transient.

5) Management should be consulted to evaluate the feasibility of a Unit restart if a Reactor trip occurs with RCS C_B less than 50 ppm.

6) Do not exceed the positive AFD limit of NOB, Sheet A-1 during power coastdown.

NOTES

1) T_{AVG} is programmed from 557°F at no load to 586.2°F at 100%, at a rate of 0.29 °F/% power.

2) To maintain T_{AVG} and T_{REF} on program, the operator will be required to reduce reactor power daily during coastdown. Predicted daily power reduction varies during coastdown, and is a function of Effective Full Power Days (EFPD.)

3) For core operating recommendations during coastdown or unusual power maneuvers, Reactor Engineering should be contacted.

[10] **MONITOR** T_{AVG} on program with T_{REF} within 1.5°F. ________

Date________ **Initials**

5.4 Power Coastdown at End of Life (continued)

NOTE
Placing an unborated mixed bed in service should be performed only after consultation and concurrence with plant management.

[11] **WHEN** RCS C_B is less than or equal to 50 ppm, **THEN**

DEBORATE RCS as necessary to maintain T_{AVG} on program with T_{REF} per SOI-62.04. ________

NOTE
Alarm 64-F, C-11 BANK D AUTO WITHDRAWL BLOCKED, will be LIT when Bank D rods are withdrawn to 220 steps.

[12] **IF** deboration using Mixed Bed Demin is ineffective for maintaining T_{AVG}-T_{REF} on program, **THEN**

WITHDRAW Rods to maintain T_{AVG} program. ________

[13] **WHEN** Rods are fully withdrawn, **THEN**

LOWER Turbine load slowly to maintain T_{AVG} program. ________

[14] **REFER TO** Section 5.3 to remove secondary equipment as load drops. ________

End of Section

Date________ **Initials**

5.5 Frequency Variation Response

NOTE
The actions of this Section assume all data and voice communications are lost between WBN and System Load Coordinator.

[1] **MONITOR** system frequency. ________

[2] **ATTEMPT** to establish communications with System Load Coordinator. ________

[3] **WHEN** communications with System Load Coordinator established, **THEN**

FOLLOW Load Coordinator's instructions for restoration, and **RETURN** to Instruction in effect. ________

[4] **IF** communications with System Load Coordinator **CAN NOT** be established, **THEN**

CONTINUE this Instruction. ________

Date________ Initials

5.5 Frequency Variation Response (continued)

CAUTION

The following guidance does not authorize exceeding any established parameter limitation for equipment or Unit operation. Normal trip and safety setpoints continue to apply.

[5] **CONTROL** Unit load per the following table:

IF frequency is	**THEN PERFORM** the following:
Greater than 60.50 Hz	**INITIATE** reactor or turbine trip, and **GO** TO E-0, Reactor Trip or Safety Injection or AOI-17, Turbine Trip (if below 50% load)
Greater than 60.15 Hz	**DROP** Unit load at 1% per minute UNTIL frequency less than 60.03 Hz
Between 60.15 Hz and 59.85 Hz	**GO** TO Step 5.5[1]
Less than 59.85 Hz	**RAISE** Unit load at 1% per minute to maximum of 100% UNTIL frequency greater than 59.98 Hz
Less than 57.50 Hz	**INITIATE** reactor or turbine trip, and GO TO E-0, Reactor Trip or Safety Injection or AOI-17, Turbine Trip (if below 50% load)

End of Section

Date________ **Initials**

5.6 Operating with Turbine Controls in Manual Mode

NOTES

1) This section should only be used when the OPERATOR AUTO mode is malfunctioning and the turbine is online.
2) When the turbine controls are in MANUAL mode the active Turbine Manual buttons will be illuminated.
3) Turbine load changes immediately when a raise or lower button is pressed.
4) Brief momentary button presses are best for making small load changes.
5) Raising and Lowering load contained in steps 5.6[2] and 5.6[3] below may be used alternatively to achieve desired load.

[1] **IF** turbine controls are **NOT** in TURBINE MANUAL mode and TURBINE MANUAL mode is desired, **THEN**

PRESS TURBINE MANUAL button in TURBINE MODES group

[2] **INITIATE** load reduction by PERFORMING the following on the Turbine EHC panel

[2.1] (ρ) **MOMENTARILY PRESS** the lower button (GV) in the TURBINE MANUAL group.

[2.2] **MONITOR** REFERENCE DROP.

[2.3] **REPEAT** Steps 5.6[2.1] to 5.6[2.2] achieve desired load.

Date________ **Initials**

5.6 Operating with Turbine Controls in Manual Mode (continued)

CAUTION

Raise and Lower buttons operate Governor Valves at a rate of 33%/ minute. If Fast push button is also depressed at the same time the valve movement rate is 133.3%/ minute

[3] **INITIATE** load increase by PERFORMING the following on the Turbine EHC panel

[3.1] (ρ) **MOMENTARILY PRESS** the raise button (GV) in the TURBINE MANUAL group.

[3.2] **MONITOR** REFERENCE INCREASE.

[3.3] **REPEAT** Steps 5.6[3.1] to 5.6[3.2] achieve desired load.

[4] **IF** OPERATOR AUTO turbine control mode is desired,
THEN
PRESS OPER AUTO button in TURBINE MODES group. ________

End of Section

6.0 RECORDS

6.1 QA Records

The following documents are QA records and handled in accordance with the Document Control and Records Management (DCRM) program:

Completed Data Package

6.2 Non-QA Records

None

Source Notes
(Page 1 of 1)

Requirements Statement	Source Document	Implementing Statement
Nuclear Instrumentation Miscalibration	SOER 90-003	C.1
Coastdown of a Unit	INPO OER 89-3497	C.2
Nuclear Fuel Defects recommendation 2.C	SOER 90-002	C.3
Turbine operation in IMP IN/IMP OUT modes. DELETED on June 11,1996 per Westinghouse letter TG 96-031.	Westinghouse Ltr GP-89-155	C.4
Turbine low load/high back pressure operations	Westinghouse Advisory Ltr 86-02	C.5
Control rod mispositioning	SOER 84-02, Rec. 8	C.6
Decalibration Effects of Calorimetric Power Measurements on the NIS	Westinghouse Bulletin ESBU-TB-92-14-R1	C.7
Revise GOs to provide guidance to prevent exceeding (power) limits. Specify instruments to be monitored	WBPER960260	C.8
Corrective action to prevent missing surveillance requirements.	WBPER970101	C.9
Both WBN and SQN have experienced drift while on VPL.	WBPER 02-017251	C.10

Appendix A
(Page 1 of 1)
Reactivity Control Plan (Example Form)

Station: WBN Unit: 1 Cycle: 10 Burnup: 10,000 MWD/MTU Revision: 0

Preparer: ____________ / ________ Date

Reviewer: ____________ RXE / ________ Date

Approver: ____________ RXES or designee / ________ Date

Authorizer: ____________ Ops / ________ Date

RXE support required Onsite? ☑Yes ☐No Describe: ____________

Title of Reactivity Control Plan: **Downpower to 95% and Hold (8 hrs) MOL**

Assumptions:
1. Calculated volumes below assume Tave maintained on Tref.
2. Reactor is stable at 100% RTP.
3. Conditioned power level is at 100% and will not decrease during this ramp down, as the downpower lasts less than 24 hours. See TI-45

Major Steps:
1. **Ramp** down to 95% at 10%/hr.
2. **Hold reactor at 95% for 8 hours.**

Detailed Description:

NOTE: See attached plots.

NOTE: Allowing Tave drift will typically reduce the total amount of necessary boration and dilution.

NOTE: Use BEACONDH ICS Screen so long as DOGHOUSE ICS Screen shows AFD is within the +/- 3% band.

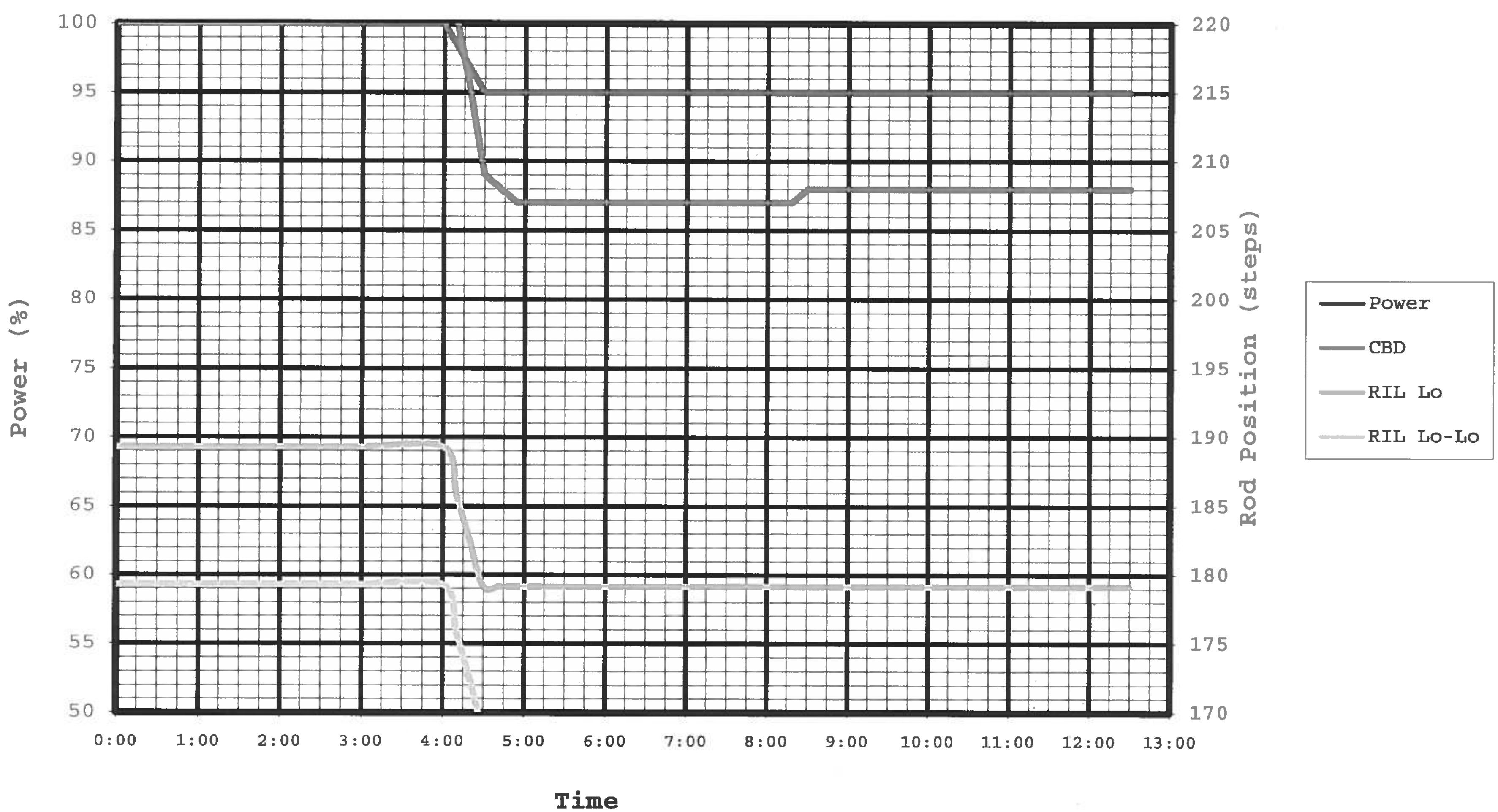
Ramp Down to 95%:
1. **BORATE** ~100 gal of **BA**.
2. **INSERT** CBD to ~207 steps to control AFD on target.

Hold at 95% (8 hrs):
1. **DILUTE** ~500 gal of **PW**.
2. **MAINTAIN** CBD at ~207 steps to control AFD on target.
3. **BORATE** ~10 gal of **BA** for Xenon decay.

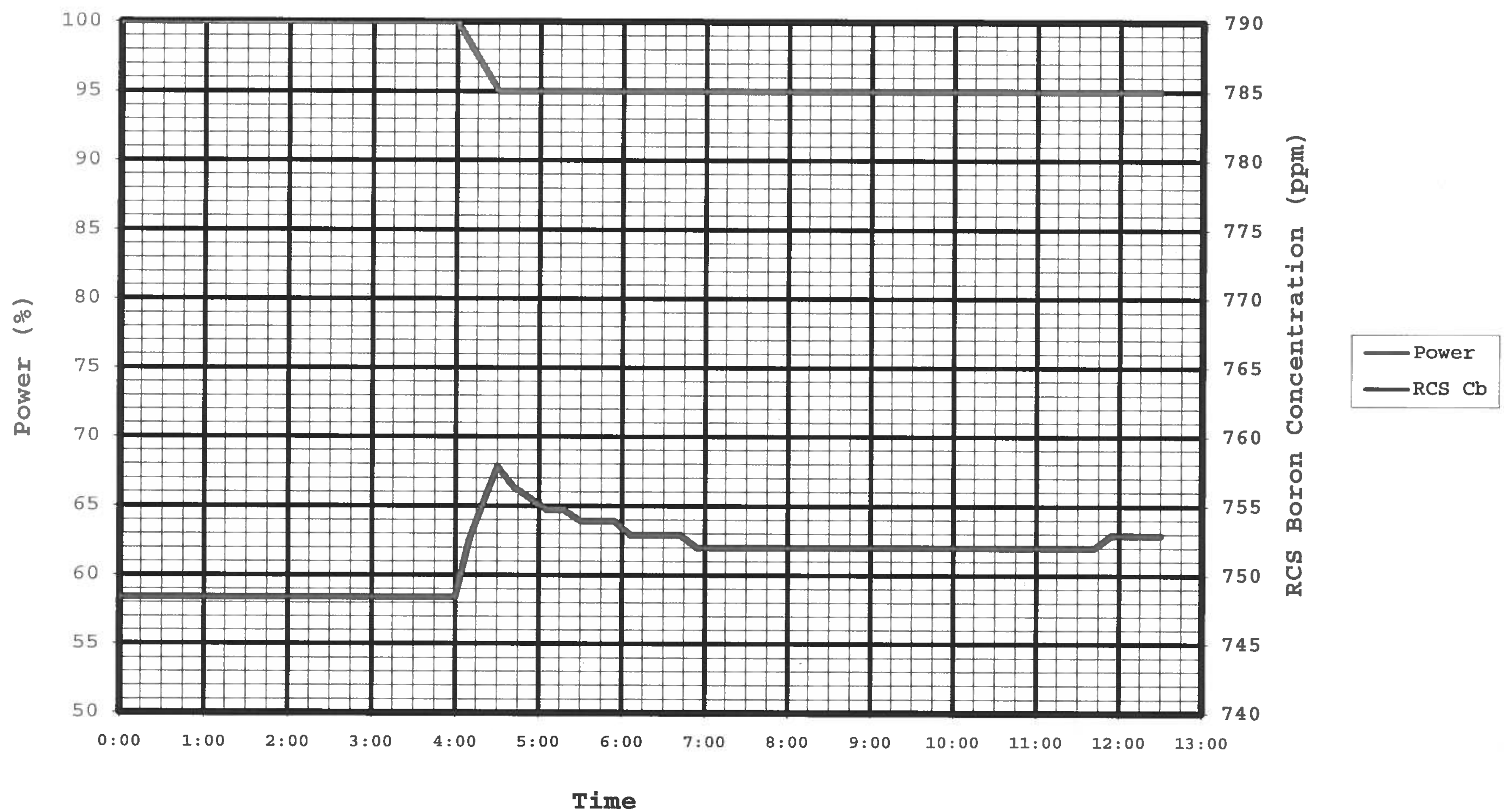
Critical Parameter	Limit	Required Action
Control Rod Height	> RIL Lo	**If** rods < RIL Lo, **then ENSURE** RCS borated amount specified in Step 1 **and WITHDRAW** rods.

Activated: ______________________/________ Terminated: ______________________/________
SM or US Date SM or US or RXE Date

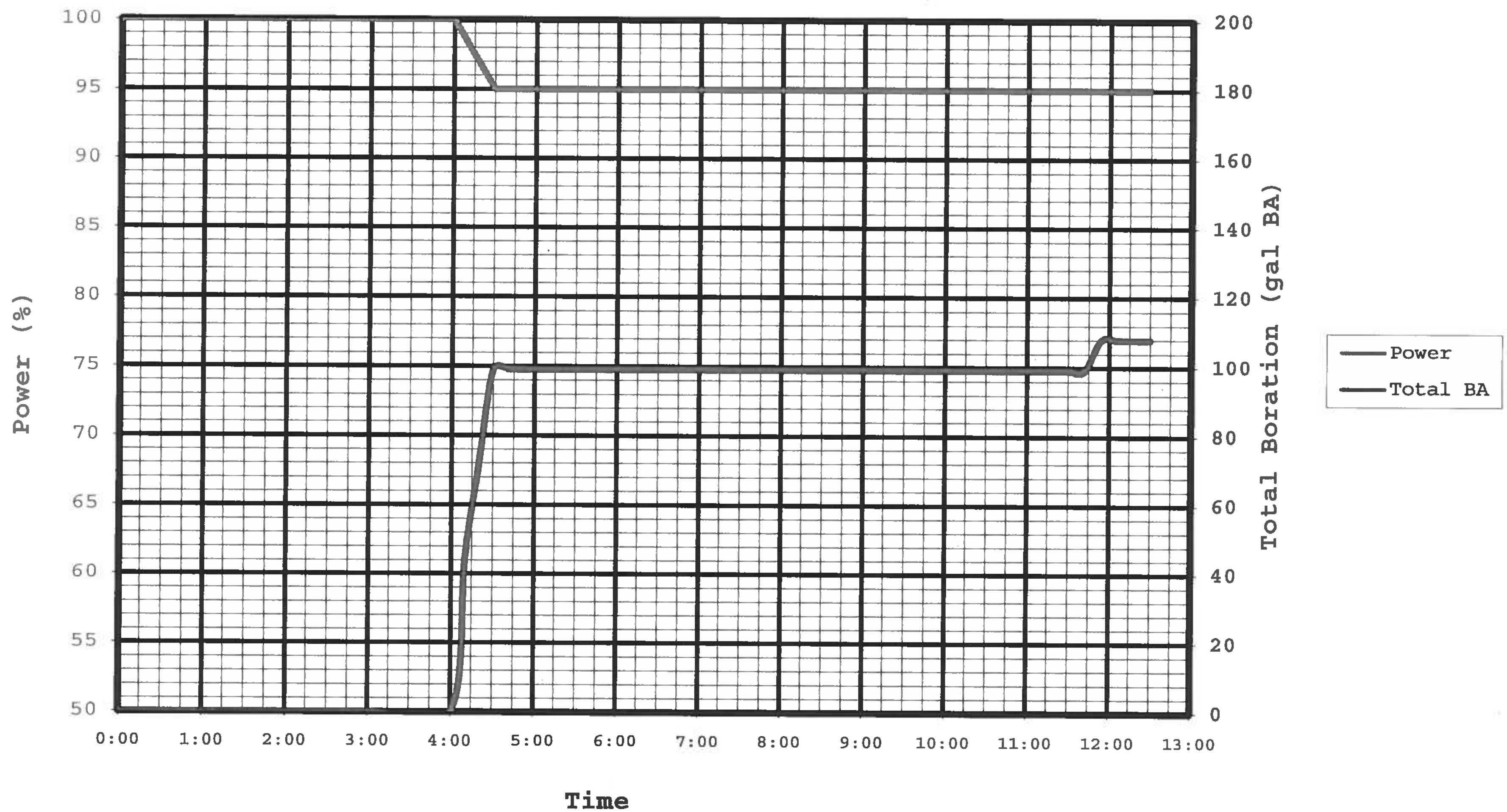
Downpower to 95% and Hold (8 hrs.) MOL



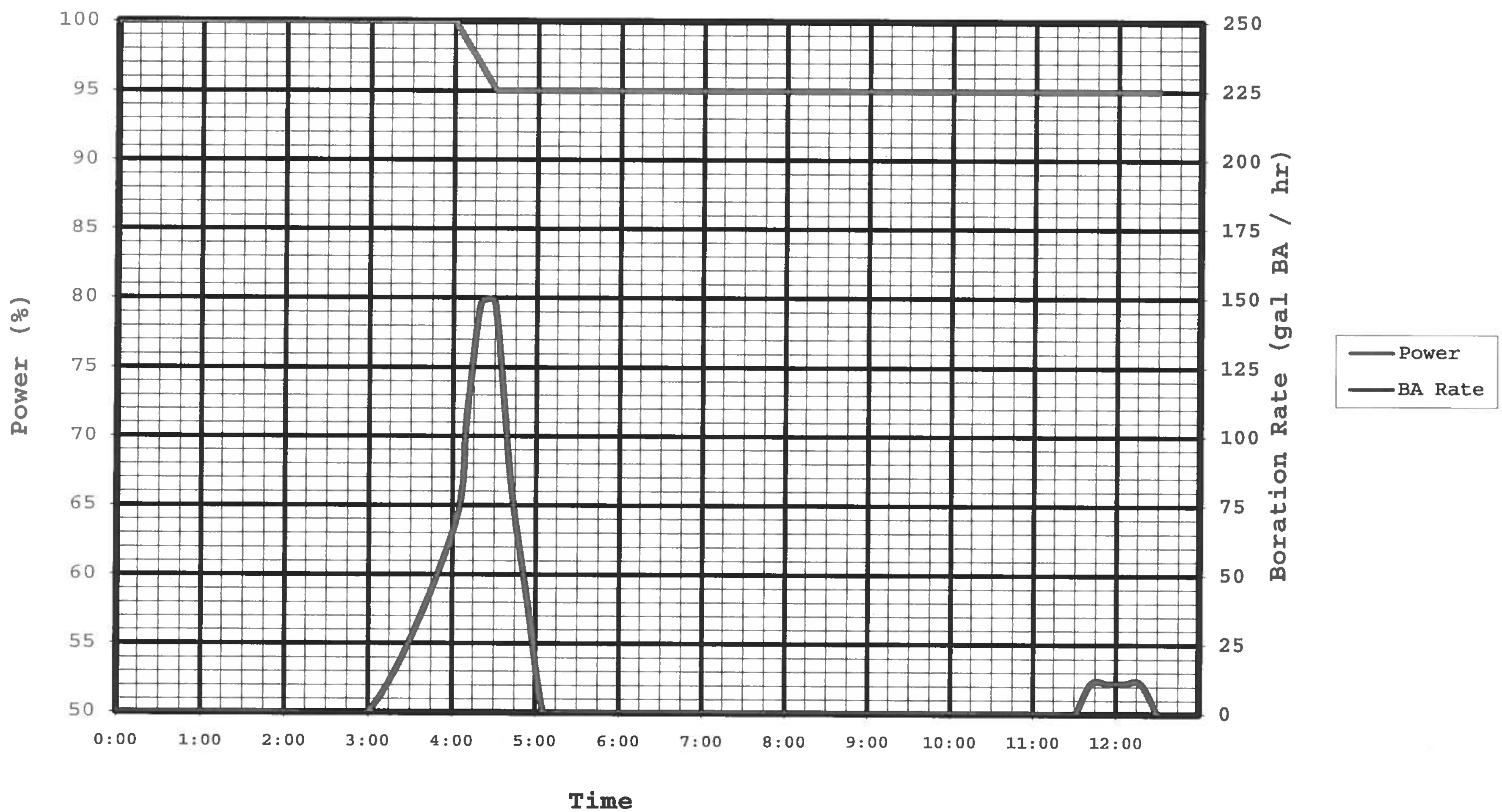
Downpower to 95% and Hold (8 hrs.) MOL



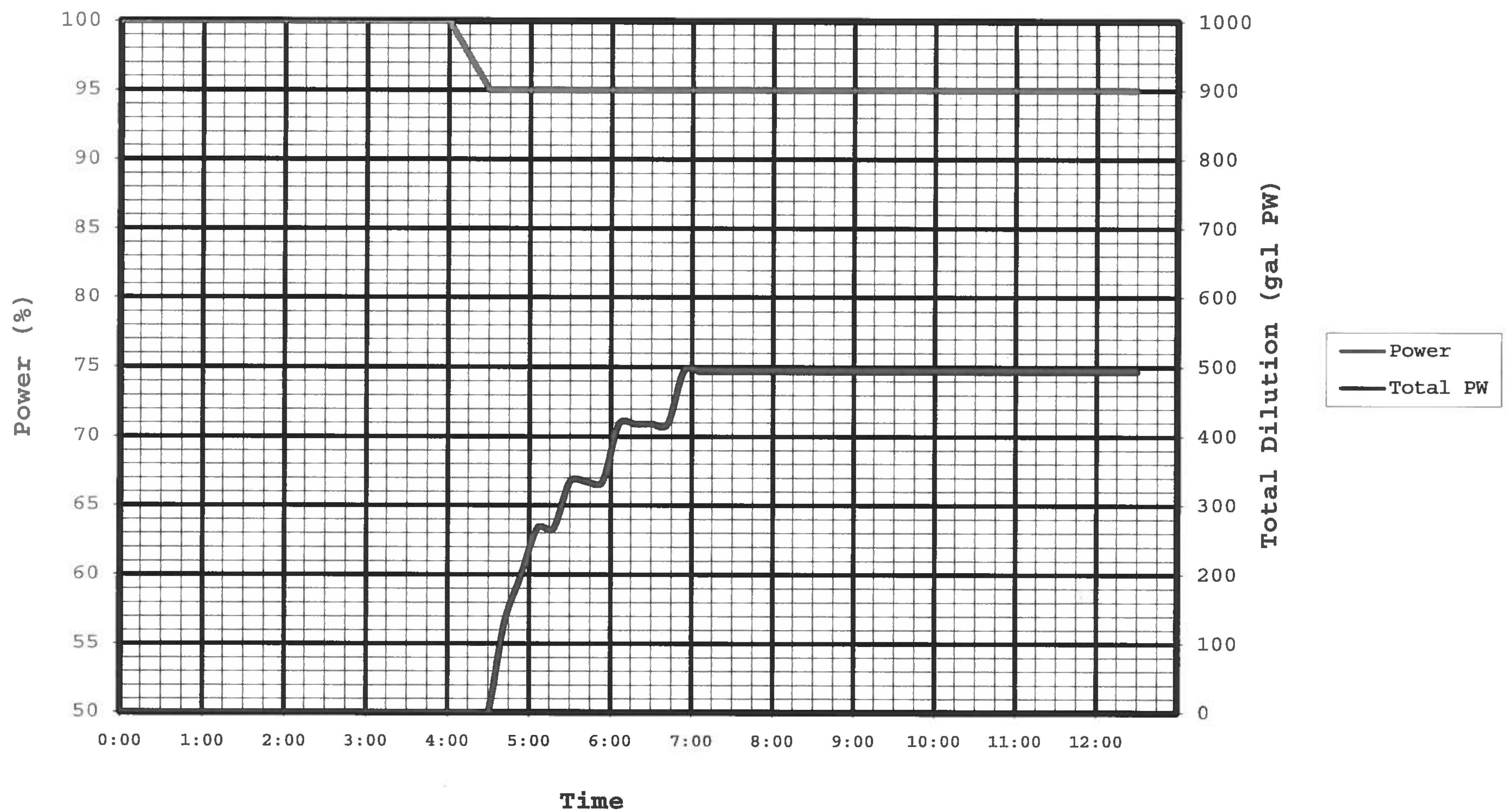
Downpower to 95% and Hold (8 hrs.) MOL



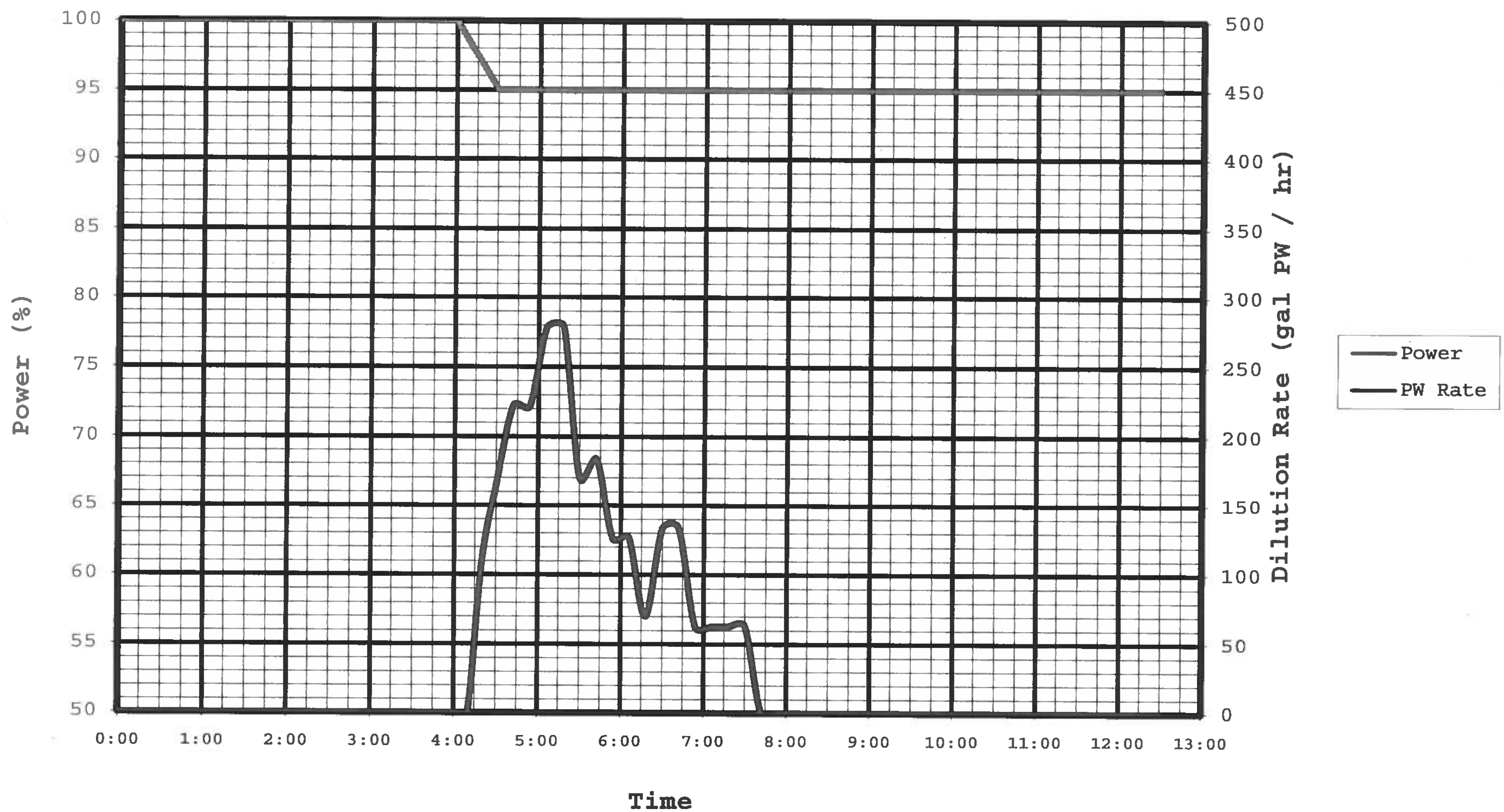
Downpower to 95% and Hold (8 hrs.) MOL



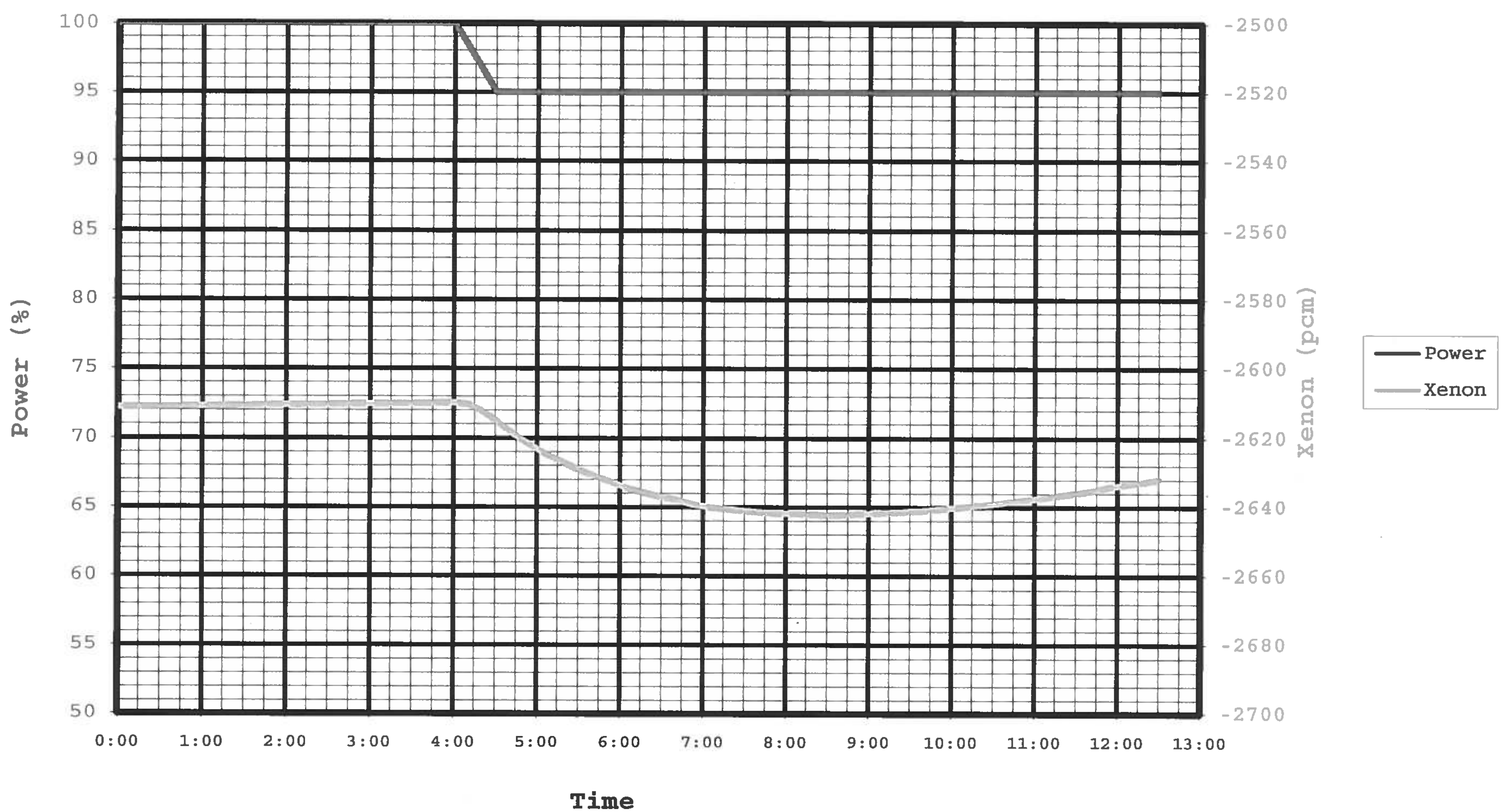
Downpower to 95% and Hold (8 hrs.)   MOL



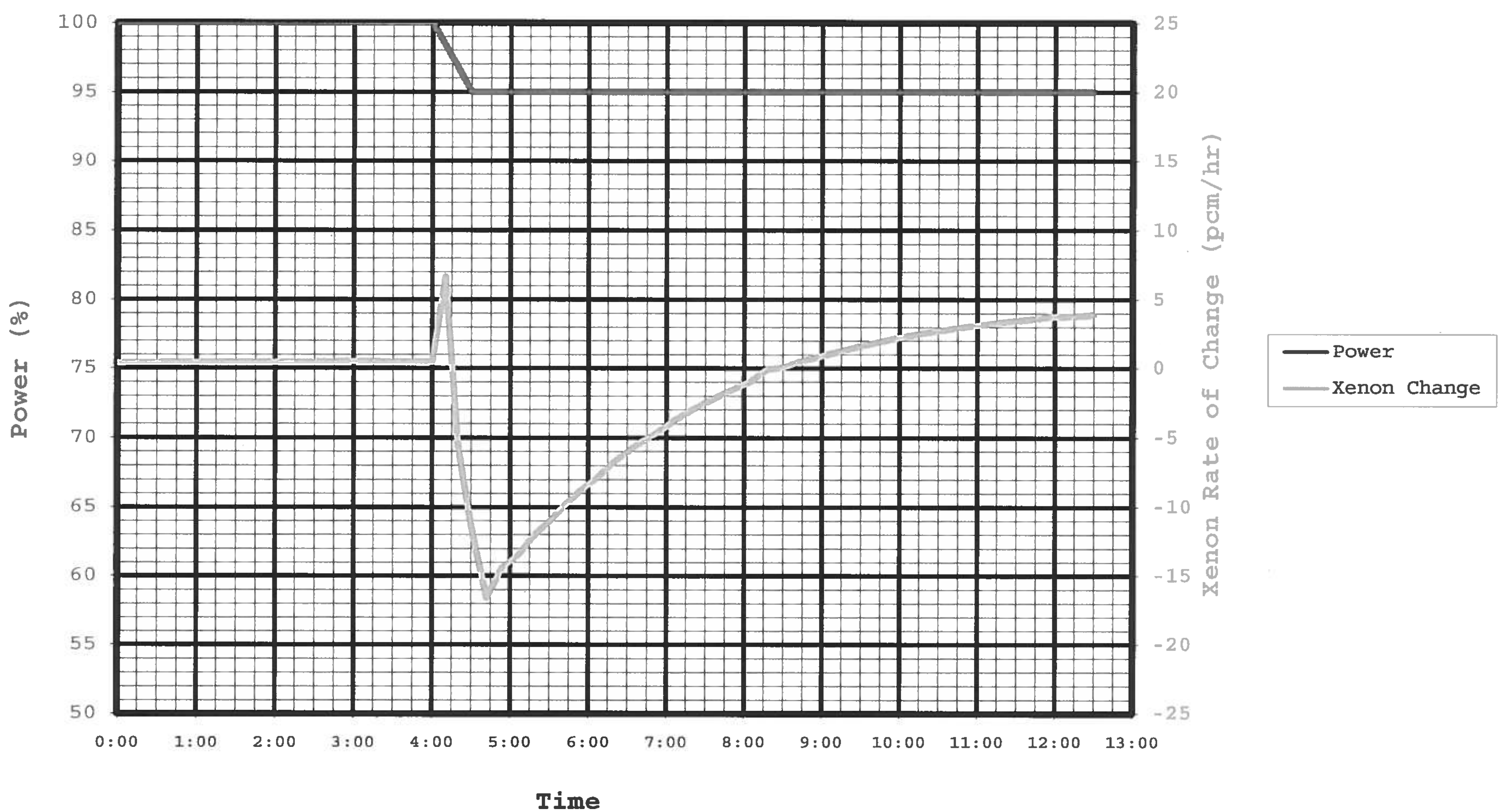
Downpower to 95% and Hold (8 hrs.) MOL



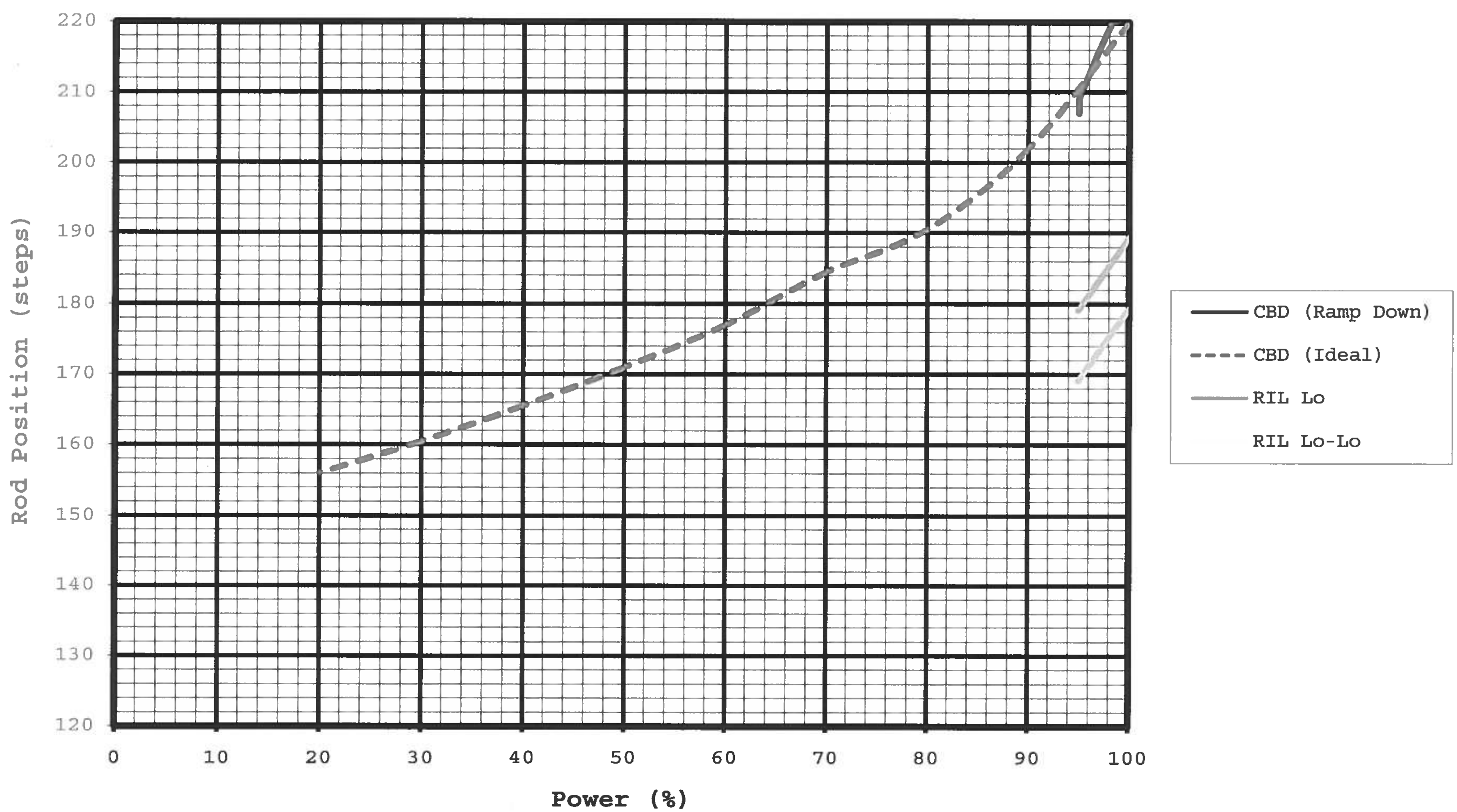
Downpower to 95% and Hold (8 hrs.) MOL



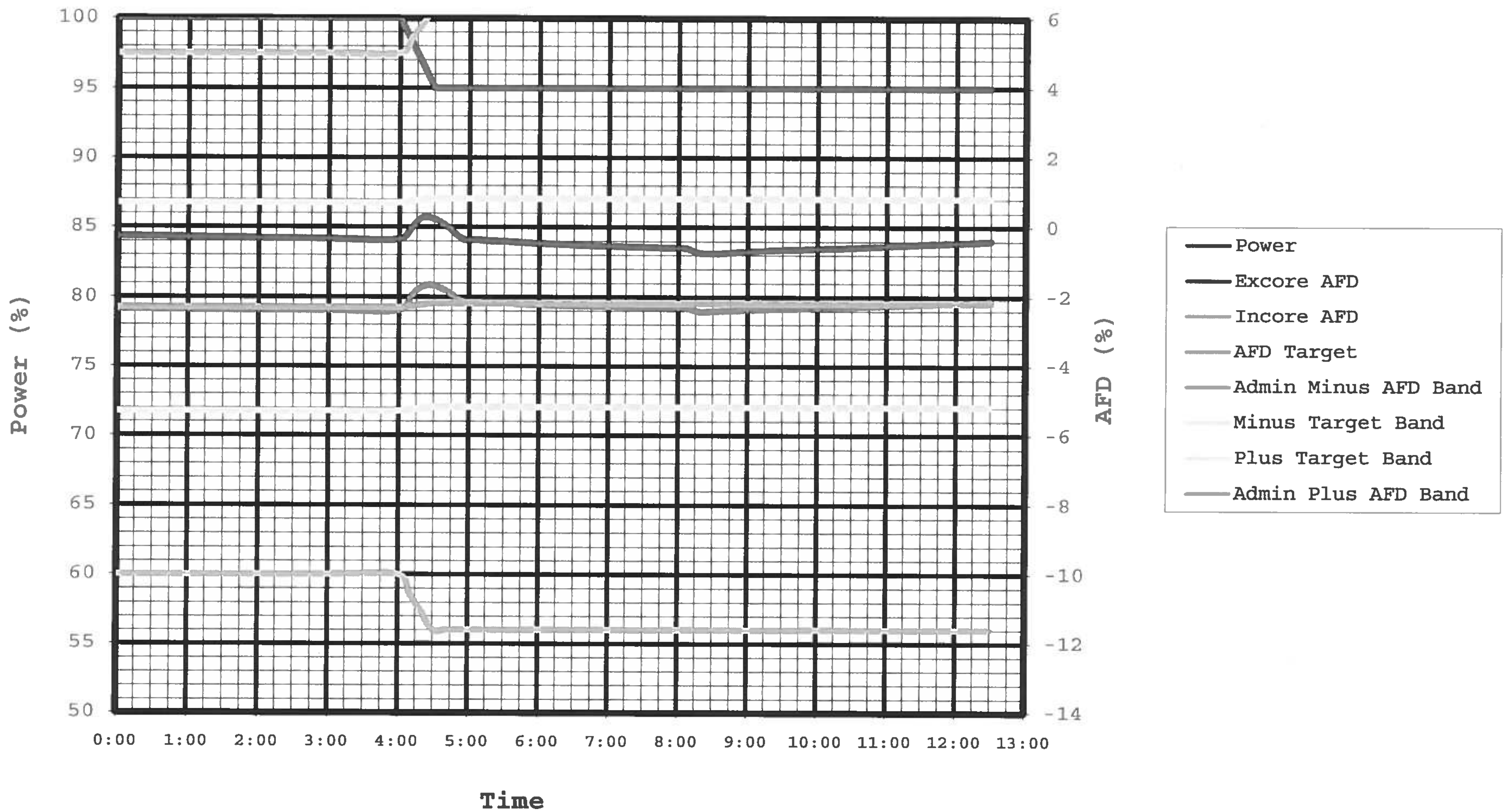
Downpower to 95% and Hold (8 hrs.) MOL



Downpower to 95% and Hold (8 hrs.) MOL



Downpower to 95% and Hold (8 hrs.) MOL



Facility:	**Watts Bar June 2011**	Scenario No.:4	Op Test No.: **1**
Examiners:	______	Operators:	______ **SRO**
	______		______ **RO**
	______		______ **BOP**

Initial Conditions: 95% power, MOL conditions. RCS boron concentration 756 ppm. Control Bank D rods are at 211 steps.

Turnover: 1B-B Motor Driven Auxiliary Feedwater pump is out of service to repair pump bearings. LCO 3.7.5.b was entered 4 hours ago. Repairs are expected to be completed in 20 hours During the previous shift the 1B Hotwell pump was removed from service to repair an oil leak. The repairs have been completed, and the 1B Hotwell pump has been returned to service. A return to full power is planned for this shift. Chemistry has requested that letdown flow be maintained at 75 gpm during the power escalation. A Severe Thunderstorm Warning has been issued for Rhea, Meigs, and McMinn Counties for the next 2 hours Train B/Channel II Work Week.

Event No.	Malf. No.	Event Type*	Event Description
1	n/a	R-RO N-SRO/BOP	Perform a power escalation to 100% power.
2	ni07c 120	C-RO TS-SRO	Power Range N43 fails high. Requires entry into AOI-4, "Nuclear Instrumentation Malfunctions." Requires a Tech Spec evaluation.
3	ch01d 15	TS-SRO	Containment Pressure transmitter 1-PDT-30-45 fails high. Requires a Tech Spec evaluation.
4	lic-68-339 1	C-RO	1-LIC-68-339 fails, causing 1-FCV-62-93, CHARG FLOW CNTRL VALVE to go to minimum flow position. Requires manual control of 1-FCV-62-93, and entry into ARI 108-A CHARGING FLOW HI/LO.
5	cc08a cc18b	C-BOP	1A Thermal Barrier Booster Pump trips and the 1B Thermal Barrier Booster Pump fails to auto start. Requires OR-14.10 evaluation.
6	th05b 2.5	C-RO	Steam generator tube leak develops on SG 2. Requires entry into AOI-33, "Steam Generator Tube Leak." Requires entry into AOI-39, "Rapid Load Reduction."
7	th05b 18	M-All	Steam generator tube leak progresses to a tube rupture. Requires reactor trip and safety injection. Requires entry into E-0, "Reactor Trip or Safety Injection," then a transition to E-3, "Steam Generator Tube Rupture."
8	si09a si09b	C-BOP	1-FCV-63-25, BIT OUTLET, and 1-FCV-63-26 BIT OUTLET fail to automatically open upon receipt of the safety injection signal. BOP must manually open the valves.

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

Scenario 4 - Summary

Initial Condition	95% power, MOL conditions. RCS boron concentration 747 ppm. Control Bank D rods are at 211 steps.

Turnover	1B-B Motor Driven Auxiliary Feedwater pump is out of service to repair pump bearings. LCO 3.7.5.b was entered 4 hours ago. Repairs are expected to be completed in 20 hours During the previous shift the 1B Hotwell pump was removed from service to repair an oil leak. The repairs have been completed, and the 1B Hotwell pump has been returned to service. A return to full power is planned for this shift. Chemistry has requested that letdown flow be maintained at 75 gpm during the power escalation. A Severe Thunderstorm Warning has been issued for Rhea, Meigs, and McMinn Counties for the next 2 hours Train B/Channel II Work Week.

Event 1	Start 1B Hotwell pump, and then perform a power escalation to 100% power.
Event 2	Power Range N43 fails high. Requires entry into AOI-4, "Nuclear Instrumentation Malfunctions." Requires a Tech Spec evaluation and entry into LCO 3.3.1, Reactor Trip System Instrumentation.
Event 3	Containment Pressure transmitter 1-PDT-30-45 fails high. Requires a Tech Spec evaluation and entry into LCO 3.3.2, Engineered Safety Feature Actuation System (ESFAS) Instrumentation.
Event 4	1-LIC-68-339 fails, causing 1-FCV-62-93, CHARG FLOW CNTRL VALVE to go to minimum flow position. Requires manual control of 1-FCV-62-93, and entry into ARI 108-A CHARGING FLOW HI/LO.
Event 5	1A Thermal Barrier Booster pump trips and the 1B Thermal Barrier Booster pump fails to auto start. Requires OR-14.10 evaluation.
Event 6	Steam generator tube leak develops on SG 2. Requires entry into AOI-33, "Steam Generator Tube Leak." Requires entry into AOI-39, "Rapid Load Reduction."
Event 7	Steam generator tube leak progresses to a tube rupture. Requires reactor trip and safety injection. Requires entry into E-0, "Reactor Trip or Safety Injection," then a transition to E-3, "Steam Generator Tube Rupture."
Event 8	1-FCV-63-25, BIT OUTLET, and 1-FCV-63-26 BIT OUTLET fail to automatically open upon receipt of the safety injection signal. BOP must manually open the valves.

Scenario 4 - Critical Task Summary

Critical Task 1	Align the boron injection tank to establish flow from at least one centrifugal charging pump (high-head ECCS pump) before transition out of E-0, "Reactor Trip or Safety Injection."
Critical Task 2	Isolate steam flow from the ruptured SG prior to initiating cooldown using the intact SGs.

Watts Bar Nuclear Plant
06-2011 NRC Examination Scenario 4
Simulator Console Operators Instructions

SIMULATOR SETUP INFORMATION

1. ENSURE NRC Examination Security has been established.

2. RESET to Initial Condition 345 by performing the following actions:

   a. Select ICManager on the THUNDERBAR menu (right hand side of Instructor Console Screen).

   b. Locate IC# 345.

   c. Right "click" on IC# 345.

   d. Select Reset on the drop down menu.

   e. Right "click" on RESET.

   f. Enter the password for IC 345.

   g. Select "Yes" on the INITIAL CONDITION RESET pop-up window.

   h. Perform SWITCH CHECK.

3. SELECT Director on the THUNDERBAR menu (right hand side of Instructor Console Screen).

4. ENSURE the following information appears on the Director Screen:

	Key	Description	Type	Event	Delay	Inserted	Ramp	Initial	Final	Value
	hs-3-128a-1	01170 aux fw pmp b-b motor sw(green)	O		00:00:00	00:00:00	00:00:00		Off	Off
	hs-3-128a	hs-3-128a auxiliary feedwater pump b-b motor sw	O		00:00:00	00:00:00	00:00:00		ptlock	start
	fw07b	electric afw pump b trip	M		00:00:00	00:00:00	00:00:00		Active	Active
	hs-3-359-2	hs-3-355 indicating lights	O		00:00:00	00:00:00	00:00:00		Off	Off
	hs-3-359-1	hs-3-355 indicating lights	O		00:00:00	00:00:00	00:00:00		Off	Off
	hs-3-359	Intentionally left blank	O		00:00:00	00:00:00	00:00:00		close	close

SIMULATOR SETUP INFORMATION

	Key	Description	Type	Event	Delay	Inserted	Ramp	Initial	Final	Value
	cc18b	block auto start thermal barrier booster pmp 1b-b	M		00:00:00	00:00:00	00:00:00		Active	Active
	si09a	failure of auto si for fcv-63-26	M		00:00:00	00:00:00	00:00:00		Active	Active
	si09b	failure of auto si for fcv-63-25	M		00:00:00	00:00:00	00:00:00		Active	Active
	ni07c	pr channel output signal failure pr chnl 3	M	2	00:00:00		00:00:00		120	96.6768
	ch01d	containment pressure transmitter failure pdt-3-45	M	3	00:00:00		00:00:00		15	0.000010
	lic-68-339	02350 przr level controller ai	O	4	00:00:00		00:00:00		1	3
	cc08a	thermal barrier booster pump a trip	M	5	00:00:00		00:00:00		Active	InActive
	th05b	steam generator tube failure sg #2	M	6	00:00:00		00:00:00		2.5	0

5. **Place simulator in RUN and acknowledge any alarms.**

6. **ENSURE Hold Order Tags are hung on 1-HS-3-128A, B-B AFW PMP and 1-HS-3-359, M-D AFWP 1B RECIRC VLV. 1-HS-3-128A, B-B AFW PMP must be in the "Stop, PULL-TO-LOCK' position.**

8. **ENSURE the "Train B Week - Channel II" sign is placed on 1-M-30.**

9. **Place simulator in FREEZE.**

10. **ENSURE Watts Bar Nuclear Plant Unit 1 Reactivity Briefing Book (Simulator Copy) MOL (Middle Of Life) is updated and on the desk, and that the MOL placards are on 1-M-6, below the Boric Acid and Primary Water Integrators. ENSURE Reactivity Plan for power maneuver is available to the crew.**

11. **WHEN prompted by the Chief Examiner, place the Simulator in RUN.**

Exam Event No.	Simulator Event No.	Description/Role Play
2		Power Range N43 fails high. ***ROLE PLAY: When contacted as Work Control, the Console Operator will repeat back request to prepare a package to troubleshoot and repair PR N43.*** ***ROLE PLAY: If contacted as Work Control, acknowledge request for performance of IMI-160.*** ***ROLE PLAY: When contacted as Operations Duty Manager, the Console Operator will repeat back information provided for N43 failure.*** ***ROLE PLAY: When contacted as Reactor Engineering, the Console Operator will repeat back information provided for N43 failure.***
3		Containment Pressure transmitter 1-PDT-30-45 fails high. ***ROLE PLAY: When contacted as Work Control, the Console Operator will repeat back request to prepare a package to troubleshoot and repair 1-PD-30-45, Containment Pressure transmitter.*** ***ROLE PLAY: If contacted as Work Control, acknowledge request for performance of IMI-160. Channel will be placed in BYPASS.***
4		1-LIC-68-339 fails, causing 1-FCV-62-93, CHARG FLOW CNTRL VALVE to go to minimum flow position. ***ROLE PLAY: When contacted as Work Control, the Console Operator will repeat back request to prepare a package to troubleshoot and repair 1-FCV-96-93A controls.***
5		1A Thermal Barrier Booster pump trips and the 1B Thermal Barrier Booster pump fails to auto start. ***ROLE PLAY: If dispatched as the Auxiliary Building AUO, report that the pump was stopped inadvertently when a Unit 2 clearance was being hung.*** ***ROLE PLAY: When contacted as Work Control, the Console Operator will repeat back request to prepare a troubleshooting and repair package to determine cause of 1B Thermal Barrier Booster pump auto start failure.***

Exam Event No.	Simulator Event No.	Description/Role Play
6		Steam generator tube leak develops on SG 2. ***ROLE PLAY: If requested as Chemistry, repeat back request to evaluate the need to evaluate appropriate blowdown routing.*** ***ROLE PLAY: If contacted as Load Coordinator (per AOI-39) repeat back information provided by the SRO.*** ***ROLE PLAY: When contacted as Chemistry, acknowledge request for sampling of all steam generators for activity. Wait 10 minutes from the time the call is received then report that SG 2 has high activity.*** ***ROLE PLAY: When contacted as Radiation Protection, acknowledge request to survey the secondary plant (steam lines, blowdown lines, etc.) Wait 10 minutes from the time the call is received then report that the surveys of the main steam lines indicate the SG 2 has high activity.***
		E-0, Reactor Trip or Safety Injection," Appendix A and B performance. ***ROLE PLAY: When contacted as an AUO, acknowledge request to stop sample pumps for 1-RM-90-106 and 1-RM-90-112.*** ***ROLE PLAY: As Control Building AUO, acknowledge request to perform E-0 Attachment 1, "Ice Condenser AHU Breaker Operation," then report Attachment 1 complete.***

Op Test No.:	NRC	Scenario #	4	Event #	1	Page	1 of 42
Event Description:	Perform a power escalation to 100% power.						

Time	Position	Applicant's Actions or Behavior
		EXAMINER: The following actions are taken from GO-4, "Normal Power Operation" Section 5.2, "Unit Startup from 30% to 100% Reactor Power," beginning at Step 46. The SRO may direct that a dilution be started prior to the beginning of GO-4 actions.
		EXAMINER: The SRO may elect to perform the power escalation using MANUAL rod control. SOI-85.01, "Control Rod Drive and Indication System," Section 5.6, "Manual Rod Control With Reactor At Power," is includes as Attachment 1.
		SOI-62.02 — **The following actions are taken from SOI-62.02, "Boron Concentration Control," Section 6.6, "Minor Dilution."**
		NOTES 1) Section 6.6, Minor Dilution, may be reproduced, laminated, displayed, reused, etc. as desired. 2) Minor Dilution is defined as the addition of Primary Water done several times each shift to compensate for fuel burn-up, and maintain Tavg on program.
	RO	[1] **ENSURE** 1-HS-68-341H, BACKUP HEATER C, is ON, to equalize Pzr-RCS CB. ***RO determines that that the GREEN indicating light is DARK and the RED indicating light is LIT on 1-HS-68-341H, BACKUP HEATER C.***
	RO	[2] **ADJUST** 1-FQ-62-142, PW BATCH COUNTER, for required quantity. ***From the TI-7.012 "Reactivity Control Plan" provided, RO enters between 150 and 200 gallons of primary water in the batch counter to accomplish a 1% power change.***
	RO	[3] **PLACE** 1-HS-62-140B, VCT MAKEUP MODE in DIL. ***RO rotates 1-HS-62-140B, VCT MAKEUP MODE from the AUTO position three positions to the right to the DIL position.***
	RO	[4] **(ρ) TURN** 1-HS-62-140A, VCT MAKEUP CONTROL, to START. [4.1] **CHECK** Red light is LIT. ***RO rotates 1-HS-62-140A VCT MAKEUP CONTROL to the right to the START position, and allows the switch to return to the mid position. RO observes the RED indicating light LIT in 1-HS-62-140A.***

Op Test No.:	NRC	Scenario #	4	Event #	1	Page	2	of	42

Event Description: Perform a power escalation to 100% power.

Time	Position	Applicant's Actions or Behavior
	RO	[5] **MONITOR** the following parameters: **Instrument** / **Location** / **Parameters** 1-PI-62-122 / 1-M-6 / VCT PRESS 1-LI-62-129A / 1-M-6 / VCT LEVEL 1-FI-62-142 / 1-M-6 / PW TO BLENDER FLOW 1-FQ-62-142 / 1-M-6 / PW BATCH COUNTER 1-FQ-62-139 / 1-M-6 / BA BATCH COUNTER
	RO	[6] **WHEN** dilution is COMPLETE, AND 1-FCV-62-128 is closed, **THEN PLACE** 1-HS-62-140B, VCT MAKEUP MODE, in AUTO. ***RO rotates 1-HS-62-140B, VCT MAKEUP MODE from the DIL position three positions to the left to the AUTO position.***
	RO	[7] **TURN** 1-HS-62-140A, VCT MAKEUP CONTROL, to START. [7.1] **CHECK** Red light is LIT. ***When the dilution stopped automatically, 1-HS-62-140A VCT MAKEUP CONTROL received a STOP signal. To enable AUTO makeup, 1-HS-62-140A VCT MAKEUP must be rotated the right to the START position.***
	RO	[8] **IF** desired to reduce VCT level, **THEN GO TO** Section 8.5, VCT Level Reduction.

Op Test No.: NRC Scenario # 4 Event # 1 Page 3 of 42

Event Description: Perform a power escalation to 100% power.

Time	Position	Applicant's Actions or Behavior
GO-4		**The following actions are taken from GO-4, "Normal Power Operation" Section 5.2, "Unit Startup from 30% to 100% Reactor Power," beginning at Step 46.**
	RO	[46] **CONTINUE** ascension to 100% power by performing the following: [46.1] **IF** during any of the following steps the REFERENCE changes in an undesired manner, **THEN ADJUST** VPL to stop turbine load rise **OR PUSH** TURBINE MANUAL to place the turbine control mode in manual mode and **PROCEED** to section 5.6 [46.2] **CHECK** VALVE POS LIMIT light is **NOT** LIT. [46.3] **SET** VALVE POSITION LIMIT at 100% or ≤ to 5% above the Gov Control Indication. [46.4] **SET** LOAD RATE at predetermined value. ***For a load escalation of 10% in an hour, the LOAD RATE will be set at 1%, the lowest value that can be selected.*** [46.5] **PUSH** REFERENCE CONTROL Δ (raise) button to set desired load in SETTER display. ***The BOP will depress the REFERENCE CONTROL Δ (raise) button and raise the SETTER display by 1%.***

NOTE

The Conditioned Power Level (CPL) needs to be tracked for ramp rate considerations.

	RO	[47] **DETERMINE** the CPL and ramp rate restrictions from TI-45, Determination of Preconditioned Reactor Power, AND **RECORD** section reviewed / restrictions in narrative log: **RECORD** section reviewed / restrictions in table below:

NOTES

1) RCS should be diluted to raise TAVG, then Turbine load raised along with TAVG. Control rods will be used along with dilution to maintain ΔI and if needed for temperature.
2) During power ascension, #1 bearing has experienced higher than normal metal temperature but never exceeded the alarm set point. The cause of the elevated temperature is due to the partial arc admission design of the HP turbine and the less than optimal alignment between the HP turbine and the "A" LP turbine. Although this condition is expected, operators should closely monitor #1 bearing metal temperature during power ascensions and take appropriate corrective actions as required. Contact the Predictive Maintenance Group for additional guidance.

Op Test No.:	NRC	Scenario #	4	Event #	1	Page	4 of 42
Event Description:	Perform a power escalation to 100% power.						

Time	Position	Applicant's Actions or Behavior
	RO	[47.1] **IF** returning to this step from AOI-11, Loss of Condenser Vacuum, **ENSURE** Operations manager approval is obtained prior to increasing load. ***SRO determines that this step is not applicable.*** [47.2] (p) **PUSH** GO button. [47.3] **MONITOR** Generator Megawatts RISING. [47.4] **CHECK** that load rise has **STOPPED** when reference display equals setter **OR IF** desired to stop the load change, **THEN STOP** the load change by depressing the HOLD pushbutton ***BOP monitors load rise and checks that the load change stops when the REFERENCE and SETTER displays are matched.*** [47.5] **WHEN** desired to resume the load change, **THEN** (p) **PRESS** the GO push button and **CONTINUE** to monitor load. ***Given a LOAD ESCALATION rate of 10% in one hour, the steps will be repeated approximately once every 6 minutes.***
NOTE Guidance given in 1-PI-OPS-1-MCR, Plant Instruction - Main Control Room, should be used for Reactor power indication.		
	RO	[47.6] **MONITOR** NIS, ΔT and ICS calorimetric computer points as applicable.
NOTE Operation with the VALVE POS LIMIT light LIT is NOT desired. However, operation with VALVE POS LIMIT light LIT is acceptable if unsatisfactory load swings are experienced.		
	BOP	[48] **IF** desired to place Turbine on the Valve Position Limiter, as the unit approaches full power, and Turbine load set for 100% power, **THEN** [48.1] **SLOWLY** and CAUTIOUSLY **PULSE** the VALVE POSITION LIMIT in the LOWER direction while monitoring Megawatts for a drop and the VALVE POS LIMIT light to ILLUMINATE [48.2] **WHEN** VALVE POS LIMIT light ILLUMINATES, **THEN STOP** limiter adjustment.
Cue Console Operator to insert Event 2.		

Op Test No.: NRC	Scenario # 4	Event # 2	Page 5 of 42

Event Description: Power Range N43 fails high. Requires entry into AOI-4, "Nuclear Instrumentation Malfunctions." Requires a Tech Spec evaluation.

Time	Position	Applicant's Actions or Behavior
Indications: 83-A, POWER RANGE OVERPOWER ROD STOP 83-E, POWER RANGE CHANNEL DEVIATION 115-C, POWER RANGE FLUX HI		
	RO	Diagnoses and announces the failure of PR channel N43 high.
	RO	After confirming that there is no other reason for rod motion, may place Rod Control in MANUAL.
	RO	May stop any dilution in progress.
	BOP	May stop any turbine load increase in progress.
	SRO	May enter and direct actions of AOI-2, "Malfunction of Reactor Control System."
	SRO	Enters and directs actions of AOI-4, "Nuclear Instrumentation Malfunctions."
ARI 83-A		**The following actions are taken from ARI 83-A, POWER RANGE OVERPOWER ROD STOP.**
	RO	[1] **ENSURE** reactor power less than or equal to 100% and stable.
	RO	[2] **IF** power range channel has failed, **THEN REFER TO** AOI-4, NUCLEAR *INSTRUMENTATION MALFUNCTIONS*.
	RO	[3] **NOTIFY** Work Control to initiate corrective action, if necessary.
ARI 83-E		**The following actions are taken from ARI 83-E, POWER RANGE CHANNEL DEVIATION.**
	RO	[1] **IF** dropped or ejected rod exists, **THEN REFER TO** AOI-2, *MALFUNCTION OF REACTOR* CONTROL SYSTEM.
	RO	[2] **IF** channel is in TEST, **THEN ENSURE** Comparator Channel Defeat Switch for the channel is in TEST.
	RO	[3] **IF** a power range channel has failed, **THEN GO TO** AOI-4, NUCLEAR *INSTRUMENTATION MALFUNCTION*.
	RO	[4] **IF** a Quadrant Power Tilt exists, **THEN REFER TO** Tech Specs.

Op Test No.: NRC	Scenario # 4	Event # 2			Page 6 of 42		

Event Description: Power Range N43 fails high. Requires entry into AOI-4, "Nuclear Instrumentation Malfunctions." Requires a Tech Spec evaluation.

Time	Position	Applicant's Actions or Behavior
AOI-2		**The following actions are taken from AOI-2, "Malfunction of Reactor Control System," Section 3.2, "Continuous Rod Withdrawal/Insertion."**
	RO	1. **PLACE** control rods in MANUAL.
	RO	2. **CHECK** rod motion STOPPED.
	RO	3. **MAINTAIN** T-avg on PROGRAM. (Reference Attachment 1) • **USE** control rods. OR • **ADJUST** turbine load.
	RO	4. **CHECK** loop T-avg channels NORMAL.
	RO	5. **CHECK** Auct Tavg NORMAL on 1-TR-68-2B.
	RO	6. **CHECK** NIS power range channels NORMAL.
	RO	6. **RESPONSE NOT OBTAINED:** **GO TO** AOI-4, Nuclear Instrumentation Malfunction.
AOI-4		**The following actions are taken from AOI-4, "Nuclear Instrumentation Malfunctions," Section 3.4, "Power Range Monitor malfunction."**
	RO	1. **PLACE** control rods in MANUAL. ***RO may have already placed rods in MANUAL to stabilize the plant.***
	RO	2. **CHECK** rod motion STOPPED.
	RO	3. **CHECK** N41 Normal
	RO	4. **CHECK** N42 Normal
	RO	5. **CHECK** N43 and N44 NORMAL ***RO determines that N43 has failed high.***
	RO	5. **RESPONSE NOT OBTAINED:** **IF** N43 or N44 failed HIGH **AND** Bypass FW reg valves controlling S/G level, **THEN:** **PLACE** all Bypass FW reg. valves in MANUAL. **ADJUST** FW as required to maintain S/G levels on program. ***Since bypass regulating valves are not in service, the SRO continues to Step 6.***

Op Test No.:	NRC	Scenario #	4	Event #	2	Page	7	of	42

Event Description: Power Range N43 fails high. Requires entry into AOI-4, "Nuclear Instrumentation Malfunctions." Requires a Tech Spec evaluation.

Time	Position	Applicant's Actions or Behavior
	RO	6. **IF** Main FW reg valves controlling S/G level, **THEN:** a. **ENSURE** S/G Main FW reg valve level demand and level are matched. b. **PLACE** affected S/G Main FW reg valves in AUTO. ***Power Range N43 does not have an input to the main feed regulating valves, so the SRO continues to NOTE prior to Step 7.***

NOTE

Control rod withdrawal may not be possible if a PRM has failed high due to the 103% Rod Withdrawl Stop (C-2) (Annunciator window 83-A).

Time	Position	Applicant's Actions or Behavior
	RO	7. **MAINTAIN** T-avg and T-ref within 3°. ***Since N43 has failed high, rod withdrawal is blocked until N43 is removed from service. Adjustments must be made by changing turbine load.***
	RO	8. **ENSURE** 1-NR-92-145 recording an operable power range channel. ***RO utilizes the touch screen associated with 1-NR-92-145 to ensure that N43 is NOT selected.***

NOTE

Inputs to 1-TR-68-2A include power range monitor, pressurizer pressure, ΔT and Tavg. Selection of an operable channel should consider other failures in addition to the failed power range monitor channel.

Time	Position	Applicant's Actions or Behavior
	RO	9. **ENSURE** 1-TR-68-2A placed to operable ΔT/OTΔT/OPΔT channel using 1-XS-68-2B, ΔT RCDR TR-68-2A LOOP SELECT [1-M-5]. ***1-TR-68-2B, ΔT RCDR TR-68-2A LOOP SELECT, is in the LOOP 1 position.***
	RO	10. **DEFEAT** affected PRM functions: • **REFER TO** Attachment 1, PRM Function At NIS Rack.

EXAMINER: The following actions are taken from AOI-4, "Nuclear Instrumentation Malfunctions," Attachment 1, "PRM Function at NIS Rack."

NOTE

The following annunciators may be affected by defeating a PRM channel:

- [66-C, 67-C, 68-C, 69-C] N-(#) OVERPOWER ROD STOP BYPASSED.
- [82-E] NIS CHANNEL IN TEST.
- [83-A] POWER RANGE OVERPOWER ROD WD STOP.
- [83-E] POWER RANGE CHANNEL DEVIATION.
- [115-C] POWER RANGE FLUX HI.
- [115-E] POWER RANGE FLUX RATE HI.

Op Test No.: NRC Scenario # 4 Event # 2	Page 8 of 42
Event Description:	Power Range N43 fails high. Requires entry into AOI-4, "Nuclear Instrumentation Malfunctions." Requires a Tech Spec evaluation.

Time	Position	Applicant's Actions or Behavior
EXAMINER: In the subsequent steps, the "failed channel" position corresponds to N43.		
	RO	A. **PERFORM** the following steps for the affected PRM: 1. **PLACE** DETECTOR CURRENT COMPARATOR switch for UPPER SECTION to failed channel. ***RO rotates the UPPER SECTION switch from the NORMAL position to the right to the PRN43.*** 2. **PLACE** DETECTOR CURRENT COMPARATOR switch for LOWER SECTION to failed channel. ***RO rotates the LOWER SECTION switch from the NORMAL position to the right to the PRN43.***
NOTE On the following step, annunciator window 83-A, POWER RANGE OVERPOWER ROD WD STOP will clear (if channel failure was high) and window 66-C, 67-C, 68-C OR 69-C, N-(#) OVERPOWER ROD STOP BYPASSED, will come into alarm depending on which channel is bypassed.		
	RO	3. **PLACE** ROD STOP BYPASS switch to failed channel. ***RO rotates the ROD STOP BYPASS switch from the OPERATE position to the right to the BYPASS PR N43 position.***
	RO	4. **PLACE** POWER MISMATCH BYPASS switch to failed channel. ***RO rotates the POWER MISMATCH BYPASS switch from the OPERATE position to the right to the BYPASS PR N43 position.***
NOTE On the following step, annunciator window 83-E, POWER RANGE CHANNEL DEVIATION, will clear and annunciator window 82-E, NIS CHANNEL IN TEST, will come into alarm.		
	RO	5. **PLACE** COMPARATOR CHANNEL DEFEAT switch to failed channel. ***RO rotates the COMPARATOR CHANNEL DEFEAT switch from the NORMAL position to the right to N43.***
NOTE On the following step, annunciator window 115-E, POWER RANGE FLUX RATE HI, will clear if the positive rate trip light is LIT.		
	RO	6. **IF** POSITIVE RATE TRIP is LIT, **THEN RESET** RATE MODE switch. ***Positive Rate Trip light may NOT be LIT. If lit, RO locates the RATE MODE switch on 1-IDWR-92-N43A, POWER RANGE UPPER N43A and rotates the switch from the NORMAL position to the left to the RESET position. RO verifies that the "POSITIVE RATE TRIP" indicating light goes out.***

Op Test No.:	NRC	Scenario #	4	Event #	2	Page	9	of	42

Event Description: Power Range N43 fails high. Requires entry into AOI-4, "Nuclear Instrumentation Malfunctions." Requires a Tech Spec evaluation.

Time	Position	Applicant's Actions or Behavior
		EXAMINER: The following actions are taken from AOI-4, "Nuclear Instrumentation Malfunctions," after the completion of Attachment 1, beginning at Step 11.
	SRO	11. **IF** Bypass FW reg. valves are in MANUAL **AND** controlling S/G level, **THEN:** ***Since bypass regulating valves are not in service, the SRO continues to Step 12.***
		CAUTION **Allowing at least 5 minutes between any rod control input (i.e., T-avg, T-ref, or NIS) change and placing rods in AUTO, will help prevent undesired control rod movement.**
	RO	12. **WHEN** failed PRM defeated **AND** AUTO rod control desired, **THEN**: a. **ENSURE** T-avg and T-ref within 1°. b. **ENSURE** zero demand on control rod position indication [1-M-4]. c. **PLACE** control rods in AUTO. ***After time has elapsed, the RO determines that T-avg and T-ref within 1°, then places1-RBSS. ROD BANK SELECT in the AUTO position.***
	SRO	13. **INITIATE** repairs on failed channel. ***When contacted as Work Control, the Console Operator will repeat back request to prepare a package to troubleshoot and repair PR N43.***
	SRO	14. **NOTIFY** Work Control to have IM trip failed channel bistables. ***When contacted as Work Control, the Console Operator will repeat back request for performance of IMI-160.***
		CAUTION **Power fuses should not be removed during the performance of IMI-160 until affected S/G level controls are in manual at either the SG LEVEL - NIS BIAS controller(s) or the Main FW reg valve controllers.**
	SRO	15. **WHEN** notified bistables are tripped, **THEN CHECK** lights and alarms referenced in Appendix A are LIT.

Op Test No.: NRC Scenario # 4 Event # 2

Event Description: Power Range N43 fails high. Requires entry into AOI-4, "Nuclear Instrumentation Malfunctions." Requires a Tech Spec evaluation.

Time	Position	Applicant's Actions or Behavior
	SRO	16. **REFER TO** Tech Specs: 3.3.1-1, "Rx Trip System (RTS)" ***2.a. Power Range Neutron Flux - High*** ***Condition D. One Power Range Neutron Flux-High channel inoperable. Place channel in trip within 72 hours AND Reduce THERMAL POWER to ≤ 75% RTP within 78 hours; OR Place channel in trip within 72 hours AND Perform SR 3.2.4.2 every 12 hours OR be in Mode 3 within 78 hours.*** ***3.a. Power Range Neutron Flux Rate - High Positive Rate*** ***Condition E. With one channel inoperable, place the channel in trip within 72 hours OR be in Mode 3 in 78 hours.*** ***6. Overtemperature ΔT*** ***Condition W. Place channel in trip within 72 hours OR be in Mode 3 within 78 hours.*** ***16.c. Power Range Neutron Flux, P-8*** ***Condition S. With ONE channel inoperable, verify the interlock is in required state for existing unit conditions within 1 hour OR be in Mode 2 within 7 hours.*** ***16.d. Power Range Neutron Flux, P-9*** ***Condition S. With ONE channel inoperable, verify the interlock is in required state for existing unit conditions within 1 hour OR be in Mode 2 within 7 hours.*** ***16.e. Power Range Neutron Flux, P-10*** ***Condition R. With ONE channel inoperable, verify the interlock is in required state for existing unit conditions within 1 hour OR be in Mode 3 within 7 hours.*** 3.2.4 Quadrant Power Tilt Ratio (QPTR). ***SR 3.2.4.2 Verify QPTR is within limit using the movable incore detectors, once within 12 hours AND 12 hours thereafter.***
	SRO	17. **NOTIFY** Operations Duty Manager and Rx Engineering of failed channel. ***When contacted as Operations Duty Manager, the Console Operator will repeat back information provided for N43 failure.*** ***When contacted as Reactor Engineering, the Console Operator will repeat back information provided for N43 failure.***
	SRO	18. **DO NOT CONTINUE** with this Instruction UNTIL failed PRM repair is completed.
	SRO	**Crew Brief** would typically be conducted for this event as time allows prior to the next event.

Op Test No.: NRC Scenario # 4 Event # 2 Page 11 of 42

Event Description: Power Range N43 fails high. Requires entry into AOI-4, "Nuclear Instrumentation Malfunctions." Requires a Tech Spec evaluation.

Time	Position	Applicant's Actions or Behavior
	SRO	**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).
Cue Console Operator to insert Event 3.		

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Event Description: Containment Pressure transmitter 1-PDT-30-45 fails high. Requires a Tech Spec evaluation.

Time	Position	Applicant's Actions or Behavior
Indications: 83-D, PLANT COMPUTER GENERATED ALARAM (SEE ICS) 125-A CNTMT HI-HI PRESS STEAMLINE ISOL ICS displays Containment Pressure high as the cause of 83-D alarm.		
	RO	Diagnoses and announces failure of 1-PDT-30-45 high.
	SRO	Enters and directs actions of ARI-83-D, PLANT COMPUTER GENERATED ALARAM (SEE ICS).
	SRO	May enter and direct actions of ARI 125-A CNTMT HI-HI PRESS STEAMLINE ISOL.
ARI 125-A		**The following actions are taken from ARI 125-A CNTMT HI-HI PRESS STEAMLINE ISOL.**
	RO	**[1] CHECK** containment pressure indications, 1-PD-30-42, 1-PD-30-43, 1-PD-30-44, and 1-PD-30-45.
	SRO	**[2] IF** channel being tested or instrument failure has occurred, **THEN** **[a] REFER TO** Tech Specs. 3.3.2 Engineered Safety Feature Actuation System Instrumentation ***Function 2.c, Containment Spray - Containment Pressure High High, Condition E, With one Containment Pressure channel inoperable, (NOTE One channel may be bypassed for up to 12 hours for surveillance testing) Place channel in bypass within 72 hours OR Be in Mode 3 within 72 hours AND Be in Mode 4 within 84 hours.*** ***Function 3.b.(3) Phase B Isolation - Containment Pressure High High, Condition E (See above)*** ***Function 4.c - Steam Line Isolation - Containment Pressure High High, Condition E (See above)*** 3.3.3 Post Accident Monitoring (PAM) Instrumentation - ***Function 10, Containment Pressure (Narrow Range) Condition A One or more functions with one required channel inoperable, restore the required channel to operable status within 30 days.*** **[b] NOTIFY** Work Control to initiate corrective actions. ***When contacted as Work Control, the Console Operator will repeat back request to prepare a package to troubleshoot and repair 1-PD-30-45, Containment Pressure transmitter.*** ***When contacted as Work Control, the Console Operator will repeat back request for performance of IMI-160. Channel will be placed in BYPASS.***

Op Test No.: NRC Scenario # 4 Event # 3

Event Description: Containment Pressure transmitter 1-PDT-30-45 fails high. Requires a Tech Spec evaluation.

Time	Position	Applicant's Actions or Behavior
	SRO	***SRO contacts Work Control and requests a troubleshooting and repair package for 1-PDT-30-45. When contacted, the Console Operator repeats back request.***

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Event Description: Containment Pressure transmitter 1-PDT-30-45 fails high. Requires a Tech Spec evaluation.

Time	Position	Applicant's Actions or Behavior
ARI 83-D		**The following actions are taken from ARI 83-D, PLANT COMPUTER GENERATED ALARAM (SEE ICS)**
	RO	[1] **CHECK** ICS computer "Annunciator 83D Alarms" screen.
	RO	[2] **IF** a rod deviation exists, **PLACE** rod control in MANUAL, AND **REFER TO** AOI-2, Malfunction Of Reactor Control System. ***Not applicable.***
	SRO	[3] **IF** AFD greater than limits, **REFER TO** Tech Specs 3.2.3. ***Not applicable.***
	SRO	[4] **IF** Radial Tilt (QPTR), **REFER TO** Window 83-(B or C). ***Not applicable.***
	SRO	[5] **IF** pocket sump Rate of Rise in alarm, **REFER TO** window 160-C. ***Not applicable.***
	SRO	[6] **IF** pocket sump level monitor inoperable, **THEN REFER TO** Tech Specs 3.4.15, AND **PERFORM** 1-SI-77-3, as applicable. ***Not applicable.***
	SRO	[7] **IF** AFD monitor inoperable, **REFER TO** T/S SR 3.2.3.1, AND **PERFORM** 1-SI-92-5, as applicable. ***Not applicable.***
	SRO	[8] **REFER TO** 1-SI-0-2-00, Data Sheet 6 for shutdown rod bank overlap determination, as applicable. ***Not applicable.***
	SRO	[9] **REFER TO** 1-SI-0-2-00, Data Sheet 7 for control rod bank overlap determination, as applicable. ***Not applicable.***

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Event Description: Containment Pressure transmitter 1-PDT-30-45 fails high. Requires a Tech Spec evaluation.

Time	Position	Applicant's Actions or Behavior
	SRO	[10] **REFER TO** Tech Specs for applicable condition. 3.3.2 Engineered Safety Feature Actuation System Instrumentation ***Function 2.c, Containment Spray - Containment Pressure High High, Condition E, With one Containment Pressure channel inoperable, (NOTE One channel may be bypassed for up to 12 hours for surveillance testing) Place channel in bypass within 72 hours OR Be in Mode 3 within 72 hours AND Be in Mode 4 within 84 hours.*** ***Function 3.b.(3) Phase B Isolation - Containment Pressure High High, Condition E, With one Containment Pressure channel inoperable, (NOTE One channel may be bypassed for up to 12 hours for surveillance testing) Place channel in bypass within 72 hours OR Be in Mode 3 within 72 hours AND Be in Mode 4 within 84 hours.*** ***Function 4.c - Steam Line Isolation - Containment Pressure High High, Condition E, With one Containment Pressure channel inoperable, (NOTE One channel may be bypassed for up to 12 hours for surveillance testing) Place channel in bypass within 72 hours OR Be in Mode 3 within 72 hours AND Be in Mode 4 within 84 hours.*** 3.3.3 Post Accident Monitoring (PAM) Instrumentation - ***Function 10, Containment Pressure (Narrow Range) Condition A One or more functions with one required channel inoperable, restore the required channel to operable status within 30 days.***
	SRO	[11] **IF** RCP #4 Motor Radial Bearing temperature is high, **THEN REFER TO** ARI 95-101, Window 100-A AND **PERFORM** the action steps for "THRUST BEARING". ***Not applicable.***
	SRO	***SRO contacts Work Control and requests a troubleshooting and repair package for 1-PDT-30-45. When contacted, the Console Operator repeats back request.***
	SRO	**Crew Brief** would typically be conducted for this event as time allows prior to the next event.
	SRO	**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).
Cue Console Operator to insert Event 4.		

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Event Description: 1-LIC-68-339 fails, causing 1-FCV-62-93, CHARG FLOW CNTRL VALVE to go to minimum flow position. Requires manual control of 1-FCV-62-93, and entry into ARI 108-A CHARGING FLOW HI/LO and AOI-20, "Malfunction of Pressurizer. Level Control System."

Time	Position	Applicant's Actions or Behavior
Indications: 108-A, CHARGING FLOW HI/LO.		
	RO	Diagnoses and announces the failure of 1-FCV-62-93, CHARGING FLOW PZR LEVEL CONTROL to maintain proper charging flow.
	RO	May place 1-FCV-62-93, CHARGING FLOW PZR LEVEL CONTROL in MANUAL and raise charging flow back to approximately 87 gpm on 1-FI-62-93A, CHARGING FLOW.
	SRO	May enter and direct actions of ARI 108-A, CHARGING FLOW HI/LO.
	SRO	May enter and direct actions of AOI-20, "Malfunction of Pressurizer Level Control System."
ARI 108-A		**The following actions are taken from ARI 108-A, CHARGING FLOW HI/LO.**
	SRO	[1] **IF** ALL the following conditions exist: • Any RCP Thermal Barrier Out-of-Service • In-Service Charging pump trips • RCP seal injection flow required **THEN IMMEDIATELY START** available charging pump to restore seal flow. ***SRO determines that the conditions do NOT exist and continues to next step.***
	RO	[2] **CHECK** 1-FI-62-93A, CHARGING FLOW [1-M-5] to determine if flow is high or low. ***RO determines from 1-FI-62-93A, CHARGING FLOW that charging is low.***
	RO	[3] **CHECK** 1-LI-68-320, -335A, and -339A, PZR LEVEL [1-M-4]. ***Level indications are normal during this event.***
	SRO	[4] **IF** PZR Level Control System malfunction, **THEN GO TO** AOI-20.
	RO	[5] **IF** charging flow is low, **THEN CHECK** letdown temperature **AND EVALUATE** increasing charging flow **OR ISOLATE** letdown. ***RO determines from 1-FI-62-93A, CHARGING FLOW that charging is low, places 1-HIC-62-93A, CHARGING FLOW PZR LEVEL CONTROL in MANUAL and raises charging flow back to approximately 87 gpm.***
	RO	[6] **IF** charging is lost, **THEN IMMEDIATELY ISOLATE** letdown per SOI-62.01.

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Event Description: 1-LIC-68-339 fails, causing 1-FCV-62-93, CHARG FLOW CNTRL VALVE to go to minimum flow position. Requires manual control of 1-FCV-62-93, and entry into ARI 108-A CHARGING FLOW HI/LO and AOI-20, "Malfunction of Pressurizer. Level Control System."

Time	Position	Applicant's Actions or Behavior
	SRO	[7] **DETERMINE** cause of problem **AND INITIATE** corrective action, as necessary. ***When contacted as Work Control, the Console Operator acknowledges request for a troubleshooting and repair package to determine problem with charging flow control.***
	SRO	[8] **REFER TO** SOI-62.01 for CVCS system operation

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Event Description: 1-LIC-68-339 fails, causing 1-FCV-62-93, CHARG FLOW CNTRL VALVE to go to minimum flow position. Requires manual control of 1-FCV-62-93, and entry into ARI 108-A CHARGING FLOW HI/LO and AOI-20, "Malfunction of Pressurizer. Level Control System."

Time	Position	Applicant's Actions or Behavior
AOI-20		**The following actions are taken from AOI-20, "Malfunction Of Pressurizer Level Control System."**
		CAUTION **Charging and letdown must be in service together. If letdown isolates or charging is lost, the other must be isolated.**
	RO	1. **CHECK** pzr level program signal NORMAL: • 1-LR-68-339 (green pen).
		NOTE 1-XS-68-339E selects one channel to control level to program and one backup channel for control interlocks.
	RO	2. **CHECK** if 1-XS-68-339E is selected to FAILED channel (control or backup): • LI-68-339, OR • LI-68-320, OR • LI-68-335.
	SRO	2. **RESPONSE NOT OBTAINED:** **IF** pzr level is low **OR** dropping, **THEN GO TO** Step 12. ***Based on the fact that charging flow was low, and the effect of the low charging flow would be to drop PZR level.***
	RO	12. **CHECK** any charging pump RUNNING.
	RO	13. **PLACE** 1-HIC-62-93A, CHARGING FLOW PZR LEVEL CONTROL, in MANUAL, and **RESTORE** pzr level to program USING 1-FCV-62-93 and/or 1-FCV-62-89. ***Since 1-LIC-68-339, PZR LEVEL CHG FLOW/PZR LEVEL CONTROL is failed, 1-FCV-62-93A, CHARGING FLOW PZR LEVEL CONTROL will remain in MANUAL***
	RO	14. **CHECK** letdown IN SERVICE: • 1-FCV-62-69 OPEN. • 1-FCV-62-70 OPEN. • 1-FCV-62-77 OPEN. • Letdown orifice OPEN. ***RO observes that 1-FCV-62-69, 1-FCV-62-70, 1-FCV-62-77 and all of the letdown orifice isolation valves are OPEN.***

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Event Description: 1-LIC-68-339 fails, causing 1-FCV-62-93, CHARG FLOW CNTRL VALVE to go to minimum flow position. Requires manual control of 1-FCV-62-93, and entry into ARI 108-A CHARGING FLOW HI/LO and AOI-20, "Malfunction of Pressurizer. Level Control System."

Time	Position	Applicant's Actions or Behavior
	RO	15. **CHECK** pzr level RETURNING to program. ***RO makes periodic adjustments to 1-HIC-62-93A, CHARGING FLOW PZR LEVEL CONTROL and 1-HIC-62-89A, CHG HDR - RCP SEALS FLOW CONTROL to return PZR level to program level.***
	SRO	16. **GO TO** Step 18.
	SRO	18. **NOTIFY** Work Control to initiate corrective action, if necessary. ***When contacted as Work Control, the Console Operator will repeat back request to prepare a package to troubleshoot and repair 1-FCV-62-93A controls.***
	SRO	19. **EVALUATE** system alignment/status: • **REVIEW** actions performed in this Instruction. • **REFER TO** SOI-62.01, CVCS - Charging and Letdown.
	SRO	20. **RETURN TO** instruction in effect.
	SRO	**Crew Brief** would typically be conducted for this event as time allows prior to the next event.
	SRO	**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).
Cue Console Operator to insert Event 5.		

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Event Description:	1A Thermal Barrier Booster pump trips and the 1B Thermal Barrier Booster pump fails to auto start. Requires entry into AOI-15, "Loss of Component Cooling Water (CCS)." Requires OR-14.10 evaluation.

Time	Position	Applicant's Actions or Behavior
Indications: 237-B, RCP 1 THRM BAR RET FLOW LO 238-B, RCP 2 THRM BAR RET FLOW LO 239-B, RCP 3 THRM BAR RET FLOW LO 240-B, RCP 4 THRM BAR RET FLOW LO		
	BOP	Diagnoses and announces the trip of the 1A Thermal barrier booster pump (TBBP) and the failure of the 1B Thermal barrier booster pump to start automatically.
	BOP	May MANUALLY start the 1B Thermal barrier booster pump to recover thermal barrier cooling flow.
	SRO	Enters and directs actions of ARI 237-B RCP 1 THRM BAR RET FLOW LO. (May enter 238-B, 239-B or 240-B and take actions which are the same.)
ARI 237-B		**The following actions are taken from ARI 237-B, RCP 1 THRM BAR RET FLOW LO.**
	BOP	**[1] IF** Phase B initiated, **THEN GO TO** Emergency Instructions.
	BOP	**[2] CHECK** 1-FI-70-115, TH BAR 1 FLOW [0-M-27B], and **COMPARE** with other RCPs. ***Based on all of the RCP thermal barrier return flow alarms being LIT, the BOP diagnoses the problem as one common to ALL RCPs.***
	BOP	**[3] ENSURE** TB Booster Pump ON. ***The BOP determines that NO thermal barrier booster pumps are running, and places 1-HS-70-130A THRM BAR BSTR PMP 1B (TBBP) in the START position.*** ***BOP may dispatch Auxiliary Building AUO to determine the cause of the loss of the 1A TBBP. Report that the pump was stopped inadvertently when a Unit 2 clearance was being hung.***
	BOP	**[4] ENSURE the following TB isolation valves OPEN:** • **1-FCV-70-133 and -134, THERMAL BAR SUP CIV–ϕB** • **1-FCV-70-87 and -90, THERMAL BAR RET CIV–ϕB**

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Event Description: 1A Thermal Barrier Booster pump trips and the 1B Thermal Barrier Booster pump fails to auto start. Requires entry into AOI-15, "Loss of Component Cooling Water (CCS)." Requires OR-14.10 evaluation.

Time	Position	Applicant's Actions or Behavior
	BOP	**[5] IF** flow NOT restored, **THEN** **[5] IF** flow NOT restored, **THEN** **[5.1] ENSURE** RCP 1 seal water flow between 8 and 13 gpm. **[5.2] MONITOR** RCP temps on computer. **[5.3] REFER TO** AOI-15, LOSS OF COMPONENT COOLING WATER (CCS). **[5.4] ADJUST** 1-THV-70-684A per TI-31.08, FLOW BALANCING VALVES SETPOINTS. ***Since flow was reestablished when the 1B TB Booster pump was started, the SRO may elect to N/A this step and NOT refer to AOI-15.*** ***SRO may contact Work Control and request a troubleshooting and repair package for the failure of the 1B TBBP to auto start.***
	SRO	SRO enters OR. 14.10.1 Fire Safe Shutdown Equipment. Item e. Thermal Barrier Booster Pumps. ***14.10.1 - With one or more required equipment in Table 14.10 inoperable (or not in its FSSD condition), restore to operable status (or its FSSD condition) within 30 days.***
	SRO	**Crew Brief** would typically be conducted for this event as time allows prior to the next event.
	SRO	**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).
Cue Console Operator to insert Event 6. The remaining malfunction will enter 10 seconds after the reactor trip initiation.		

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Event Description: Steam generator tube leak develops on SG 2. Requires entry into AOI-33, "Steam Generator Tube Leak."

Time	Position	Applicant's Actions or Behavior
175-B, VAC PMP EXH 1-RM-119 RAD HI		
	BOP	Diagnoses and announces 175-B, VAC PMP EXH 1-RM-119 RAD HI
	BOP	May observe ICS Computer Screens (Steam flow vs. feed flow) to identify the affected SG.
	BOP	May enter ARI 175-B VAC PMP EXH 1-RM-119 RAD HI and contact Chemistry to begin sampling of SGs for activity, and Radiation Protection to begin surveys of the secondary plant.
	SRO	Enters and directs actions of AOI-33, "Steam Generator Tube Leak."
ARI 175-B		**The following actions are taken from ARI 175-B, VAC PMP EXH 1-RM-119 RAD HI.**
	BOP	[1] **REFER TO** AOI-33, Steam Generator Tube Leak.
	BOP	[2] **CHECK** 1-RM-90-120 (R1020A) and 1-RM-90-121 (R1021A).
	BOP	[3] **CHECK** Post Accident monitors 1-RM-90-421 (R9055A), 1-RM-90-422 (R9056A), 1-RM-90-423 (R9057A), and 1-RM-90-424 (R9058A).
EXAMINER: Ten (10) minutes after Chemistry is contacted to perform samples, the Console Operator will contact the crew and state that SG 2 has high activity. **Ten (10) minutes after Radiation Protection is contacted to perform surveys of the secondary plant, the Console Operator will contact the crew and report that surveys indicate that SG 2 has high activity.** **Contact may be made based on the performance of ARI 175-B, VAC PMP EXH 1-RM-119 RAD HI or when directed by AOI-33, "Steam Generator Tube Leak."**		
	SRO	[4] **IF** Alarm is valid, **THEN REQUEST** Chemistry to evaluate appropriate SG Blowdown routing when monitor alarms (i.e., CTBD or hotwell), based on ODCM limitations.
NOTE 1-HS-15-44 is key operated. Obtain key from Unit SRO.		
	BOP	[5] **IF** Step [4] Chemistry evaluation determines that SG Blowdown routing should divert to the hotwell on alarm, **THEN DISPATCH** AUO to VERIFY 1-HS-15-44, SG BLOWDOWN DISCH TO CTBD [T5I/708] **NOT** in OPEN.
NOTE ICS screen CHEM7 provides calculated instantaneous primary to secondary leak rate value.		
	SRO	[6] **NOTIFY** Chemistry to perform CM-9.09 "Effluent Radiation Monitor Alarm Guidelines".
	SRO	[7] **NOTIFY** Radiological Protection to investigate alarm.

Op Test No.: NRC Scenario # 4 Event # 6

Event Description: Steam generator tube leak develops on SG 2. Requires entry into AOI-33, "Steam Generator Tube Leak."

Time	Position	Applicant's Actions or Behavior
	SRO	[8] **IF** monitor declared inoperable, **THEN NOTIFY** Chemistry Countroom to initiate compensatory sampling.
	SRO	[9] **REFER TO** AOI-31, Abnormal Release Of Radioactive Material.

Op Test No.: NRC	Scenario # 4	Event # 6		Page 24 of 42
Event Description:	Steam generator tube leak develops on SG 2. Requires entry into AOI-33, "Steam Generator Tube Leak."			

Time	Position	Applicant's Actions or Behavior
AOI-33		**The following actions are taken from AOI-33, "Steam Generator Tube Leak."**
		NOTE Sufficient time must be allowed for level to respond following changes in charging flow, in order to determine if Pzr level can be maintained.
	RO	1. **MAINTAIN** PZR Level: a. **CONTROL** charging flow as necessary. 1) **OPEN** 1-FCV-62-93 as required. 2) **OPEN** 1-FCV-62-89 as required. 3) **IF** letdown at 120 gpm, **THEN PLACE** 1-HIC-62-81A, in MANUAL, AND CLOSE 1-FCV-62-72, (45 gpm). 4) **IF** required, **THEN ADJUST** 1-HIC-62-81A, AND ENSURE in AUTO.
		NOTE Sufficient time must be allowed for level to respond following changes in charging flow, in order to determine if Pzr level can be maintained.
	RO	b. **MONITOR** pzr level STABLE or INCREASING.
	SRO	**RESPONSE NOT OBTAINED:** **1. ISOLATE** letdown as necessary. **2. INCREASE** chg flow, and start additional chg pmp as needed. **3. IF** loss of PZR level is imminent, **THEN** **a) TRIP** the reactor. **b) WHEN** reactor trip is verified, **THEN INITIATE** Safety Injection. **c) GO TO** E-0, Reactor Trip or Safety Injection, Step 1.
		NOTE Condenser Vacuum Exhaust and SG blowdown Radiation Monitors should be monitored at approximately 15 minute intervals for indications of rising leak rate.

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Event Description: Steam generator tube leak develops on SG 2. Requires entry into AOI-33, "Steam Generator Tube Leak."

Time	Position	Applicant's Actions or Behavior
	BOP	**2. IDENTIFY** Leaking SG(s); **a. EVALUATE** the following: • Unexpected rise in any SG narrow range level, • Feedwater flow mismatches, ***RO may use ICS screen to determine that SG 2 feedwater flow is less than the other SGs.*** • High radiation from any Chemistry SG sample results, ***BOP may have already contacted Chemistry and requested sampling. The Console Operator will call back as Chemistry after the 10 minute clock has expired, and report that SG 2 has high activity.*** • High radiation on any SG main steamline radiation monitor, • RADCON survey of main steamlines and SG blowdown lines. ***BOP may have already contacted Radiation Protection and requested sampling. The Console Operator will call back as Radiation Protection after the 10 minute clock has expired, and report that SG 2 has higher radiation levels.*** **b. MONITOR** Condenser Vacuum Exhaust and SG Blowdown Radiation Monitors
	RO	**3. CHECK** If VCT Level Can Be Maintained: **a. MAINTAIN** VCT level greater than 13%, using automatic **OR** manual makeup.
		3. RESPONSE NOT OBTAINED **a. IF** VCT level CANNOT be maintained, **THEN PERFORM** the following: **1) ENSURE** CCP suction aligned to RWST. **2) TRIP** the reactor. **3) PERFORM** the following: • **GO TO** E-0, Reactor Trip or Safety Injection **AND** • **CONTINUE** performance of this procedure at Step **[9]** in parallel with E-0.
		NOTE Sufficient time must be allowed for level to respond following changes in charging flow, in order to determine if Pzr level can be maintained.
	SRO	**4. DETERMINE** If Plant Shutdown Is Required: • High Secondary Radiation, **AND** • PZR level continues to decrease, **OR** Charging flow continues to rise. ***SRO determines that the conditions for Step 4 are NOT met.***

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Event Description: Steam generator tube leak develops on SG 2. Requires entry into AOI-33, "Steam Generator Tube Leak."

Time	Position	Applicant's Actions or Behavior
		4. RESPONSE NOT OBTAINED **GO TO** APPENDIX A to monitor SG leakage.
EXAMINER: The following actions are taken from AOI-33, "Steam Generator Tube Leak," APPENDIX A, Steam Generator Tube Leak Monitoring.		
NOTE **This appendix provides steps to monitor primary to secondary leakage and directs unit shutdown if leakage limits are exceeded.**		
	BOP	**1. MONITOR** PZR level STABLE.
NOTE Lower containment rad monitor count rate rising concurrently with secondary rad monitors may indicate a developing fuel defect, which could give a false indication of SG tube leak. Threshold values for correlating RM-90-119 count rate to SG tube leakage must be recalculated if RCS activity has changed significantly.		
	SRO	**2. INITIATE** Sampling To Monitor SG Leak. a. **CHECK** lower containment rad monitor count rate - STABLE or DROPPING. b. **NOTIFY** Chem Lab to evaluate Leakage **USING** CM-5.01. c. **NOTIFY** RADCON To Monitor: • Main Steam Lines. • S/G blowdown lines.
	SRO	**3. NOTIFY** the following: a. Shift Manager. b. Plant personnel via PA: "Attention plant personnel. We have developed a SG tube leak. Treat all steam leaks as radioactive."
NOTE Based on monitor sensitivity, the Condenser Vacuum Exhaust rad monitor (1-RM-90-119) is the preferred indication for leak rate monitoring. Other secondary rad monitors and/or SG sampling should be used for confirmation. Confirmation time should be kept to a minimum.		

Op Test No.: NRC	Scenario # 4	Event # 6	Page 27 of 42

Event Description: Steam generator tube leak develops on SG 2. Requires entry into AOI-33, "Steam Generator Tube Leak."

Time	Position	Applicant's Actions or Behavior
	BOP	4. **MONITOR** Primary-To-Secondary Leak Rate Trend. a. **PERFORM** Data Sheet 1, Steam Generator Tube Leak Trending every 15 min. b. **ESTIMATE** leak rate using ICS Chem 7 screen. c. **CHECK** rise in count rate validated by at least one of the following: • Sample results confirming rise in SG activity. **OR** • Two independent secondary rad monitors showing rise in count rate.
NOTE To prevent an unnecessary Unit shutdown, primary to secondary leakage and rate of change should be monitored over a 30 minute time period, to ensure the rise in leakage is not a temporary spike that returns to less than 75 gpd (0.052 gpm) limit.		
	RO	5. **CHECK** Plant Shutdown **NOT** Required, USING App C, SG Tube Leak Action Levels. ***SRO determines that ACTION LEVEL 3, Condition #2 is applicable, and determines that Action 2, Continue the performance of section 3.0 to place the unit in Mode 3 within 6 hours must be applied.***
		5. **RESPONSE NOT OBTAINED** **IF** Plant Shutdown is required, **THEN**; **RETURN TO** Section **3.0**, step **6**.
EXAMINER: The following actions are taken from AOI-33, "Steam Generator Tube Leak," Section 3.0, beginning at Step 6.		
	SRO	6. **PERFORM** The Following Evaluations: a. **EVALUATE** Tech Specs for applicability: • 3.4.13, RCS Operational Leakage, ***SRO determines that the primary-to-secondary leakage limits have been exceeded.*** • 3.7.5, Auxiliary Feedwater (AFW) System, • 3.7.6, Condensate Storage Tank (CST), • 3.7.14, Secondary Specific Activity, b. **EVALUATE** EPIP-1, Emergency Plan Classification Matrix. ***When contacted as the Shift Manager, the Console Operator acknowledges the need to implement EPIP-1.***

Op Test No.: NRC	Scenario # 4	Event # 6

Event Description: Steam generator tube leak develops on SG 2. Requires entry into AOI-33, "Steam Generator Tube Leak."

Time	Position	Applicant's Actions or Behavior
	SRO	**7. CHECK** Unit Load - GREATER THAN 30%: **a. INITIATE** unit shutdown USING: • **AOI-39**, Rapid Load Reduction. **AND** • **CONTINUE** performance of this procedure.
EXAMINER: After the applicants implement Step 6, the Console Operator will increase the severity of the tube leak from 2.5 to 18. The applicants will re-evaluate the SG 2 leak size and apply Step 1.c.3 to initiate a reactor trip and SI.		
	RO	**b. MONITOR** pzr level STABLE or INCREASING.
	SRO	**RESPONSE NOT OBTAINED:** **1. ISOLATE** letdown as necessary. **2. INCREASE** chg flow, and start additional chg pmp as needed. **3. IF** loss of PZR level is imminent, **THEN** **a) TRIP** the reactor. **b) WHEN** reactor trip is verified, **THEN INITIATE** Safety Injection. **c) GO TO** E-0, Reactor Trip or Safety Injection, Step 1.

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Event Description: Steam generator tube leak progresses to a tube rupture. Requires reactor trip and safety injection. Requires entry into E-0, "Reactor Trip or Safety Injection," then a transition to E-3, "Steam Generator Tube Rupture."

Time	Position	Applicant's Actions or Behavior
	E-0	**The following actions are taken from E-0, "Reactor Trip or Safety Injection."**
		NOTE Steps 1 thru 4 are **IMMEDIATE ACTION STEPS.** Status Trees / SPDS should be monitored when transitioned to another instruction.
	RO	1. **ENSURE** reactor trip: • Reactor trip and bypass breakers OPEN. ***RO checks 1-52RTB, RX TRIP BKR A RED indicating light LIT on panel 1-M-4.*** ***RO checks 1-52RTB, RC TRIP BKR B RED indicating light LIT on panel 1-M-4*** ***RO checks 1-52BYA, BYPASS BKR A lights DARK*** ***RO checks 1-52BYB, BYPASS BKR B lights dark*** • RPIs at bottom of scale. ***RO observes 1-MON 85 5000/1 CERPI Monitor 1 and 1-MON-85 5000/2 CERPI MONITOR 2 for indication that all SHUTDOWN and CONTROL bank rods are inserted.*** • Neutron flux DROPPING. ***RO observes neutron flux trending down on 1-NR-92-145, NEUTRON FLUX LEVEL REXCORDER. May also observe levels decreasing on 1-NI-92-135A, CH I NEUTRON MON % PWR, and 1-NI-92-136A, CH II NEUTRON MON % PWR.***
	RO	2. **ENSURE** Turbine Trip: • All turbine stop valves CLOSED. ***RO observes that indicating lights on 1-XX-47-1000 EHC CONTROL for individual throttle and governor valves are GREEN.***
	RO	3. **CHECK** 6.9 kV shutdown boards: a. At least one board energized from: CSST (offsite), OR D/G (blackout). ***When observed by the RO during IMMEDIATE OPERATOR ACTIONS, both shutdown boards are energized, based on 1-EI-57-39, 6.9 SDB 1A-A VOLTS indicating approximately 7000 volts and 1-EI-57-66, 6.9 SDB 1B-B VOLTS indicating approximately 7000 volts.***

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Event Description: Steam generator tube leak progresses to a tube rupture. Requires reactor trip and safety injection. Requires entry into E-0, "Reactor Trip or Safety Injection," then a transition to E-3, "Steam Generator Tube Rupture."

Time	Position	Applicant's Actions or Behavior
	RO	4. **CHECK** SI actuated: a. Any SI annunciator LIT. ***RO will announce that the window 70-A, SI ACTUATED is LIT. May also announce that FIRST OUT 76-G SI MANUAL is LIT.*** b. Both trains SI **ACTUATED**. • 1-XX-55-6C • 1-XX-55-6D
EXAMINER: E-0, "Reactor Trip or Safety Injection," Appendixes A and B are included as Attachment 1. Step 4.e RESPONSE NOT OBTAINED of E-0 Appendix A is flagged as CRITICAL TASK 1.		
CRITICAL TASK 1 Align the boron injection tank to establish flow from at least one centrifugal charging pump (high-head ECCS pump) before transition out of E-0, "Reactor Trip or Safety Injection."		
Critical Task 1	BOP	5. **PERFORM** Appendixes A and B, E-0, pages 16-30. ***BOP is assigned to perform actions contained in the Appendices. A separate copy of the Appendices is contained in this package for Examiner use.***
	SRO	6. **ANNOUNCE** reactor trip and safety injection over PA system.
	RO	7. **ENSURE** secondary heat sink available with either: • Total AFW flow greater than 410 gpm, ***BOP observes that AFW flow is greater than 410 gpm and reports that the 1A-A MD AFW pump and the TD AFW Pumps are running and that the 1B-B AFW pump is tagged.*** OR • At least one S/G NR level greater than 29% [39% ADV].
	RO	8. **MONITOR** RCS temperature stable at or trending to 557°F using: • RCS Loop T-avg with any RCP running, **OR** • RCS Loop T-cold with RCPs out-of-service.

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Event Description: Steam generator tube leak progresses to a tube rupture. Requires reactor trip and safety injection. Requires entry into E-0, "Reactor Trip or Safety Injection," then a transition to E-3, "Steam Generator Tube Rupture."

Time	Position	Applicant's Actions or Behavior
		8. **RESPONSE NOT OBTAINED:** **IF** temp less than 557°F, **THEN ENSURE** steam dumps and S/G PORVs CLOSED. **IF** cooldown continues**, THEN CONTROL** total AFW flow to maintain greater than 410 gpm UNTIL NR level in at least one S/G greater than 29% [39% ADV]. **IF** cooldown continues after AFW flow is controlled, **THEN** • **PLACE** steam dump controls OFF. • **CLOSE** MSIVs. • **ENSURE** MSIV bypasses CLOSED. **IF** RCS temp greater than 564°F, **THEN ENSURE** either steam dumps or S/G PORVs OPEN.
	RO	9. **ENSURE** excess letdown valves CLOSED: • 1-FCV-62-54 • 1-FCV-62-55
	RO	10. **CHECK** pzr PORVs and block valves: a. Pzr PORVs CLOSED. b. At least one block valve OPEN. ***RO observes 1-HS-68-340AA, PZR PORV 340A, CLOSED, GREEN indicating light is LIT, RED indicating light is DARK.*** ***RO observes 1-HS-68-334A, PZR PORV 334, CLOSED, GREEN indicating light is LIT, RED indicating light is DARK.*** ***RO observes 1-HS-68-333A, BLOCK VLV FOR PORV 340A, OPEN, GREEN indicating light is DARK, RED indicating light is LIT.*** ***RO observes 1-HS-68-332A, BLOCK VLV FOR PORV 334, OPEN, GREEN indicating light is DARK, RED indicating light is LIT.***
	RO	11. **CHECK** pzr safety valves CLOSED: • **EVALUATE** tailpipe temperatures and acoustic monitors. ***RO observes response of 1-TI-68-330, SAFETY 68-563 TAILPIPE TEMP, 1-TI-68-329, SAFETY 68-564 TAILPIPE TEMP, and 1-TI-68-328, SAFETY 68-565, stable at approximately 110°F.*** ***BOP may observe 1-XI-68-363, PZR VALVES ACOUSTIC MONITOR indicating lights are DARK for 1-XI-68-363 (68-563), 1-XI-68-364 (68-564) and 1-XI-68-365 (68-565).***

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Event Description: Steam generator tube leak progresses to a tube rupture. Requires reactor trip and safety injection. Requires entry into E-0, "Reactor Trip or Safety Injection," then a transition to E-3, "Steam Generator Tube Rupture."

Time	Position	Applicant's Actions or Behavior
	RO	12. **CHECK** pzr sprays CLOSED. ***RO observes the GREEN indicating lights are LIT for 1-XI-68-340B, PZR SPRAY LOOP 2 and 1-XI-68-340D, PZR SPRAY LOOP 1.***
NOTE Seal injection flow should be maintained to all RCPs.		
	RO	13. **CHECK** if RCPs should remain in service: a. Phase B signals DARK [MISSP]. b. RCS pressure greater than 1500 psig. ***RO reports that RCS pressure is greater than 1500 psig and there is no Phase B isolation signal present.***
	RO	14. **CHECK** S/G pressures: • All S/G pressures controlled or rising. • All S/G pressures greater than 120 psig.
	SRO	15. **CHECK** for RUPTURED S/G • All S/Gs narrow range levels **CONTROLLED** or **DROPPING**. ***BOP reports that SG 2 level is rising.*** • Secondary side radiation **NORMAL** from Appendix A. ***SRO determines from previous sample requests and the 175-B radiation alarm that a SG tube rupture is in progress.***
	SRO	15. **RESPONSE NOT OBTAINED:** **IF** any S/G has level rising in an uncontrolled manner OR has high radiation, **THEN ** GO TO** E-3, Steam Generator Tube Rupture.
E-3		**The following actions are taken from E-3, "Steam Generator Tube Rupture."**
NOTE Early notification of RADPROT and Chemistry could expedite subsequent sampling efforts if needed.		
	SRO	1. **REFER TO** EPIP-1, Emergency Plan Classification Flowchart.
NOTE Seal injection flow should be maintained to all RCPs.		
	SRO	2. **CHECK** if RCPs should remain in service: a. Phase B DARK [MISSP]. b. RCS pressure greater than 1500 psig. ***RO reports that RCS pressure is greater than 1500 psig and there is no Phase B isolation signal present.***

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Event Description: Steam generator tube leak progresses to a tube rupture. Requires reactor trip and safety injection. Requires entry into E-0, "Reactor Trip or Safety Injection," then a transition to E-3, "Steam Generator Tube Rupture."

Time	Position	Applicant's Actions or Behavior
EXAMINER: The applicants have already identified SG 2 as the ruptured SG.		
	RO	3. **IDENTIFY** Ruptured S/G based on ANY of the following: • Unexpected rise in S/G NR level. **OR** • S/G discharge monitor high radiation. **OR** • RP Survey. **OR** • Chemistry sample.
	RO	4. **ENSURE** Ruptured S/G PORV aligned: a. **ENSURE** controller in AUTO set at 90%. ***RO rotates the dial for 1-PIC-1-13A, SG 2 PORV PCV-1-12, to the 90% position from approximately 84%.*** b. **ENSURE** HS in P-AUTO. ***RO ensures that 1-HS-1-13A, SG 2 PORV PCV-1-12, is in the mid position for P-AUTO.*** c. **WHEN** Ruptured S/G pressure less than 1130 psig. **THEN** 1) **ENSURE** Ruptured S/G PORV CLOSED, ***RO ensures that 1-HS-1-13A SG 2 PORV 1-PCV-1-12, GREEN indicating light is LIT and the RED indicating light is DARK.*** **OR** 2) **OBTAIN** Radiation Protection support **AND** Locally **CLOSE** Ruptured S/G isolation valve: • Loop 1, 1-ISV-1-619 [South Valve Room]. • Loop 2, 1-ISV-1-620 [North Valve Room]. • Loop 3, 1-ISV-1-621 [North Valve Room]. • Loop 4, 1-ISV-1-622 [South Valve Room].
CAUTION **If turbine-driven AFW pump is only available source of feed flow, then steam supply to the turbine-driven AFW pump must be maintained.**		
	RO	5. **ENSURE** TD AFW pump being supplied from Intact S/G. ***Since SG 2 has been identified as the ruptured SG, the RO reports that the TD AFW pump is being supplied from an intact SG.***
	RO	6. **ENSURE** Ruptured S/G blowdown isolated. ***BOP reports that all SG blowdown isolation valves are closed.***

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Event Description: Steam generator tube leak progresses to a tube rupture. Requires reactor trip and safety injection. Requires entry into E-0, "Reactor Trip or Safety Injection," then a transition to E-3, "Steam Generator Tube Rupture."

Time	Position	Applicant's Actions or Behavior
		CAUTION **At least one S/G must be maintained available for RCS cooldown.**
	BOP	7. **CLOSE** Ruptured S/G MSIV and bypass valve. ***BOP rotates 1-HS-1-11A SG 2 MSIV to the left to the CLOSE position. BOP verifies GREEN indicating light LIT, RED indicating light DARK.***
		CAUTION **If any Ruptured S/G is also faulted, feed flow should remain isolated in subsequent steps UNLESS needed for RCS cooldown.**
	BOP	8. **CONTROL** Ruptured S/G level: a. **CHECK** Ruptured S/G NR level greater than 29% [39% ADV]. ***BOP reports SG 2 level is greater than 29%.*** b. **ISOLATE** AFW flow to Ruptured S/G. ***RO will rotate 1-HS-3-156A, SG2 SUPPLY LCV-3-156 CNTL, from the AUTO position to the right to the ACC RESET MODULATE position, and then rotate the handswitch to the CLOSE position and pull the handswitch to the LOCK position.*** ***RO may also depress 1-LIC-3-156A SG 2 SUPPLY, RM (Remote Manual) pushbutton, then move the "slider" control to the left to the CLOSE position and LOCK.*** ***RO will rotate 1-HS-3-173A, SG2 SUPPLY LCV-3-173CNTL, from the AUTO position to the right to the ACC RESET MODULATE position, and then rotate the handswitch to the CLOSE position and pull the handswitch to the LOCK position.*** c. **ENSURE** MFW ISOLATED to Ruptured S/G: • MFW isolation valves CLOSED. • MFW bypass isolations CLOSED. • MFW reg and bypass reg valves CLOSED. • MFW pumps TRIPPED. d. **CONTROL** Ruptured S/G NR level greater than 29% [39% ADV].
	RO	9. **PLACE** dump back valve to CST, 1-LIC-2-3, in MANUAL, and **CLOSE** valve. ***BOP slides the toggle switch on 1-LIC-2-3 from the AUTO position to the mid position to establish MANUAL control, and then depress the white CLOSE pushbutton to close the valve.***
	RO	10. **MAINTAIN** condenser level 1-LR-2-12 on-scale [M-3].

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Event Description: Steam generator tube leak progresses to a tube rupture. Requires reactor trip and safety injection. Requires entry into E-0, "Reactor Trip or Safety Injection," then a transition to E-3, "Steam Generator Tube Rupture."

Time	Position	Applicant's Actions or Behavior
	SRO	11. **DISPATCH** operator to OPEN 1-FCV-14-3 to bypass condensate DI. ***SRO observes1-ZI-14-3, COND DEMIN BYPASS RED indicating light LIT.***
	RO	12. **ENSURE** RADPROT dispatched to survey secondary plant. ***SRO may contact Radiation Protection again for secondary plant surveys.***
	SRO	13. **NOTIFY** Chemistry to obtain samples as necessary for confirming Ruptured S/G. ***SRO may contact Chemistry again to continue sampling SGs for activity.***
	SRO	14. **NOTIFY** plant personnel of potential contaminated release.

CRITICAL TASK 2

Isolate steam flow from the ruptured SG prior to initiating cooldown using the intact SGs.

Time	Position	Applicant's Actions or Behavior
Critical Task 2	RO	15. **ENSURE** major steam flowpaths from the ruptured S/G isolated: a. TD AFW pump steam supply from Ruptured S/G CLOSED (if applicable). ***SRO determines that the ruptured SG does not supply the TD AFW pump and marks the step N/A*** b. Ruptured S/G MSIV and bypass valve CLOSED, OR Intact S/G MSIVs and bypass valves CLOSED. ***BOP reports 1-HS-1-11A SG 2 GREEN indicating light LIT, RED indicating light DARK.*** ***BOP reports that 1-HS-1-148 handswitch indicates that power is removed with the valve in the closed position.***
	RO	16. **CHECK** Ruptured S/G pressure greater than 690 psig. ***RO reports SG 2 pressure (should be approximately 1050 psig).***

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Event Description: Steam generator tube leak progresses to a tube rupture. Requires reactor trip and safety injection. Requires entry into E-0, "Reactor Trip or Safety Injection," then a transition to E-3, "Steam Generator Tube Rupture."

Time	Position	Applicant's Actions or Behavior
	SRO	17.**DETERMINE** target incore temp for RCS cooldown: • **IF** Ruptured S/G pressure is between listed values, **THEN USE** lower value:

RUPTURED S/G PRESSURE (PSIG)	TARGET INCORE TEMP (°F)
1100	491°F [471°F ADV]
1000	479°F [459°F ADV]
900	466°F [446°F ADV]
800	451°F [431°F ADV]
700	434°F [414°F ADV]
690	433°F [413°F ADV]

Based on reported pressure of 1050 psig, Target Temperature is 479°F.

CAUTION

- **The 1500 psig RCP trip criteria is NOT applicable during or after a controlled RCS cooldown and depressurization.**
- **If total feed flow CAPABILITY of 410 gpm is AVAILABLE, FR-H.1, Loss of Secondary Heat Sink, should NOT be implemented.**
- **Excessive steam dump cooldown rate will cause MSIV isolation due to the rate sensitive signal.**
- **If RCPs are NOT running, a false red or orange path may be indicated for FR-P.1 during the following steps. T-cold in the ruptured loop should be disregarded until Step 43.**

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Event Description: Steam generator tube leak progresses to a tube rupture. Requires reactor trip and safety injection. Requires entry into E-0, "Reactor Trip or Safety Injection," then a transition to E-3, "Steam Generator Tube Rupture."

Time	Position	Applicant's Actions or Behavior
	RO/BOP	18. **INITIATE** RCS cooldown to target incore temp, determined from Step 17. a. **DUMP** steam to condenser from Intact S/G(s) at maximum achievable rate: **IF** dumps are in Tavg mode, **THEN**: 1) **PLACE** steam dump controls OFF. ***BOP places 1-HS-1-103A, STEAM DUMP FSV "A" in the OFF RESET position.*** ***BOP places 1-HS-1-103B, STEAM DUMP FSV "B" in the OFF RESET position.*** 2) **PLACE** steam dump mode switch in STEAM PRESSURE. ***BOP places 1-HS-1-103D, STEAM DUMP MODE in the STM PRESS position.*** 3) **ENSURE** steam dump demand indicator 1-XI-1-33 reading zero. 4) **PLACE** steam dump controls ON. ***BOP places 1-HS-1-103A, STEAM DUMP FSV "A" in the ON position.*** ***BOP places 1-HS-1-103B, STEAM DUMP FSV "B" in the ON position.*** 5) **PLACE** steam dump controller in MAN, **AND FULLY OPEN** three cooldown valves (≤ 25% demand). ***BOP lifts the toggle switch on 1-PIC-1-33 STM DUMP PRESS CONTROL to the MANUAL position, then opens the steam dumps by establishing a 25% demand on 1-XI-1-33, STEAM DUMP DEMAND.***

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Event Description: Steam generator tube leak progresses to a tube rupture. Requires reactor trip and safety injection. Requires entry into E-0, "Reactor Trip or Safety Injection," then a transition to E-3, "Steam Generator Tube Rupture."

Time	Position	Applicant's Actions or Behavior
		18. **INITIATE** RCS cooldown to target incore temp, determined from Step 17. (Continued from previous page) b. **WHEN** RCS pressure is less than 1962 psig (P-11), **THEN**: • **BLOCK** low pzr pressure SI. ***RO rotates 1-HS-63-136A, LO PZR PRESS SI BLOCK P-11 to the BLOCK position. RO rotates 1-HS-63-136B, LO PZR PRESS SI BLOCK P-11 to the BLOCK position. Window 69-B, PZR PRESS SI BLOCKED will light.*** • **BLOCK** low steam pressure SI ***RO rotates 1-HS-63-135A, LO STEAM PRESS SI BLOCK to the BLOCK position. RO rotates 1-HS-63-1356B, LO STEAM PRESS SI BLOCK to the BLOCK position. Window 68-B LO STM PRESS SI-BLKD STM PRESS RATE SLI - ACTIVE P-11 will light.*** c. **WHEN** Tavg is less than 550°F (P-12), **THEN BYPASS** Lo-Lo Tavg interlock. ***When Window 68-A, P-12 LO-LO TAVG STM DUMP BLOCK is LIT, the BOP rotates 1-HS-103A STEAM DUMP FSV "A" from the mid position to the right to the BYPASS INTLK position.*** ***BOP rotates 1-HS-103B STEAM DUMP FSV "B" from the mid position to the right to the BYPASS INTLK position.*** d. **WHEN** incore temp is less than target temp, **THEN STOP** RCS cooldown, **AND MAINTAIN** incore temperature less than or equal to target. e. **CONTINUE** with Step 19 of this Instruction.
	BOP	19. **MONITOR** Intact S/G levels: a. At least one S/G NR level greater than 29% [39% ADV]. b. S/G NR levels less than 50% and controlled.
	BOP	20. **CONTROL** Intact S/G NR levels between 29% and 50% [39% and 50% ADV].

Op Test No.: NRC Scenario # 4 Event # 7 , 8

Event Description: Steam generator tube leak progresses to a tube rupture. Requires reactor trip and safety injection. Requires entry into E-0, "Reactor Trip or Safety Injection," then a transition to E-3, "Steam Generator Tube Rupture."

Time	Position	Applicant's Actions or Behavior
	RO	21. **MONITOR** pzr PORVs and block valves: a. Pzr PORVs CLOSED. b. At least one block valve OPEN. ***RO observes 1-HS-68-340AA, PZR PORV 340A, CLOSED, GREEN indicating light is LIT, RED indicating light is DARK.*** ***RO observes 1-HS-68-334A, PZR PORV 334, CLOSED, GREEN indicating light is LIT, RED indicating light is DARK.*** ***RO observes 1-HS-68-333A, BLOCK VLV FOR PORV 340A, OPEN, GREEN indicating light is DARK, RED indicating light is LIT.*** ***RO observes 1-HS-68-332A, BLOCK VLV FOR PORV 334, OPEN, GREEN indicating light is DARK, RED indicating light is LIT.***
	RO	22. **CHECK** pzr safety valves CLOSED: • **EVALUATE** tailpipe temperatures and acoustic monitors. ***RO observes response of 1-TI-68-331, PORV 340A & 334 TAILPIPE TEMP stable at approximately 110°F.*** ***BOP may observe 1-XI-68-363, PZR VALVES ACOUSTIC MONITOR indicating lights are DARK for 1-XI-68-340A and 1-XI-68-334.***
CAUTION		**If offsite power is lost after SI reset, manual action will be required to restart the SI pumps and RHR pumps due to loss of SI start signal.**
	RO	23. **RESET** SI, **AND CHECK** the following: • SI ACTUATED permissive DARK. • AUTO SI BLOCKED permissive LIT.
	RO	24. **RESET** Phase A and Phase B.
	BOP	25. **ENSURE** cntmt air in service: a. Aux air pressure greater than 75 psig [M-15]. b. Cntmt air supply valves OPEN [M-15]: • 1-FCV-32-80. • 1-FCV-32-102. • 1-FCV-32-110.

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Event Description: Steam generator tube leak progresses to a tube rupture. Requires reactor trip and safety injection. Requires entry into E-0, "Reactor Trip or Safety Injection," then a transition to E-3, "Steam Generator Tube Rupture."

Time	Position	Applicant's Actions or Behavior
	RO	26. **DETERMINE** if RHR pumps should be stopped: a. **CHECK** RHR suction aligned from RWST. b. **CHECK** RCS pressure greater than 150 psig. c. **CHECK** RCS pressure stable or rising. d. **STOP** RHR pumps **AND PLACE** in A-AUTO. e. **MONITOR** RCS pressure greater than 150 psig.
	RO	27. **CHECK** target incore temperature: a. **VERIFY** incore temperature1 less than target temperature. b. **STOP** RCS cooldown. c. **MAINTAIN** incore temperature less than target temperature.
	RO	28. **MONITOR** Ruptured S/G pressure stable or rising.
	RO	29. **CHECK** RCS subcooling greater than 85°F [105°F ADV].

CAUTION

Cycling of the pzr PORV should be minimized to improve PORV reliability.

NOTE

- If RCPs are **NOT** running, the upper head region may void during RCS depressurization. This will result in a rapidly rising pzr level.
- Either Loop 1 or 2 pzr spray valve is effective for Loop 2 RCP in service or for Loops 1, 3, & 4 RCPs in service.

	RO	30. **INITIATE** RCS depressurization to minimize break flow, **AND REFILL** pzr to greater than 15% [33% ADV]. a. **CHECK** pzr level less than 63% [58% ADV]. b. **MAINTAIN** subcooling greater than 65°F [85°F ADV]. c. **DEPRESSURIZE** RCS with normal sprays at maximum rate.

NOTE

Appendix B is a duplicate of this step and is provided as a handout for the MCR operators.

Op Test No.:	NRC	Scenario #	4	Event #	7 , 8	Page	41	of	42

Event Description: Steam generator tube leak progresses to a tube rupture. Requires reactor trip and safety injection. Requires entry into E-0, "Reactor Trip or Safety Injection," then a transition to E-3, "Steam Generator Tube Rupture."

Time	Position	Applicant's Actions or Behavior
	SRO	31. **DETERMINE** if RCS depressurization should be stopped: a. **CONTINUE** RCS depressurization UNTIL one of the following: • Pzr level rises to greater than 63% [58% ADV]. **OR** • RCS subcooling drops to less than 65°F [85°F ADV]. **OR** • **BOTH** of the following: RCS pressure is less than Ruptured S/G pressure. **AND** Pzr level is greater than 15% [33% ADV]. b. **WHEN** depressurization criteria satisfied, **THEN ENSURE** the following: 1) Normal pzr spray valves CLOSED. 2) Pzr PORVs CLOSED. 3) Aux spray valve CLOSED.
CAUTION • **SI should be terminated as quickly as possible after termination criteria are met to prevent Ruptured S/G overfill.** • **If total feed flow CAPABILITY of 410 gpm is AVAILABLE, FR-H.1, Loss of Secondary Heat Sink, should NOT be implemented.**		
		32. **CHECK** SI termination criteria: a. **CHECK** RCS subcooling greater than 65°F [85°F ADV]. b. **CHECK** secondary heat sink with either: • Total available feed flow greater than 410 gpm, **OR** • At least one S/G NR level greater than 29% [39% ADV]. c. **CHECK** RCS pressure stable or rising. d. **CHECK** pzr level greater than 15% [33% ADV].
		33. **IF** RHR suction aligned from RWST, **THEN STOP** ECCS pumps, **AND PLACE** in A-Auto: • RHR pumps. • SI pumps. • All BUT one charging pump.

Op Test No.:	NRC	Scenario #	4	Event #	7 , 8	Page	42	of 42

Event Description: Steam generator tube leak progresses to a tube rupture. Requires reactor trip and safety injection. Requires entry into E-0, "Reactor Trip or Safety Injection," then a transition to E-3, "Steam Generator Tube Rupture."

Time	Position	Applicant's Actions or Behavior
		34. **ALIGN** charging: a. **CLOSE** RCP seal flow control 1-FCV-62-89. b. **OPEN** charging isolation valves 1-FCV-62-90 and 1-FCV-62-91. c. **ENSURE** charging valve 1-FCV-62-85 or 1-FCV-62-86 OPEN. d. **CHECK** RHR Suction aligned from RWST. e. **OPEN** seal return valves 1-FCV-62-61 and 1-FCV-62-63.
		35. **CLOSE** BIT outlets 1-FCV-63-25 and 1-FCV-63-26.
		36. **CONTROL** charging flow: a. **ADJUST** 1-FCV-62-89 and 1-FCV-62-93 to establish: • Seal injection flow between 8 and 13 gpm for each RCP. • Pzr level stable or rising.

END OF SCENARIO

Scenario 4
Attachment 1

SOI-85.01, “Control Rod Drive And Indication System.”

Section 5.6, “Manual Rod Control With Reactor At Power.”

Date ________ Initials

5.6 Manual Rod Control With Reactor At Power

NOTE

The manipulation of Control Rod position to maintain required parameter(s) is a continuous action by a Licensed Reactor Operator. The following is exempt from the "Continuous Use" requirements of SPP-2.2.

[1] **ENSURE** ROD BANK SELECT SWITCH (1-RBSS) in MANUAL. ________

[2] **POSITION** Control Rods as necessary to maintain Tavg with Tref using 1-FLRM, IN-HOLD-OUT SWITCH (maximum Tavg-Tref deviation < 3.0°F). ________

[3] **WHEN** AUTOMATIC Rod control is desired, **THEN**

ENSURE Tavg is within 1.0°F of Tref to avoid immediate rod movement on transfer. ________

CAUTION

Allowing at least 5 minutes between any rod control input (i.e., T-avg, T-ref, or NIS) change and placing rods in AUTO, will help prevent undesired control rod movement.

[4] **ENSURE** zero demand on control rod position indication [1-M-4]. ________

[5] **PLACE** ROD BANK SELECT SWITCH (1-RBSS) in AUTO. ________

[6] **WHEN** Rod Control is in AUTO, **THEN**

ENSURE the following: ________

A. Tavg and Tref within +/- 1.5°F ________

B. Step counters and RPIs within 12 steps ________

C. Bank Overlap maintained ________

D. Power distribution within limits, AFD/QPTR ________

Scenario 4
Attachment 2

E-0, “Reactor Trip or Safety Injection”

Appendix A and B
Attachments 1 through 5

Appendix A
(Page 1 of 9)

Equipment Verification

Step	Action/Expected Response	Response Not Obtained
1.	**ENSURE** PCBs OPEN: • PCB 5084. • PCB 5088.	**OPEN** manually.
2.	**ENSURE** AFW pump operation: • Both MD AFW pumps RUNNING. • TD AFW pump RUNNING. • LCVs in AUTO, OR controlled in MANUAL.	**ESTABLISH** at least one train AFW operation.
3.	**ENSURE** MFW isolation: • MFW isolation and bypass isolation valves CLOSED. • MFW reg and bypass reg valves CLOSED. • MFP A and B TRIPPED. • Standby MFP STOPPED. • Cond demin pumps TRIPPED. • Cond booster pumps TRIPPED.	Manually **CLOSE** valves **AND** **STOP** pumps, as necessary. **IF** any valves can **NOT** be closed, **THEN** **CLOSE** #1 heater outlet valves.

Appendix A
(Page 2 of 9)

Equipment Verification

Step	Action/Expected Response	Response Not Obtained
4.	**MONITOR** ECCS operation:	
	a. Charging pumps RUNNING.	a. Manually **START** charging pumps.
	b. Charging pump alignment: • RWST outlets 1-LCV-62-135 and 1-LCV-62-136 OPEN. • VCT outlets 1-LCV-62-132 and 1-LCV-62-133 CLOSED. • Charging 1-FCV-62-90 and 1-FCV-62-91 CLOSED.	b. **ENSURE** at least one valve in each set aligned.
	c. RHR pumps RUNNING.	c. Manually **START** RHR pumps.
	d. SI pumps RUNNING.	d. Manually **START** SI pumps.
CRITICAL TASK 1	e. BIT alignment: • Outlets 1-FCV-63-25 and 1-FCV-63-26 OPEN. • Flow thru BIT.	e. **ENSURE** at least one valve aligned, and flow thru BIT.
	f. RCS pressure greater than 1650 psig.	f. **ENSURE** SI pump flow. **IF** RCS press drops to less than 150 psig, **THEN** **ENSURE** RHR pump flow.

Appendix A
(Page 3 of 9)

Equipment Verification

Step	Action/Expected Response	Response Not Obtained
5.	**CHECK** cntmt isolation: a. Phase A isolation: • Train A GREEN. • Train B GREEN. b. Cntmt vent isolation: • Train A GREEN. • Train B GREEN.	**ACTUATE** Phase A and Cntmt Vent Isolation signal, **OR** Manually **CLOSE** valves and dampers as necessary.

Appendix A
(Page 4 of 9)

Equipment Verification

Step	Action/Expected Response	Response Not Obtained
6.	**CHECK** cntmt pressure: • Phase B DARK [MISSP]. • Cntmt Spray DARK [MISSP]. • Cntmt press less than 2.8 psig.	**PERFORM** the following: 1) **ENSURE** Phase B actuated. 2) **ENSURE** Cntmt Spray actuated. 3) **ENSURE** cntmt spray pumps running. 4) **ENSURE** cntmt spray flow. 5) **ENSURE** Phase B isolation: • Train A GREEN. • Train B GREEN • Manually **CLOSE** valves and dampers as necessary. 6) **STOP** all RCPs. 7) **ENSURE** MSIVs and bypasses CLOSED. 8) **PLACE** steam dump controls OFF. 9) **WHEN** 10 minutes has elapsed since Phase B actuated, **THEN** **ENSURE** air return fans start. 10) **USE** adverse cntmt [ADV] setpoints where provided.
7.	**DISPATCH** AUO to perform Attachment 1 (E-0), Ice Condenser AHU Breaker Operation.	

Appendix A
(Page 5 of 9)

Equipment Verification

Step	Action/Expected Response	Response Not Obtained
8.	**CHECK** plant radiation NORMAL: • S/G blowdown rad recorder 1-RR-90-120 NORMAL prior to isolation [M-12]. • Condenser vacuum exhaust rad recorder 1-RR-90-119 NORMAL prior to trip [M-12]. • 1-RR-90-106 and 1-RR-90-112 radiation recorders NORMAL prior to isolation [M-12]. • S/G main steamline discharge monitors NORMAL [M-30]. • Upper and Lower containment high range monitors NORMAL [M-30]. • **NOTIFY** Unit Supervisor conditions NORMAL.	**NOTIFY** Unit Supervisor IMMEDIATELY.
9.	**ENSURE** all D/Gs RUNNING.	**EMERGENCY START** D/Gs
10.	**ENSURE** ABGTS operation:	
	a. ABGTS fans RUNNING.	a. Manually **START** fans.
	b. ABGTS dampers OPEN: • FCO-30-146A. • FCO-30-146B. • FCO-30-157A. • FCO-30-157B.	b. Locally **OPEN** dampers.

Appendix A
(Page 6 of 9)

Equipment Verification

Step	Action/Expected Response	Response Not Obtained
11.	**ENSURE** at least four ERCW pumps RUNNING, one on each shutdown board preferred.	Manually **START** pumps as necessary.
12.	**ENSURE** ERCW supply valves OPEN to running D/Gs.	**IF** ERCW can **NOT** be aligned to running D/G, **THEN** **EMERGENCY STOP** affected D/G.
13.	**ENSURE** 0-FCV-67-152, CCS HX C ALT DISCH TO HDR B, is open to position A.	Manually **OPEN** 0-FCV-67-152 to position A.
14.	**CLOSE** 0-FCV-67-144, CCS HX C DISCH TO HDR A.	
15.	**MONITOR** EGTS operation: • EGTS fans RUNNING. • **ENSURE** dampers OPEN - **VERIFY** filter bank dp between 5 and 9 inches of water.	Manually **START** fans **AND** **OPEN** dampers.
16.	**ENSURE** CCS pumps RUNNING: • 1A-A CCS pump. • 1B-B CCS pump. • C-S or 2B-B CCS pump.	Manually **START** pumps as necessary.
17.	**DISPATCH** AUO to shutdown Upper and Lower CNTMT rad monitors USING SOI-90.02.Gaseous Process Radiation Monitors	

Appendix A
(Page 7 of 9)

Equipment Verification

Step	Action/Expected Response	Response Not Obtained
18.	**WHEN** Attachment 1 is complete (Ice Condenser AHU Breakers OPEN), **THEN** **ENERGIZE** hydrogen igniters [1-M-10]: • 1-HS-268-73 ON. • 1-HS-268-74 ON.	

NOTE The following equipment is located on 1-M-9.

Step	Action/Expected Response	Response Not Obtained
19.	**CHECK** CNTMT PURGE fans STOPPED.	**STOP** fans **AND** **PLACE** handswitch in PULL-TO-LOCK.
20.	**CHECK** FUEL HANDLING EXH fans STOPPED, Fuel and Cask loading dampers CLOSED:	**STOP** fans **AND** **PLACE** handswitch in PULL-TO-LOCK, **THEN** Manually **CLOSE** dampers.
21.	**ENSURE** AB GEN SUPPLY and EXH fans STOPPED.	**STOP** fans **AND** **PLACE** handswitch in PULL-TO-LOCK.

NOTE Dampers 1-HS-30-158 and 2-HS-30-270 remain open during ABI.

Step	Action/Expected Response	Response Not Obtained
22.	**ENSURE** AB GEN SUP & EXH dampers CLOSED.	Manually **CLOSE** dampers.

Appendix A
(Page 8 of 9)

Equipment Verification

Step	Action/Expected Response	Response Not Obtained
23.	**ENSURE** MCR & SPREAD RM FRESH AIR dampers CLOSED: • FCV-31-3. • FCV-31-4.	Manually **CLOSE** dampers.
24.	**ENSURE** at least one CB EMER CLEANUP fan RUNNING and associated damper OPEN:	
	• CB EMERG CLEANUP FAN A-A, **OR** • Fan B-B RUNNING..	Manually **START** fan.
	• FCO-31-8, OPEN. **OR** • FCO-31-7, OPEN	**NOTIFY** TSC if at least one damper **NOT** OPEN.
25.	**ENSURE** at least one CB EMER PRESS fan RUNNING and associated damper OPEN:	
	• CB EMERG PRESS FAN A-A, **OR** FAN B-B RUNNING.	Manually **START** fan.
	• FCO-31-6, OPEN. **OR** • FCO-31-5, OPEN.	**NOTIFY** TSC if at least one damper NOT OPEN.

Appendix A
(Page 9 of 9)

Equipment Verification

Step	Action/Expected Response	Response Not Obtained
26.	**ENSURE** Control Building fans STOPPED and dampers CLOSED:	
	• SPREADING ROOM SUPPLY and EXH FANS AND dampers. • TOILET & LKR RM EXHAUST FAN AND dampers.	Manually **STOP** fans **AND** **NOTIFY** TSC if any damper **NOT** CLOSED.
27.	**INITIATE** Appendix B (E-0), Phase B Pipe Break Contingencies.	

Appendix B
(Page 1 of 1)

Phase B Pipe Break Contingencies

Step	Action/Expected Response	Response Not Obtained
1.	**CHECK** PHASE B actuated. [MISSP - 1-XX-55-6C, -6D]	**WHEN** PHASE B actuation occurs, **THEN** **GO TO** step 2.
2.	**ENSURE** 1-FCV-32-110 CLOSED. [CISP - 1-XX-55-6E] (A-train, window 13)	**DISPATCH** AUO to perform Attachment 2 (E-0).
3.	**ENSURE** 1-FCV-67-107 CLOSED. [CISP - 1-XX-55-6E] (A -train, window 43)	**DISPATCH** AUO to perform Attachment 3 (E-0).
4.	**ENSURE** 1-FCV-70-92 CLOSED. [CISP - 1-XX-55-6E] (A -train, window 73)	**DISPATCH** AUO to perform Attachment 4 (E-0).
5.	**ENSURE** 1-FCV-70-140 CLOSED. [CISP - 1-XX-55-6F] (B -train, window 74)	**DISPATCH** AUO to perform Attachment 5 (E-0).

Attachment 1
(Page 1 of 1)
Ice Condenser AHU Breaker Operation

OPEN the following to remove power from ice condenser air handling units AND **REPORT** completion to UO:

BOARD	COMPT	NOMENCLATURE
480 V Reactor Vent Board 1A-A	13D	1-BKR-232-A000/13D ICE COND 1-AHU-61-1/4/8/12/16/20/24/28
480 V Reactor Vent Board 1A-A	14D	1-BKR-232-A000/14D ICE COND 1-AHU-61-3/7/11/15/19/23/27
480 V Reactor Vent Board 1B-B	13D	1-BKR-232-B000/13D ICE COND 1-AHU-61-2/6/10/14/18/22/26/30
480 V Reactor Vent Board 1B-B	14D	1-BKR-232-B000/14D ICE COND 1-AHU-61-5/9/13/17/21/25/29

Attachment 2
(Page 1 of 1)

Control Air Isolation

A. **CLOSE** 0-ISV-32-1013 - CONTROL AIR EL 713 AB HDR ISOL [A6/S EL. 713] (chain operated - behind Fuel and Waste Handling Bd. A).

B. **IF** 0-ISV-32-1013 CANNOT BE CLOSED,
THEN

OPEN and **DISCONNECT** C&SS air compressor breakers:

1. 0-BKR-32-25 [480V SD BD 1A2-A, C/3D]
2. 0-BKR-32-26 [480V SD BD 1B1-B, C/3D]
3. 0-BKR-32-27 [480V AUX BLDG COM BD, C/6C]
4. 0-BKR-32-4900A [480V TURB BLDG COM BD, C/6C]

Attachment 3
(Page 1 of 1)

ERCW Isolation

UNLOCK AND CLOSE 1-ISV-67-523B, LOWER CNTMT VENT CLR 1B &1D ERCW SUP ISOL [A2U/692] (U-1 penetration room - North of AB Pipe Chase Cooler 1B-B in overhead)

Attachment 4
(Page 1 of 1)
CCS Return Isolation

CLOSE 1-ISV-70-700, RCP OIL COOLER CCS RETURN ISOLATION [A4/V EL. 710 U-1 Penetration Room] (approximately 10 ft. North of Penetration Room Cooler 1B-B on mezzanine above RHR Sump Valve Room)

Attachment 5
(Page 1 of 1)
CCS Supply Isolation

CLOSE 1-ISV-70-516, REACTOR BUILDING CCS SUPPLY ISOLATION [A6/T EL. 737] (Behind Elevator approximately 2 ft. west on mezzanine above "A" CCS Heat Exchanger)

Facility:	**Watts Bar June 2011**	Scenario No.: 5	Op Test No.: 1
Examiners:		Operators:	**SRO**
			RO
			BOP

Initial Conditions: 1.66×10^{-4}% power. RCS boron concentration is 1620 ppm. Train A/ Channel III Work Week.

Turnover: Continue with startup to log critical data at 10^{-2}% power. After logging critical data, raise power to 1-4% using GO-2, "Reactor Startup." Currently GO-2, "Reactor Startup," Section 5.3, "Reactor Startup," is complete to Step 23, ready for performance of Step 24.

Event No.	Malf. No.	Event Type*	Event Description
1	n/a	R-RO N-SRO/BOP	Raise power to 10^{-2}% power, stabilize, then log critical data. After logging critical data, raise power to 1-4% using GO-2, "Reactor Startup."
2	rp38c 100	C-RO TS-SRO	Eagle Rack 2 Loop processor - LCP Card Failure. Requires entry into AOI-44, "Eagle 21 Malfunctions." Requires entry into AOI-2, "Malfunction of Reactor Control System." Requires Tech Spec evaluation.
3	fw87a 100	C-BOP TS-SRO	1-LCV-3-164, SG 1 SUPPLY LCV-3-164A CNTL fails open, and SG 1 level rises. Attempts at manual control are unsuccessful and requires trip of the 1A-A MD AFW pump or manual isolation of flow path. Requires a Tech Spec evaluation.
4	cc05b	C-BOP	CCS supply to RCP 2 thermal barrier develops a leak. Requires entry into AOI-15, "Loss of Component Cooling Water (CCS)."
5	cv17b	C-RO	Loop 2 RCP #1 seal fails, requiring entry into AOI-24, "RCP Malfunctions During Pump Operations." Requires a reactor trip and shutdown of Loop 2 RCP.
6	ms01b 3 rp02b	M-All	After transition from E-0,"Reactor Trip or Safety Injection," to ES-0.1, "Reactor Trip Response," a steam leak on steam generator 2 develops in containment. Automatic safety injection fails to actuate. Requires re-entry into E-0,"Reactor Trip or Safety Injection," then a transition to E-2, "Faulted Steam Generator Isolation."
7	cs11a cs06g cs06h cs01b	C-BOP	1A Containment Spray pump shaft shears 10 seconds after start. A-A and B-B Air Return fans fail to start on Phase B signal. 1B Containment Spray Pump trips 9 minutes after start. Requires entry into FR-Z.1, "High Containment Pressure."

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

Scenario 5 - Summary

Initial Condition	1.66×10^{-4}% power. RCS boron concentration is 1620 ppm. Train A/ Channel III Work Week.

Turnover	Continue with startup to log critical data at 10^{-2}% power. After logging critical data, raise power to 1-4% using GO-2, "Reactor Startup." Currently GO-2, "Reactor Startup," Section 5.3, "Reactor Startup," is complete to Step 23, ready for performance of Step 24.

Event 1	Raise power to 10^{-2}% power, stabilize, then log critical data. After logging critical data, raise power to 1-4% using GO-2, "Reactor Startup."
Event 2	Eagle Rack 2 Loop processor - LCP Card Failure. Requires entry into AOI-44, "Eagle 21 Malfunctions." Requires entry into AOI-2, "Malfunction of Reactor Control System." Requires Tech Spec evaluation and entry LCO 3.3.1, Reactor Trip System Instrumentation and LCO3.3.3 Post Accident Monitoring (PAM) Instrumentation.
Event 3	1-LCV-3-164, SG 1 SUPPLY LCV-3-164A CNTL fails open, and SG 1 level rises. Attempts at manual control are unsuccessful and requires trip of the 1A-A MD AFW pump or manual isolation of flow path. Requires a Tech Spec evaluation.
Event 4	CCS supply to RCP 2 thermal barrier develops a leak. Requires entry into AOI-15, "Loss of Component Cooling Water (CCS)."
Event 5	Loop 2 RCP #1 seal fails, requiring entry into AOI-24, "RCP Malfunctions During Pump Operations." Requires a reactor trip and shutdown of Loop 2 RCP.
Event 6	After transition from E-0,"Reactor Trip or Safety Injection," to ES-0.1, "Reactor Trip Response," a steam leak on steam generator 2 develops in containment. Automatic safety injection fails to actuate. Requires re-entry into E-0,"Reactor Trip or Safety Injection," then a transition to E-2, "Faulted Steam Generator Isolation."
Event 7	1A Containment Spray pump shaft shears 10 seconds after start. A-A and B-B Air Return fans fail to start on Phase B signal. 1B Containment Spray Pump trips 9 minutes after start. Requires entry into FR-Z.1, "High Containment Pressure."

Scenario 5 - Critical Task Summary

Critical Task 1	Manual safety injection is actuated upon discovery of the steam line break, prior to transition to E-2, "Faulted Steam Generator Isolation."
Critical Task 2	Manually start at least one Containment Air Return Fan prior to exiting FR-Z.1, "High Containment Pressure."

Watts Bar Nuclear Plant
06-2011 NRC Examination Scenario 5
Simulator Console Operators Instructions

SIMULATOR SETUP INFORMATION

1. **ENSURE NRC Examination Security has been established.**
2. **RESET to Initial Condition 346 by performing the following actions:**
   a. **Select ICManager on the THUNDERBAR menu (right hand side of Instructor Console Screen).**
   b. **Locate IC# 346.**
   c. **Right "click" on IC# 346.**
   d. **Select Reset on the drop down menu.**
   e. **Right "click" on RESET.**
   f. **Enter the password for IC 346.**
   g. **Select "Yes" on the INITIAL CONDITION RESET pop-up window.**
   h. **Perform SWITCH CHECK.**
3. **SELECT Director on the THUNDERBAR menu (right hand side of Instructor Console Screen).**
4. **ENSURE the following information appears on the Director Screen:**

	Key	Description	Type	Event	Delay	Inserted	Ramp	Initial	Final	Value
	cs06g	air return fan a-a fail to start on phase b	M		00:00:00	00:00:00	00:00:00		Active	Active
	cs06h	air return fan b-b fail to start on phase b	M		00:00:00	00:00:00	00:00:00		Active	Active
	rp02b	auto si initiation signal failure	M		00:00:00	00:00:00	00:00:00		Active	Active
	cs11a	cs pump a sheared shaft	M	13	00:00:10		00:00:00		Active	InActive
	cs01b	containment spray system pump b trip	M	13	00:09:00		00:00:00		Active	InActive
	rp38c	eagle rack #2 loop proc - lcp card failure	M	2	00:00:00		00:00:00		100	0

SIMULATOR SETUP INFORMATION

	Key	Description	Type	Event	Delay	Inserted	Ramp	Initial	Final	Value
	fw87a	lcv-3-164 aux fw loop 1 fail to position	O	3	00:00:00		00:00:30		100	0
	cc05b	comp cool pipe break inside containment rcp#2 thermal barr hx	M	4	00:00:00		00:00:00		Active	InActive
	cv17b	rcp 1 seal failure rcp #2	M	5	00:00:00		00:01:00		1.5	0
	ms01b	main steam line break inside containment sg #2	M	6	00:00:00		00:00:00		3	0

5. **Place simulator in RUN and acknowledge any alarms.**

6. **ENSURE the "Train A Week - Channel 1" sign is placed on 1-M-30.**

7. **Place simulator in FREEZE.**

8. **ENSURE Watts Bar Nuclear Plant Unit 1 Reactivity Briefing Book (Simulator Copy) BOL (Beginning Of Life) is updated and on the desk, and that the BOL placards are on 1-M-6, below the Boric Acid and Primary Water Integrators. ENSURE Reactivity Plan for continuation of the reactor startup is available to the crew.**

9. **WHEN prompted by the Chief Examiner, place the Simulator in RUN.**

Exam Event No.	Simulator Event No.	Description/Role Play
1	n/a	Reactor startup to 1-4% power. ***ROLE PLAY: When contacted as Reactor Engineering, state that Mode 2 physics testing is NOT required. All Low Power Physics testing is complete per PET-201.***
2	2	Eagle Rack 2 Loop processor - LCP Card Failure. ***ROLE PLAY: When contacted as Work Control, acknowledge request to perform IMI-160.*** ***ROLE PLAY: When contacted as Work Control, repeat back request to prepare a package to troubleshoot and repair Loop 1 Temperature circuit.*** ***ROLE PLAY: When contacted as Work Control, the Console Operator will repeat back request to prepare a package to troubleshoot and repair 1-R-2.***
3	3	1-LCV-3-164 fails open, causing SG 1 level to rise. ***ROLE PLAY: When contacted, repeat back request to investigate 1-LCV-3-164. After 2 minutes, report back that 1-LCV-3-164A has failed open.*** ***ROLE PLAY: When contacted, repeat back request to isolate 1-LCV-3-164. Enter fwr39a to close the manual isolation valve. Report back that isolation valve is closed.*** ***ROLE PLAY: When contacted as Work Control, repeat back request to trouble shoot and repair 1-LCV-3-164 circuit.***
4	4	CCS supply to RCP 2 thermal barrier develops a leak. ***ROLE PLAY: NONE***
5	5	Loop 2 RCP #1 seal fails, requiring entry into AOI-24, "RCP Malfunctions During Pump Operations." ***ROLE PLAY: If contacted as Plant Management, state that RCP #2 should be removed from service as soon as possible.***
6	6	Small steam leak on steam generator 2 develops in containment which progresses to a steam line break. Automatic safety injection fails to actuate. ***ROLE PLAY: NONE.***

Exam Event No.	Simulator Event No.	Description/Role Play
7	n/a	1A Containment Spray pump shaft shears 10 seconds after start. A-A and B-B Air Return fans fail to start on Phase B signal. 1B Containment Spray Pump trips 9 minutes after start. ***Role Play: When contacted as the Control Building AUO, state that the breaker for the 1B Containment Spray Pump tripped due to instantaneous overcurrent.*** ***Role Play: When contacted as the Auxiliary Building AUO, state that the 1A Containment Spray pump is severely damaged, and the shaft appears to be broken.***

Op Test No.: NRC	Scenario # 5	Event # 1		Page 1	of 36

Event Description: Raise power to 10^{-2}% power, stabilize, then log critical data. After logging critical data, raise power to 1-4% using GO-2, "Reactor Startup."

Time	Position	Applicant's Actions or Behavior
GO-2		**The applicants will begin to raise reactor power using GO-2, "Reactor Startup," Section 5.3, "Reactor Startup," Step 24.**
	SRO	[24] **IF** TAVG is less than 561°F **AND** Alarm 94 A, TAVG-TREF DEVIATION, is LIT, **THEN INITIATE** 1-SI-68-34 (SR 3.4.2.1).
	RO	[25] **(þ) ADJUST** Control Rods and/or boron concentration to RAISE Reactor power, at a rate of less than 1 dpm, to 1 X 10-2 %.
	RO	[26] **STABILIZE** Reactor power at 1 X 10-2 %.
	SRO	[27] **RECORD** CRITICAL DATA: [27] **RECORD** CRITICAL DATA: Power Level: ______ % (1 NI 92 135A) ______ % (1 NI 92 136A) Rod Position: ______ (Bank) ______ (Steps) ______ RCS C_B ______ PPM Loop T_{AVG} ______ °F (1 TI 68 2E) ______ °F (1 TI 68 25E) ______ °F (1 TI 68 44E) ______ °F (1 TI 68 67E) ______ Initials ______ Date ______ Time
	SRO	[28] **IF** Actual Critical Rod Position is between 500 and 750 pcm from ECP, **THEN ENSURE** Reactor Engineering evaluates **AND** initiates a SR. ***SRO determines that this step is not applicable.***
	SRO	[29] **IF** Mode 2 physics testing required, **THEN ENSURE** that the Mode 2 and Mode 3 Surveillances are in effect during the duration of rod worth measurements (approx 8 hours) per PET-201, and **ENSURE** Reactor Engineering has performed the applicable low-power physics tests per PET-201. ***If contacted as Reactor Engineering, the Console Operator will repeat back the request and state that Mode low power physics testing is not required.***
NOTE If AFW is in service, Reactor power must be maintained within the capability of AFW to maintain SG levels.		
	BOP	[30] **EVALUATE** closing AFW Pumps Recirc Valves (refer to SOI-3.02, Section 8.9).
NOTE TAVG will vary as a function of reactor power until the unit is greater than 15% turbine load (C5) and the Tavg program is maintained by AUTO or manual rod control. The TAVG-TREF deviation alarm is expected as reactor power approaches 7% RTP.		
	RO	[31] **(þ) ADJUST** Control Rods or RCS CB to RAISE Reactor power, at a rate of less than 1 dpm, to between 1 and 4%.

Op Test No.: NRC Scenario # 5 Event # 1 Page 2 of 36

Event Description: Raise power to 10^{-2}% power, stabilize, then log critical data. After logging critical data, raise power to 1-4% using GO-2, "Reactor Startup."

Time	Position	Applicant's Actions or Behavior
	RO	[32] **STABILIZE** Reactor power between 1 and 4%: [32.1] **MAINTAIN** RCS Steam Dumps in Pressure Mode, set at 84% (1092 psig.), or SG PORVs set at 84%. [32.2] **(þ) FOLLOW** Xenon by Rod movement or Boration to maintain control banks ABOVE the LO INSERTION LIMIT.
Cue Console Operator to insert Event 2.		

Op Test No.:	NRC	Scenario #	5	Event #	2	Page	3 of 36

Event Description: Eagle Rack 2 Loop processor - LCP Card Failure. Requires entry into AOI-44, "Eagle 21 Malfunctions." Requires entry into AOI-2, "Malfunction of Reactor Control System." Requires Tech Spec evaluation.

Time	Position	Applicant's Actions or Behavior
Indications: 92-A, PZR LEVEL HI/LO 93-A, RCS LOOP ΔT DEVIATION 94-A, TAVG-TREF DEVIATION 94-B TAVG-T AUCT DEVIATION 111-F, PROT SET I CHANNEL FAILURE 122-C, OVERPOWER ΔT TRIP ALERT 122-D, OVERPOWER ΔT TURB RUNBACK & C-4 ROD BLOCK 123-C, OVERTEMP ΔT TRIP ALERT 123-D, OVERTEMP ΔT TURB RUNBACK & C-3 ROD BLOCK		
	RO	May diagnose and announce the failure of Eagle Rack 1-R-2.
	RO	May diagnose and announce the failure of Loop 1 RTD.
	RO	May place 1-HIC-62-93A, CHARGING FLOW PZR LEVEL CONTROL in MANUAL and throttle closed to restore charging flow to normal.
	SRO	May enter and direct action of AOI-44, "Eagle 21 Malfunctions."
	SRO	May enter and direct actions of AOI-2,"Malfunction of Reactor Control System."
AOI-44		**The following actions are taken from AOI-44, "Eagle 21 Malfunctions," Section 3.1, "Protection Set Failure Identification."**
	RO	1. **IDENTIFY** rack associated with failure: • **REFER TO** ALARM printer. **OR** • **REFER TO** ICS computer screen: 1) **SELECT** NSSS AND BOP 2) **SELECT** EAGLE 21 MENU 3) **SELECT** EGLRCK [upper right of screen] 4) **DETERMINE** which rack has failure by red light next to any rack status ***RO determines that 1-R-2 has failed.***
NOTE Additional bistables lit in row may indicate a power or Logic Control Panel (LCP) failure. (PROT SET TROUBLE lights 19, 39, 59, & 79 are not bistables)		
	RO	2. **CHECK** bistable indications NORMAL.

Op Test No.: NRC	Scenario # 5	Event # 2		Page 4 of 36

Event Description: Eagle Rack 2 Loop processor - LCP Card Failure. Requires entry into AOI-44, “Eagle 21 Malfunctions.” Requires entry into AOI-2, “Malfunction of Reactor Control System.” Requires Tech Spec evaluation.

Time	Position	Applicant's Actions or Behavior
	SRO	2. **RESPONSE NOT OBTAINED:** **GO TO** Section 3.2, Response to LCP or Output Failure.

EXAMINER: The following action is taken from AOI-44, “Eagle 21 Malfunctions,” Section 3.2, Response to LCP or Output Failure.”

SRO

IF FAILURE IN:	** **GO TO**
Protection Set I/Channel 1	
1-R-1	Section 3.2.1
1-R-2	Section 3.2.2
1-R-3	Section 3.2.3
1-R-4	Section 3.2.4

EXAMINER: The following actions are taken from AOI-44, “Eagle 21 Malfunctions,” Section 3.2.2 Rack 1-R-2 Failure.”

CAUTION

Complete failure of LCP results in inoperable control functions and frozen or failed analog outputs. Partial failure may affect analog outputs only.

SRO

1. **PERFORM** COMPENSATORY MEASURES to defeat control functions:

COMPENSATORY MEASURES		
EQUIPMENT FAILED	**EQUIPMENT REQUIRING CONTROL**	**PROCEDURE**
Auctioneered Delta T and TAVG (CHNL I)	Loop LPT-68-2	AOI-2
Loops 1 & 2 RCS Wide Range T-Hot/T-Cold (Loops LPT-68-1&18, 24&41)	N/A	N/A
RCS Wide Range Pressure LPP-66-63 including 1-FCV-74-1 & 8 Interlock & ICCM	N/A	N/A
COMS LPS 1 & 2 PORV 340A	N/A	N/A
RVLIS and Subcooling Monitor 1-XI-68-100 & 1-TI-68-105	N/A	N/A

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Event Description: Eagle Rack 2 Loop processor - LCP Card Failure. Requires entry into AOI-44, "Eagle 21 Malfunctions." Requires entry into AOI-2, "Malfunction of Reactor Control System." Requires Tech Spec evaluation.

Time	Position	Applicant's Actions or Behavior
AOI-2		**The following actions are taken from AOI-2, "Malfunction of Reactor Control System," Section 3.2, "Continuous Rod Withdrawal/Insertion."**
	RO	1. **PLACE** control rods in MAN. ***Due to current plant conditions, rods are in MANUAL.***
	RO	2. **CHECK** control rod movement STOPPED.
	RO	3. **MAINTAIN** T-avg on PROGRAM. (Reference Attachment 1) • **USE** control rods. OR • **ADJUST** turbine load.
	RO	4. **CHECK** loop T-avg channels NORMAL. ***RO determines that Loop 1 RTD has failed.***
	RO	4. **RESPONSE NOT OBTAINED:** **DEFEAT** failed loop ΔT and loop T-avg channels by placing 1-XS-68-2D, ΔT CHANNEL DEFEAT, and 1-XS-68-2M, TAVG CHANNEL DEFEAT in failed channel position then PULL. ***RO will rotate 1-XS-68-2D and 1-HS-68-2M to the LOOP 1 position and then pull out the selector switch.*** **ENSURE** TR-68-2A placed to operable channel using.1-XS-68-2B, ΔT RCDR TR-68-2A LOOP SELECT [1-M-5]. ***1-XS-68-2B, ΔT RCDR TR-68-2A LOOP SELECT, is selected to LOOP 1 and must be selected to any other channel.*** **NOTIFY** Maintenance to implement IMI-160 for failed channel. ***SRO should request performance of IMI-160.*** **WHEN** at least 3 minutes have elapsed since failed T-avg channel is defeated, **THEN** a) **ENSURE** T-avg and T-ref within 1°F. b) **ENSURE** zero demand on control rod position indication [1-M-4]. c) **PLACE** rods in AUTO. ***Since the conditions for AUTO rod control do not exist, the rods will remain in MANUAL.***
	RO	5. **CHECK** Auct Tavg NORMAL on 1-TR-68-2B.
	RO	6. **CHECK** NIS power range channels NORMAL.
	BOP	7. **CHECK** the following: • Turbine impulse pressure channel 1-PI-1-73, NORMAL. • Tref and Auct Tavg NORMAL on 1-TR-68-2B (Reference Attachment 1)

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Event Description: Eagle Rack 2 Loop processor - LCP Card Failure. Requires entry into AOI-44, "Eagle 21 Malfunctions." Requires entry into AOI-2, "Malfunction of Reactor Control System." Requires Tech Spec evaluation.

Time	Position	Applicant's Actions or Behavior
	RO/BOP	8. **MONITOR** core power distribution parameters: • Power range channels. • Flux Indicators. • T-avg. • Loop ΔT. • Incore TCs. • Feed flow/Steam flow.
	SRO	9. **INITIATE** repairs to failed equipment.
	SRO	10. **REFER TO** Tech Specs: 3.1.1, Shutdown Margin. ***Not applicable*** 3.1.5, Rod Group Alignment Limits. ***Not applicable*** 3.1.6, Shutdown Bank Insertion Limits. ***Not applicable*** 3.1.7, Control Bank Insertion Limits. ***Not applicable*** 3.2.1, Heat Flux Hot Channel Factor. ***Not applicable*** 3.2.2, Nuclear Enthalpy Rise Hot Channel Factor. ***Not applicable*** 3.2.4, Quadrant Power Tilt Ratio. ***Not applicable*** 3.2.3, Axial Flux Difference. ***Not applicable*** 3.3.1, Reactor Trip System (RTS) Instrumentation. ***Function 6 Overtemperature ΔT, Condition W, With one channel inoperable (One channel may be bypassed for up to 12 hours for surveillance testing), place the channel in trip within 72 hours OR be in Mode 3 within 78 hours.*** ***Function 7 Overpower ΔT, Condition W, With one channel inoperable (One channel may be bypassed for up to 12 hours for surveillance testing), place the channel in trip within 72 hours OR be in Mode 3 within 78 hours.*** ***Channel 1 ΔT is not used for TTD functions for SG level trips.*** 3.3.2, Engineered Safety Features Actuation System (ESFAS) Instrumentation. ***Channel 1 ΔT is not used for TTD functions for AFW pump starts.***
CAUTION **Allowing at least 5 minutes between any rod control input (i.e., T-avg, T-ref, or NIS) change and placing rods in AUTO, will help prevent undesired control rod movement.**		
	SRO	11. **NOTIFY** Chemistry of any reactor power changes greater than 15% in one hour. ***Due to the conditions at the time of the failure, the conditions of this step are not applicable.***

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Event Description: Eagle Rack 2 Loop processor - LCP Card Failure. Requires entry into AOI-44, "Eagle 21 Malfunctions." Requires entry into AOI-2, "Malfunction of Reactor Control System." Requires Tech Spec evaluation.

Time	Position	Applicant's Actions or Behavior
	SRO	12. **IF** loop ΔT and loop Tavg channels were defeated due to Tavg channel failure, and Tavg channel has been repaired, **THEN PUSH IN** 1-XS-68-2D, ΔT CHANNEL DEFEAT, and 1-XS-68-2M, TAVG CHANNEL DEFEAT, and select away from all ΔT and Tavg channels. ***Due to the conditions at the time of the failure, the conditions of this step are not applicable.***
		13. **WHEN** conditions allow auto rod control, **THEN**: a. **ENSURE** T-avg and T-ref within 1°F. b. **ENSURE** zero demand on control rod position indication [1-M-4]. c. **PLACE** rods in AUTO. ***Due to the conditions at the time of the failure, the conditions of this step are not applicable.***
		14. **WHEN** conditions allow auto pzr level control, **THEN ENSURE** pzr level returned to normal program, AND **PLACE** 1-FCV-62-93 in AUTO ***SRO directs the BOP to place 1-HIC-62-93A, CHARGING FLOW PZR LEVEL CONTROL in AUTO.***
		15. **RETURN TO** Instruction in effect. ***SRO returns to "Eagle 21 Malfunctions," Section 3.2.2 Rack 1-R-2 Failure," after completing compensatory actions of AOI-2, "Malfunction of Reactor Control System," Section 3.2, "Continuous Rod Withdrawal/Insertion."***

Op Test No.:	NRC	Scenario #	5	Event #	2	Page	8 of 36

Event Description: Eagle Rack 2 Loop processor - LCP Card Failure. Requires entry into AOI-44, "Eagle 21 Malfunctions." Requires entry into AOI-2, "Malfunction of Reactor Control System." Requires Tech Spec evaluation.

Time	Position	Applicant's Actions or Behavior
AOI-44		**The following actions are taken from AOI-44, "Eagle 21 Malfunctions," Section 3.2.2, "Rack 1-R-2 Failure."**
	RO	2. **ENSURE** 1-HS-68-340/AD, COPS BLOCK/ARM FOR PORV 340A in BLOCK.
	RO	3. **REFER** to Appendix A as necessary to compare expected bistable pattern with actual failure.

Op Test No.: NRC	Scenario # 5	Event # 2	Page 9 of 36

Event Description: Eagle Rack 2 Loop processor - LCP Card Failure. Requires entry into AOI-44, "Eagle 21 Malfunctions." Requires entry into AOI-2, "Malfunction of Reactor Control System." Requires Tech Spec evaluation.

Time	Position	Applicant's Actions or Behavior
		EXAMINER: Since RCS temperature channel 1 has failed and is NOT used in the SG level Trip Time Delay (TTD) circuitry, LCO 3.3.1 Condition N and LCO 3.3.2 Condition V are NOT APPLICABLE.
	SRO	4. **REFER TO** Tech Specs: • 3.3.1 for Modes 1 and 2 ***Function 6 Overtemperature ΔT, Condition W, With one channel inoperable (One channel may be bypassed for up to 12 hours for surveillance testing), place the channel in trip within 72 hours OR be in Mode 3 within 78 hours.*** ***Function 7 Overpower ΔT, Condition W, With one channel inoperable (One channel may be bypassed for up to 12 hours for surveillance testing), place the channel in trip within 72 hours OR be in Mode 3 within 78 hours.*** ***Channel 1 ΔT is not used for TTD functions for SG level trips.*** • 3.3.2 for Modes 1 and 2 ***Channel 1 ΔT is not used for TTD functions for AFW pump starts.*** • 3.3.3 for Modes 1, 2 and 3 ***Function 3, RCS Hot Leg Temperature, Condition C, One or more Functions with two required channels inoperable OR Functions 3, 4, 14, and 16 with one required channel inoperable, restore one channel to OPERABLE status within 7 days.*** ***Function 4, RCS Cold Leg Temperature Condition C, One or more Functions with two required channels inoperable OR Functions 3, 4, 14, and 16 with one required channel inoperable, restore one channel to OPERABLE status within 7 days.*** ***Function 5, RCS Pressure (Wide Range) Condition A, One or more Functions with one required channel inoperable, restore required channel to OPERABLE status within 30 days.*** ***Function 6, Reactor Vessel Water Level, Condition A, One or more Functions with one required channel inoperable, restore required channel to OPERABLE status within 30 days.*** ***Function 22, Reactor Coolant System Subcooling Margin Monitor, Condition A, One or more Functions with one required channel inoperable, restore required channel to OPERABLE status within 30 days.*** • 3.3.12 for Modes 4, 5 and 6 when vessel head is on ***Not applicable.*** ***Based on the Tech Specs involves, no mode change is allowed (i.e., must maintain reactor power <5 %) without further evaluation.*** ***SRO may request support to evaluate applicability of 3.3.4, Remote Shutdown System.***

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Event Description: Eagle Rack 2 Loop processor - LCP Card Failure. Requires entry into AOI-44, "Eagle 21 Malfunctions." Requires entry into AOI-2, "Malfunction of Reactor Control System." Requires Tech Spec evaluation.

Time	Position	Applicant's Actions or Behavior
	SRO	5. **INITIATE** repairs to failed rack. ***When contacted as Work Control, the Console Operator will repeat back request to prepare a package to troubleshoot and repair 1-R-2.***
	RO	6. **CHECK** indications normal for other Eagle 21 rack(s). ***RO monitors ICS display to determine that other Eagle Racks are normal.***
	RO/BOP	7. **MONITOR** any alternate indications available for inputs lost to lit alarms.
	SRO	8. **RETURN TO** Instruction in effect.
	SRO	**Crew Brief** would typically be conducted for this event as time allows prior to the next event.
	SRO	**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).
Cue Console Operator to insert Event 3.		

Op Test No.: NRC Scenario # 5 Event # 3

Event Description: 1-LCV-3-164, SG 1 SUPPLY LCV-3-164A CNTL fails open, and SG 1 level rises. Attempts at manual control are unsuccessful and requires trip of the 1A-A MD AFW pump or manual isolation of flow path. Requires a Tech Spec evaluation.

Time	Position	Applicant's Actions or Behavior
Indications: 63-F SG LEVEL DEVIATION 60-B SG 1 LEVEL HI 1-FI-3-163A AFW TO SG1 FLOW indicates high flow 1-FI-3-163B AFW TO SG 1 FLOW indicates high flow.		
	BOP	Diagnoses and announces failure of 1-LCV-3-164, SG1 SUPPLY LCV-3-164 CNTL.
	BOP	May shift 1-LIC-3-164A SG 1 SUPPLY FRM PMP A-A from AUTO to MANUAL to attempt to close 1-LCV-3-164.
	SRO	Enters and directs actions contained in ARI 63-F.
ARI 63-F		**The following actions are taken from ARI 63-F "SG LEVEL DEVIATION"**
	BOP	**[1] DETERMINE** which S/G has abnormal level. ***BOP determines from rapid level rise that SG 1 has abnormal level.***
	BOP	**[2] CHECK** steam flow/feed flow instrumentation to **VERIFY** level controls are restoring S/G levels to **NORMAL**. ***BOP determines from observing SG 1 level on 1-LI-3-42, 1-LI-3-39, 1-LI-3-38 (1-M-4), and AFW flow to SG 1 on 1-FI-3-163A and 1-FI-3-163B (1-M-3) that the 1-LCV-3-164A has failed OPEN.***

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Event Description: 1-LCV-3-164, SG 1 SUPPLY LCV-3-164A CNTL fails open, and SG 1 level rises. Attempts at manual control are unsuccessful and requires trip of the 1A-A MD AFW pump or manual isolation of flow path. Requires a Tech Spec evaluation.

Time	Position	Applicant's Actions or Behavior
	BOP	**[3] IF** level controls have malfunctioned, **THEN** **[3.1] PLACE** FW controls in manual. ***Places 1-LIC-3-174, SG 1 SUPPLY FRM T-D PMP, in MANUAL and moves slider to the left to close the valve. While closing 1-LIC-3-174, BOP observes AFW flow reduction. Determines SG 1 level is rising above normal level of 38% narrow range. Places 1-LIC-3-164A, SG 1 SUPPLY FRM PMP A-A, in MANUAL and moves slider to the left to close the valve and locks slider. Determines that 1-LCV-3-164 will NOT CLOSE. Diagnoses that 1-LCV-3-164 has failed OPEN.*** ***SRO may direct the BOP to place 1-HS-3-118A, AFW PMP A-A in STOP, PULL-TO-LOCK position.*** **[3.2] RESTORE** S/G level to normal and **GO TO** AOI-16, *LOSS OF NORMAL FEEDWATER.* ***SRO may dispatch Auxiliary Building AUO to locally close 1-LCV-3-164, or to locally close isolation valves associated with 1-LCV-3-164. When contacted to isolate 1-FCV-2-164, the Console Operator repeats back the request. The Console Operator will enter remote function fwr39a to close a manual isolation valve. 1-LCV-3-164A will continue to indicate full open.*** ***SRO determines that there are no actions contained in AOI-16 to address the AFW problem and continues to the next step.***
	SRO	**[4] IF** MFPT speed controls have malfunctioned, **THEN** **[4.1] PLACE** MFPT speed controls in manual. **[4.2] RESTORE** MFW/MS ΔP to program AND **GO TO** AOI-16, *LOSS OF NORMAL FEEDWATER.* ***SRO determines that this step is not applicable to the current failure and continues to the next step.***
	BOP	**[5] INITIATE** Service Request for corrective action, if necessary. ***Evaluates effect of the failure on Train A AFW, and determines that LCO 3.7.5, Auxiliary Feedwater (AFW) System, Condition B must be entered. Requires that the AFW train be restored to OPERABLE status within 72 hours.***

Op Test No.:	NRC	Scenario #	5	Event #	3	Page	13	of	36

Event Description: 1-LCV-3-164, SG 1 SUPPLY LCV-3-164A CNTL fails open, and SG 1 level rises. Attempts at manual control are unsuccessful and requires trip of the 1A-A MD AFW pump or manual isolation of flow path. Requires a Tech Spec evaluation.

Time	Position	Applicant's Actions or Behavior
ARI 60-B		**The following actions are taken from ARI 60-B, "SG 1 LEVEL HIGH."**
	BOP	**[1] If** AFW system is in service, **THEN CHECK** AFW operation **AND** CONTROL level manually if necessary per SOI-3.02, AUXILIARY FEEDWATER SYSTEM. ***Places 1-LIC-3-174, SG 1 SUPPLY FRM T-D PMP, in MANUAL and moves slider to the left to close the valve. While closing 1-LIC-3-174, BOP observes AFW flow reduction. Determines SG 1 level is rising above normal level of 38% narrow range. Places 1-LIC-3-164A, SG 1 SUPPLY FRM PMP A-A, in MANUAL and moves slider to the left to close the valve and locks slider. Determines that 1-LCV-3-164 will NOT CLOSE. Diagnoses that 1-LCV-3-164 has failed OPEN.*** ***SRO may direct the BOP to place 1-HS-3-118A, AFW PMP A-A in STOP, PULL-TO-LOCK position.*** ***SRO may dispatch Auxiliary Building AUO to locally close 1-LCV-3-164, or to locally close isolation valves associated with 1-LCV-3-164. When contacted to isolate 1-FCV-2-164, the Console Operator repeats back the request. The Console Operator will enter remote function fwr39a to close a manual isolation valve. 1-LCV-3-164A will continue to indicate full open.***
	SRO	**[2] PLACE** 1-FC-3-35 and/or 1-FC-3-35A in **MANUAL AND RESTORE** S/G level to program. ***SRO determines this step is not applicable since S/G level control is not on Main or Bypass feed reg valves.***
	SRO	**[3] REFER** TO AOI-16, LOSS OF NORMAL FEEDWATER. ***SRO determines that reference to AOI-16, "Loss of Normal Feedwater," is not applicable.***
	BOP	**[4] DETERMINE** cause of Hi Level AND INITIATE corrective action, if necessary. ***When the SRO contacts Work Control, the Console Operator will repeat back request for a troubleshooting and repair package***
	SRO	Evaluate Tech Specs ***Evaluates effect of the failure on Train A AFW, and determines that LCO 3.7.5, Auxiliary Feedwater (AFW) System, Condition B must be entered. Requires that the AFW train be restored to OPERABLE status within 72 hours.***

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Event Description: 1-LCV-3-164, SG 1 SUPPLY LCV-3-164A CNTL fails open, and SG 1 level rises. Attempts at manual control are unsuccessful and requires trip of the 1A-A MD AFW pump or manual isolation of flow path. Requires a Tech Spec evaluation.

Time	Position	Applicant's Actions or Behavior
	SRO	If 1A-A AFW pump is stopped may, address GOI-7, "Generic Equipment Operating Guidelines," Section 5.2.5, "Motor Operating and Starting Limitations," CAUTION, which states that the Auxiliary Feedwater Pump motor is limited to six starts per day. (Ref GOI-7, Rev. 41 page 27 of 62.)
	SRO	**Crew Brief -** conduct for this event as time allows prior to the next event.
	SRO	**Notifications** should be addressed as applicable if not specifically addressed by the procedure or in the crew brief.
	SRO	Operations Management - Shift Manager. Maintenance Personnel – Maintenance Shift Supervisor (MSS). (**Note:** Maintenance notification may be delegated to the Shift Manager).
Console Operator enters Event 4		

Op Test No.:	NRC	Scenario #	5	Event #	4	Page	15	of	36

Event Description: CCS supply to RCP 2 thermal barrier develops a leak. Requires entry into AOI-15, "Loss of Component Cooling Water (CCS)."

Time	Position	Applicant's Actions or Behavior
Indications: 237-B, RCP 1 THRM BAR RET FLOW LO 238-B, RCP 2 THRM BAR RET FLOW LO 239-B, RCP 3 THRM BAR RET FLOW LO 240-B, RCP 4 THRM BAR RET FLOW LO		
	BOP	Diagnoses and announces thermal barrier leakage.
	BOP	May request that the RO monitor RCP seal parameters normal, since thermal barrier flow has been lost
	BOP	May stop pull-to-lock the TBBPs and then isolate the thermal barrier flowpath into and out of containment.
	SRO	May enter and direct actions of ARI 237A, 237-B, RCP 1 THRM BAR RET FLOW LO.
	SRO	Enters and directs actions of AOI-15, "Loss of Component Cooling Water (CCS)."
ARI 237-B		**The following actions are taken from ARI 238-B, RCP 2 THRM BAR RET FLOW LO.**
	RO	**[1] IF** Phase B initiated, **THEN GO TO** Emergency Instructions.
	BOP	**[2] CHECK** 1-FI-70-105, TH BAR 2 FLOW [0-M-27B], and **COMPARE** with other RCPs. ***BOP determines that RCP 2 thermal barrier flow is abnormal.***
	BOP	**[3] ENSURE** TB Booster Pump ON.
	BOP	**[4] ENSURE** the following TB isolation valves OPEN: • 1-FCV-70-133 and -134, THERMAL BAR SUP CIV–ϕB • 1-FCV-70-87 and -90, THERMAL BAR RET CIV–ϕB
	BOP	**[5] IF** flow NOT restored, **THEN** **[a] ENSURE** RCP 1 seal water flow between 8 and 13 gpm. **[b] MONITOR** RCP temps on computer. **[c] REFER TO** AOI-15, *LOSS OF COMPONENT COOLING WATER (CCS).* **[d] ADJUST** 1-THV-70-684A per TI-31.08, *FLOW BALANCING VALVES SETPOINTS.*

Op Test No.: NRC	Scenario # 5	Event # 4			Page 16 of 36		

Event Description: CCS supply to RCP 2 thermal barrier develops a leak. Requires entry into AOI-15, "Loss of Component Cooling Water (CCS)."

Time	Position	Applicant's Actions or Behavior
AOI-15		**The following actions are taken from AOI-15, "Loss of Component Cooling Water (CCS)."**
	BOP	1. **CHECK** CCS pumps status: a. **CHECK** any CCS pump TRIPPED or running pump NOT pumping forward: • ERCW/CCS Motor tripout alarm, • Low header pressure (train A or B), • Multiple low flow alarms.
	BOP	1. **RESPONSE NOT OBTAINED:** a. **GO TO** Caution prior to Step 2.
CAUTION **A closed surge tank vent valve may cause a positive or negative tank pressure, giving an erroneous level indication.**		
	BOP	2. **CHECK** 1-FCV-70-66, U1 Surge Tank Vent, OPEN. ***BOP observes the GREEN indicating light DARK and RED indicating light LIT on 1-HS-70-66, U1 SURGE TANK VENT.***
	BOP	3. **IF** surge tank level less than 57%, **THEN ENSURE** 1-LCV-70-63, U1 Surge Tank Makeup LCV, OPEN (Refer to SOI-70.01 as required if makeup not available).
	BOP	4. **MONITOR** A and B side surge tank levels greater than 10%.
	SRO	5. IF RHR Shutdown Cooling is in service, **THEN GO TO** AOI-14, Loss Of RHR Shutdown Cooling.
CAUTION **CCP may survive for only 10 to 12 minutes after loss of CCS to lube oil cooler.**		
	SRO	6. **MONITOR** the following for Unit 1 CCS Train A: • U-1 CCS Train A level • ERCW flow to CCS Hx A **IF** loss of either is imminent, **THEN PERFORM** the following: ***SRO determines that loss of level is NOT imminent and continues to the next step.***
	SRO	7. **MONITOR** the following for Unit 1 CCS Train B: • U-1 CCS Train B level • ERCW flow to CCS Hx C **IF** loss of either is imminent, **THEN STOP** and **LOCKOUT** the following Train B equipment: ***SRO determines that loss of level is NOT imminent and continues to the next step.***

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Event Description: CCS supply to RCP 2 thermal barrier develops a leak. Requires entry into AOI-15, "Loss of Component Cooling Water (CCS)."

Time	Position	Applicant's Actions or Behavior
	BOP	8. **CHECK** all RCP upper and lower oil cooler flows NORMAL: • Upper Cooler flow: 150-220 gpm • Lower Cooler flow: 5-10 gpm ***BOP determines that the RCP upper and lower oil cooler flows are within the ranges provided in the step.***
CAUTION **Seal injection water must be maintained to all RCPs following isolation of thermal barriers.**		
	BOP	9. **CHECK** Thermal Barrier Hx flows NORMAL. • Thermal Barrier flow 40-50 gpm ***BOP determines that thermal barrier heat exchanger flows are ABNORMAL.***
	BOP	9. **RESPONSE NOT OBTAINED:** **IF** flow abnormally high or low indicating possible line break, **THEN**: a. **ENSURE** Thermal Barrier Booster pumps STOPPED. ***BOP places 1-HS-70-131A, THRM BAR BSTR PMP 1A (TBBP) in the STOP, PULL-TO-LOCK. BOP places 1-HS-70-130A, THRM BAR BSTR PMP 1B (TBBP) in the STOP, PULL-TO-LOCK position.*** b. **ENSURE** the following isol valves CLOSED: • 1-FCV-70-133 or 1-FCV-70-134, Thermal Barrier Supply CIV. • 1-FCV-70-87 or 1-FCV-70-90, Thermal Barrier Return CIV. ***BOP places one thermal barrier supply and one thermal barrier return isolation valve in the CLOSE position.*** c. **IF** RCP lower bearing temp rising uncontrolled (180 °F max), **THEN REFER TO** AOI-24, Reactor Coolant Pump Seal Abnormalities. ***RO may use ICS RCP parameter screen to monitor RCP lower bearing temperatures.***
	BOP	10. **CHECK** 1A ESF Supply Header flow NORMAL, 1-FI-70-159A. • Normal ~100 gpm with RHR out of service.
	BOP	11. **CHECK** 1B ESF Supply Header flow NORMAL, 1-FI-70-165A. • Normal 5000-6000 gpm with RHR in service.
	BOP	12. **CHECK** SFP Hx A flow NORMAL, 0-FI-70-20. • Normal 2700-3500 gpm with SFP Hx A in service.

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Event Description: CCS supply to RCP 2 thermal barrier develops a leak. Requires entry into AOI-15, "Loss of Component Cooling Water (CCS)."

Time	Position	Applicant's Actions or Behavior
EXAMINER: The following indication is NOT simulated. Provide cue that 0-FI-70-6 SFP Hx B is off-scale high at this time.		
	BOP	13. **CHECK** SFP Hx B flow NORMAL, 0-FI-70-6. • Normal top of scale with SFP Hx B in service (may require local observation to determine if leak exists).
	BOP	14. **IF** leak location can be isolated, **THEN RETURN** CCS surge tank to normal level (refer to SOI-70.01).
EXAMINER: AOI-15, "Loss of Component Cooling Water (CCS)." Appendix A, "Header Cross-Reference," is contained as Attachment 1.		
	BOP	15. **EVALUATE** affected equipment operation USING Appendix A. ***SRO may assign the performance of Appendix A to the BOP.***
	BOP	16. **WHEN** CCS returned normal, **THEN** • **CHECK** only one CCS pump per Train. • **CHECK** one TBBP running. ***With thermal barrier heat exchanger flow path isolated, the SRO determines that step performance is not applicable at this time.***
	SRO	17. **REFER TO** Tech Specs 3.7.7, Component Cooling Water System (CCS). ***SRO determines that LCO 3.7.7 is not applicable. SRO enters OR 14.10 for thermal barrier booster pump loss.***
	SRO	18. **INITIATE** repairs.
	SRO	19. **WHEN** repairs are complete, **THEN**: ***SRO determines that the conditions on the step will not be met and continues to the next step.***
	SRO	20. **RETURN TO** Instruction in effect.
	SRO	**Crew Brief** would typically be conducted for this event as time allows prior to the next event.
	SRO	**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).
Cue Console Operator to insert Event 5.		

Op Test No.:	NRC	Scenario #	5	Event #	5	Page	19	of 36

Event Description: Loop 2 RCP #1 seal fails, requiring entry into AOI-24, "RCP Malfunctions During Pump Operations." Requires a reactor trip and shutdown of Loop 2 RCP.

Time	Position	Applicant's Actions or Behavior
Indications: 100-D RCP SEAL LEAK OFF FLOW HI 1-FR-68-24 SEAL LEAKOFF - HI RANGE indicates a rising trend, continuing until the recorder is at full scale.		
	RO	Diagnoses and announces the high seal return flow on RCP 2.
	RO	Refers to 100-D RCP SEAL LEAK OFF FLOW HI
	SRO	Enters and directs actions of AOI-24,"RCP Malfunctions During Pump Operation."
AOI-24		**The following actions are taken from AOI-24, "RCP Malfunctions During Pump Operation," Section 3.3, "#1 seal leakoff flow HIGH."**
CAUTION **A seal leakoff rise to greater than 2.0 gpm AFTER experiencing low leakoff of less than 0.8 gpm may indicate seal degradation. Plant Management should be notified of leakoff trends.**		
NOTE 1 Anytime #1 seal leakoff flow exceeds the values shown on Attachment 1, system engineering should be requested to perform an evaluation of the #1 seal condition.		
NOTE 2 During plant startup after seal maintenance, the #1 seal may require 24 hours of run time before the seal seats fully and operates normally.		
NOTE 3 The #1 seal return should be isolated between 3 and 5 minutes after tripping an RCP to allow for pump coastdown.		
	RO	1. **MONITOR** #1 seal leakoff equal to or greater than 6.0 gpm.
EXAMINER: Depending on the speed of crew actions, temperatures may be dropping at step 2 and they may continue to step 3. As time passes, this monitor step will send the SRO to section 3.2, step 2.		
	RO	2. **MONITOR** RCPs lower bearing and #1 seal outlet temp STABLE or DROPPING.
	SRO	2. **RESPONSE NOT OBTAINED:** **GO TO** Subsection 3.2, Step 2

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Event Description: Loop 2 RCP #1 seal fails, requiring entry into AOI-24, "RCP Malfunctions During Pump Operations." Requires a reactor trip and shutdown of Loop 2 RCP.

Time	Position	Applicant's Actions or Behavior
	SRO	3. **REFER TO** appropriate instruction to initiate a controlled shutdown to Mode 3 while continuing with this instruction: • AOI-39, Rapid Load Reduction. • GO-4, Normal Power Operation. • GO-5, Unit Shutdown From 30% Reactor Power to Hot Standby. ***Due to plant conditions, GO-5, "Unit Shutdown From 30% Reactor Power to Hot Standby," is the appropriate instruction.***
NOTE RCP shutdown time is based on an orderly reactor shutdown and may be delayed or expedited based on ongoing evaluations of current plant conditions, other pump parameters and efforts to restore seal leakoff flows to normal.		
	SRO	4. **REMOVE** RCP from service: • Within 8 hrs, OR • As directed by Plant Management. ***If the SRO contacts Plant Management, repeat back information provided and direct removal of the RCP as soon as possible.***
EXAMINER: AOI-24,"RCP Malfunctions During Pump Operation," Attachment 2, "RCP Immediate Shutdown Criteria," is contained as Attachment 2.		
	RO	5. **MONITOR** RCP immediate shutdown required: • **REFER TO** ATTACHMENT 2, RCP Immediate Shutdown Criteria. **GO TO** Subsection 3.2, Step 2.
EXAMINER: The following actions are taken from AOI-24, "RCP Malfunctions During Pump Operation," Section 3.2, "RCP tripped or shutdown required."		
NOTE 1 Malfunctions addressed by this procedure require RCP shutdown as soon as possible.		
NOTE 2 Exceeding any of the limits listed on Attachment 2 of this procedure will require immediate shutdown of the affected RCP		
NOTE 3 Malfunctions resulting in high #1 seal leakoff will require closing #1 seal return FCV following RCP coastdown		
	SRO	1. **CHECK** RCP tripped

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Event Description: Loop 2 RCP #1 seal fails, requiring entry into AOI-24, "RCP Malfunctions During Pump Operations." Requires a reactor trip and shutdown of Loop 2 RCP.

Time	Position	Applicant's Actions or Behavior
	SRO	1. **RESPONSE NOT OBTAINED:** **MONITOR** RCP immediate shutdown Criteria: • **REFER TO** ATTACHMENT 2, RCP Immediate Shutdown Criteria. 1) **IF** RCP immediate shutdown required, **THEN GO TO** Step 2.
	RO	2. **CHECK** unit in Mode 1 or 2
NOTE Control room staff should brief on Steps 3 through 6 prior to tripping the reactor. This ensures that the affected RCP is stopped and that appropriate actions are taken when unit is removed from service.		
	SRO	3. **TRIP** the reactor, and **GO TO** E-0, Reactor Trip or Safety Injection, WHILE continuing with this instruction.
EXAMINER: RCP 2 may be tripped after confirmation of reactor trip in Step 1 of E-0, "Reactor Trip or Safety Injection," OR after performance of Step 4 of E-0.		
	RO	4. **STOP** and **LOCK OUT** affected RCP(s).
	SRO	5. **IF** in Mode 3, **THEN CHECK** any RCP Running
CAUTION If the RCP seal return flow control valve (FCV) is NOT closed within 5 minutes of stopping the RCP with excessive leakoff, seal damage may occur.		
	RO	6. **MONITOR** RCP seal leakoff less than 6 gpm per pump: • 1-FR-62-24 [RCP 1 & 2] • 1-FR-62-50 [RCP 3 & 4] • ICS "RCP DATA" • ICS "RCP SEALS"
EXAMINER: RCP 2 is the affected pump and requires that 1-FCV-68-22 be closed during the performance of Step 6 RESPONSE NOT OBTAINED.		
	RO	6. **RESPONSE NOT OBTAINED:** **WHEN** the RCP has coasted down (between 3 and 5 minutes), **THEN CLOSE** affected RCP seal return FCV: • 1-FCV-62-9 [RCP 1] • 1-FCV-62-22 [RCP 2] • 1-FCV-62-35 [RCP 3] • 1-FCV-62-48 [RCP 4]
	RO	7. **CHECK** RCPs 1 and 2 running.

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Event Description: Loop 2 RCP #1 seal fails, requiring entry into AOI-24, "RCP Malfunctions During Pump Operations." Requires a reactor trip and shutdown of Loop 2 RCP.

Time	Position	Applicant's Actions or Behavior
	RO	7. **RESPONSE NOT OBTAINED:** **CLOSE** affected loop's pressurizer spray valve. ***RO places 1-PIC-68-340B, LOOP 2 SPRAY CONTROL in MANUAL and moves the toggle to the left to CLOSE the valve.***

Op Test No.:	NRC	Scenario #	5	Event #	5	Page	23 of 36

Event Description: Loop 2 RCP #1 seal fails, requiring entry into AOI-24, "RCP Malfunctions During Pump Operations." Requires a reactor trip and shutdown of Loop 2 RCP.

Time	Position	Applicant's Actions or Behavior
E-0		**The following actions are taken from E-0, Reactor Trip or Safety Injection."**
		NOTE Steps 1 thru 4 are **IMMEDIATE ACTION STEPS.** Status Trees / SPDS should be monitored when transitioned to another instruction.
	RO	1. **ENSURE** reactor trip: • Reactor trip and bypass breakers OPEN. ***RO checks 1-52RTB, RX TRIP BKR A RED indicating light LIT on panel 1-M-4.*** ***RO checks 1-52RTB, RC TRIP BKR B RED indicating light LIT on panel 1-M-4*** ***RO checks 1-52BYA, BYPASS BKR A lights DARK*** ***RO checks 1-52BYB, BYPASS BKR B lights dark*** • RPIs at bottom of scale. ***RO observes 1-MON 85 5000/1 CERPI Monitor 1 and 1-MON-85 5000/2 CERPI MONITOR 2 for indication that all SHUTDOWN and CONTROL bank rods are inserted.*** • Neutron flux DROPPING. ***RO observes neutron flux trending down on 1-NR-92-145, NEUTRON FLUX LEVEL RECORDER. May also observe levels decreasing on 1-NI-92-135A, CH I NEUTRON MON % PWR, and 1-NI-92-136A, CH II NEUTRON MON % PWR.***
	RO	2. **ENSURE** Turbine Trip: • All turbine stop valves CLOSED ***RO observes that indicating lights on 1-XX-47-1000 EHC CONTROL for individual throttle and governor valves are GREEN.***
	RO	3. **CHECK** 6.9 kV shutdown boards: a. At least one board energized from: • CSST (offsite), OR • D/G (blackout). ***When observed by the RO during IMMEDIATE OPERATOR ACTIONS, both shutdown boards are energized, based on 1-EI-57-39, 6.9 SDB 1A-A VOLTS indicating approximately 7000 volts and 1-EI-57-66, 6.9 SDB 1B-B VOLTS indicating approximately 7000 volts.***

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Event Description: Loop 2 RCP #1 seal fails, requiring entry into AOI-24, "RCP Malfunctions During Pump Operations." Requires a reactor trip and shutdown of Loop 2 RCP.

Time	Position	Applicant's Actions or Behavior
	RO	4. **CHECK** SI actuated: a. Any SI annunciator LIT. ***RO determines that NO SI annunciator is LIT.***
	SRO	4. **RESPONSE NOT OBTAINED:** **DETERMINE** if SI required: a. **IF** ANY of the following exists: • S/G press less than 675 psig, OR • RCS press less than 1870 psig, OR • Cntmt press greater than 1.5 psig **THEN ACTUATE** SI manually. ***RO observes plant conditions and determines that SI actuation criteria are NOT MET at this time.*** **IF** SI **NOT** required, **THEN GO TO** ES-0.1, Reactor Trip Response.

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Event Description: Loop 2 RCP #1 seal fails, requiring entry into AOI-24, "RCP Malfunctions During Pump Operations." Requires a reactor trip and shutdown of Loop 2 RCP.

Time	Position	Applicant's Actions or Behavior
	ES-0.1	**The following actions are taken from ES-0.1, "Reactor Trip Response."**
		CAUTION **Plant conditions, AFW pump start signals and flow requirements should be evaluated as time allows.**
	RO	1. **MONITOR** SI actuation criteria: • **IF** SI actuation occurs during the performance of this Instruction, **THEN ** GO TO** E-0, Reactor Trip or Safety Injection.
	BOP	2. **CHECK** Generator PCBs OPEN.
	RO	3. **MONITOR** RCS temperature stable at or trending to 557°F using: • RCS Loop T-avg with any RCP running. .OR • RCS Loop T-cold with RCPs out-of-service.
	BOP	4. **ENSURE** AFW operation: a. AFW established: • Both MD AFW pumps RUNNING. • TD AFW pump RUNNING. • LCVs in AUTO or controlled in MANUAL. ***If 1A-A MD AFW pump was secured due to the earlier failure of 1-LCV-3-164, the pump will remain in the STOP, PULL-TO-LOCK position for the duration of the scenario.*** ***If 1-LCV-3-164 was isolated due to the earlier failure, it will remain isolated for the duration of the scenario.*** b. Heat sink available: • Total feed flow greater than 410 gpm, OR • At least one S/G NR level greater than 29%.
	BOP	5. **CHECK** MFW status: a. **CHECK** RCS T-avg less than 564°F. b. **ENSURE** MFW isolation: • MFW isolation and bypass isolation valves CLOSED. • MFW reg and bypass reg valves CLOSED. • MFP A and B TRIPPED. • Standby MFP STOPPED. • Cond demin pumps TRIPPED. • Cond booster pumps TRIPPED.

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Event Description: Loop 2 RCP #1 seal fails, requiring entry into AOI-24, "RCP Malfunctions During Pump Operations." Requires a reactor trip and shutdown of Loop 2 RCP.

Time	Position	Applicant's Actions or Behavior
	RO	6. **ENSURE** all control and shutdown rods fully inserted: • RPIs at bottom scale. ***RO observes 1-MON 85 5000/1 CERPI Monitor 1 and 1-MON-85 5000/2 CERPI MONITOR 2 for indication that all SHUTDOWN and CONTROL bank rods are inserted.***
	SRO	7. **ANNOUNCE** reactor trip over PA system
	BOP	8. **MONITOR** S/G levels: a. At least one S/G NR level greater than 29%. b. S/G NR levels less than 50% and controlled.
	BOP	9. **CONTROL** S/G NR levels between 29% and 50%.
EXAMINER: AOI-17, "Turbine Trip," Section 3.3, "BOP Realignment," is contained as Attachment 3.		
	BOP	10. **INITIATE** BOP realignment: • **REFER TO** AOI-17, Turbine Trip.
	RO	11. **MONITOR** pzr pressure: a. Pzr pressure greater than 1870 psig. b. Pzr pressure trending to 2235 psig.
Cue Console Operator to insert Event 6.		

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Event Description: A small steam leak on steam generator 2 develops in containment which progresses to a steam line break. Automatic safety injection fails to actuate. Requires re-entry into E-0, "Reactor Trip or Safety Injection," then a transition to E-2, "Faulted Steam Generator Isolation." 1A Containment Spray pump shaft shears 10 seconds after start. A-A and B-B Air Return fans fail to start on Phase B signal. 1B Containment Spray Pmp trips 9 minutes after start. Requires entry into FR-Z.1, "High Containment Pressure."

Time	Position	Applicant's Actions or Behavior
Indications: 144-A, ICE COND INLET DOOR OPEN Containment pressure rising. Steam pressure lowering. RCS temperature lowering.		
	RO	Diagnoses and announces the steam leak inside containment.
	RO	Determines that automatic safety injection failed to actuate and manually actuates the signal.
	SRO	Re-enters and directs actions of E-0, "Reactor Trip or Safety Injection."
E-0		**The following actions are taken from E-0, "Reactor Trip or Safety Injection." The applicants re-enter E-0, "Reactor Trip or Safety Injection," after the safety injection is actuated.**
EXAMINER: Per TI-12.04, "User's Guide For Abnormal And Emergency Operating Instructions," Section 2.2.4, "Immediate Operator Actions," C.1.4 states "When re-entering E-0 from another EOI, the first 4 high level steps must be reconfirmed, it is NOT necessary to re-perform each low level action."		
NOTE Steps 1 thru 4 are **IMMEDIATE ACTION STEPS.** Status Trees / SPDS should be monitored when transitioned to another instruction.		
	RO	1. **ENSURE** reactor trip: • Reactor trip and bypass breakers OPEN. • RPIs at bottom of scale. • Neutron flux DROPPING.
	RO	2. **ENSURE** Turbine Trip: • All turbine stop valves CLOSED.
	RO	3. **CHECK** 6.9 kV shutdown boards: a. At least one board energized from: CSST (offsite), OR D/G (blackout).

Op Test No.:	NRC	Scenario #	5	Event #	6 and 7	Page	28 of 36

Event Description: A small steam leak on steam generator 2 develops in containment which progresses to a steam line break. Automatic safety injection fails to actuate. Requires re-entry into E-0, "Reactor Trip or Safety Injection," then a transition to E-2, "Faulted Steam Generator Isolation." 1A Containment Spray pump shaft shears 10 seconds after start. A-A and B-B Air Return fans fail to start on Phase B signal. 1B Containment Spray Pmp trips 9 minutes after start. Requires entry into FR-Z.1, "High Containment Pressure."

CRITICAL TASK 1

Manual safety injection is actuated upon discovery of the steam line break, prior to transition to E-2, "Faulted Steam Generator Isolation."

Time	Position	Applicant's Actions or Behavior
	RO	4. **CHECK** SI actuated: a. Any SI annunciator **LIT**. ***RO will announce that the window 70-A, SI ACTUATED is LIT. May also announce that FIRST OUT 76-G SI MANUAL is LIT.*** b. Both trains SI **ACTUATED**. • 1-XX-55-6C • 1-XX-55-6D

EXAMINER: E-0, "Reactor Trip or Safety Injection," Appendixes A and B are included as Attachment 4.

Time	Position	Applicant's Actions or Behavior
	BOP	5. **PERFORM** Appendixes A and B , E-0, pages 16-30 ***BOP is assigned to perform actions contained in the Appendices. A separate copy of the Appendices is contained in this package for Examiner use.***
	SRO	6. **ANNOUNCE** reactor trip and safety injection over PA system.
	RO	7. **ENSURE** secondary heat sink available with either: • Total AFW flow greater than 410 gpm, OR ***It is expected that Adverse Containment (>2.81 psig) conditions will exist soon after the entry into E-0. When announced, the crew will use the bracketed parameter values.*** • At least one S/G NR level greater than 29% [39% ADV].
	RO	8. **MONITOR** RCS temperature stable at or trending to 557°F using: • RCS Loop T-avg with any RCP running, **OR** • RCS Loop T-cold with RCPs out-of-service.

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Event Description: A small steam leak on steam generator 2 develops in containment which progresses to a steam line break. Automatic safety injection fails to actuate. Requires re-entry into E-0, "Reactor Trip or Safety Injection," then a transition to E-2, "Faulted Steam Generator Isolation." 1A Containment Spray pump shaft shears 10 seconds after start. A-A and B-B Air Return fans fail to start on Phase B signal. 1B Containment Spray Pmp trips 9 minutes after start. Requires entry into FR-Z.1, "High Containment Pressure."

Time	Position	Applicant's Actions or Behavior
	RO	8. **RESPONSE NOT OBTAINED:** **IF** temp less than 557°F, **THEN ENSURE** steam dumps and S/G PORVs CLOSED. **IF** cooldown continues, **THEN CONTROL** total AFW flow to maintain greater than 410 gpm UNTIL NR level in at least one S/G greater than 29% [39% ADV]. **IF** cooldown continues after AFW flow is controlled, **THEN** • **PLACE** steam dump controls OFF. • **CLOSE** MSIVs. • **ENSURE** MSIV bypasses CLOSED. **IF** RCS temp greater than 564°F, **THEN ENSURE** either steam dumps or S/G PORVs OPEN.
	RO	9. **ENSURE** excess letdown valves CLOSED: • 1-FCV-62-54 • 1-FCV-62-55 ***RO observes GREEN indicating lights LIT on handswitches 1-HS-62-54A, EXCESS LTDN ISOL, and 1-HS-62-55A, EXCESS LTDN.***
	RO	10. **CHECK** pzr PORVs and block valves: a. Pzr PORVs CLOSED. b. At least one block valve OPEN. ***RO observes 1-HS-68-340AA, PZR PORV 340A, GREEN indicating light is LIT, RED indicating light is DARK.*** ***RO observes 1-HS-68-334A, PZR PORV 334, GREEN indicating light is LIT, RED indicating light is DARK.*** ***RO observes 1-HS-68-333A, BLOCK VLV FOR PORV 340A, GREEN indicating light is DARK, RED indicating light is LIT.*** ***RO observes 1-HS-68-332A, BLOCK VLV FOR PORV 334, GREEN indicating light is DARK, RED indicating light is LIT.***
	RO	11. **CHECK** pzr safety valves CLOSED: • EVALUATE tailpipe temperatures and acoustic monitors. ***RO observes response of 1-TI-68-330, SAFETY 68-563 TAILPIPE TEMP, 1-TI-68-329, SAFETY 68-564 TAILPIPE TEMP, and 1-TI-68-328, SAFETY 68-565, stable at approximately 110°F.*** ***BOP may observe 1-XI-68-363, PZR VALVES ACOUSTIC MONITOR indicating lights are DARK for 1-XI-68-363 (68-563), 1-XI-68-364 (68-564) and 1-XI-68-365 (68-565).***

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Event Description: A small steam leak on steam generator 2 develops in containment which progresses to a steam line break. Automatic safety injection fails to actuate. Requires re-entry into E-0, "Reactor Trip or Safety Injection," then a transition to E-2, "Faulted Steam Generator Isolation." 1A Containment Spray pump shaft shears 10 seconds after start. A-A and B-B Air Return fans fail to start on Phase B signal. 1B Containment Spray Pmp trips 9 minutes after start. Requires entry into FR-Z.1, "High Containment Pressure."

Time	Position	Applicant's Actions or Behavior
	RO	12. **CHECK** pzr sprays CLOSED. ***RO observes the GREEN indicating lights are LIT for 1-XI-68-340B, PZR SPRAY LOOP 2 and 1-XI-68-340D, PZR SPRAY LOOP 1.***
NOTE Seal injection flow should be maintained to all RCPs.		
	RO	13. **CHECK** if RCPs should remain in service: a. Phase B signals DARK [MISSP].
		13.a. **RESPONSE NOT OBTAINED:** a. **STOP** all RCPs. ** **GO TO** Step 14.
	RO	14. **CHECK** S/G pressures: • All S/G pressures controlled or rising. ***RO observes PAM pressure instruments on SG 1 through 4 (black labels) and determines that pressures are dropping. May also observe trends on 1-PR-1-2, SG 1 & 2 PRESS PSIG, and 1-PR-1-23, SG 3 & 4 PRESS PSIG to assess this step.*** • All S/G pressures greater than 120 psig. ***RO observes PAM pressure instruments on SG 1 through 4 (black labels) and determines that pressures are greater than 120 psig*** ***SG 2 is diagnosed as the faulted steam generator, based on steam pressure response after MSIVs are closed.***
	RO	14. **RESPONSE NOT OBTAINED:** **IF** S/G pressure low OR dropping uncontrolled, **THEN GO TO** E-2, Faulted Steam Generator Isolation.

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Event Description: A small steam leak on steam generator 2 develops in containment which progresses to a steam line break. Automatic safety injection fails to actuate. Requires re-entry into E-0, "Reactor Trip or Safety Injection," then a transition to E-2, "Faulted Steam Generator Isolation." 1A Containment Spray pump shaft shears 10 seconds after start. A-A and B-B Air Return fans fail to start on Phase B signal. 1B Containment Spray Pmp trips 9 minutes after start. Requires entry into FR-Z.1, "High Containment Pressure."

Time	Position	Applicant's Actions or Behavior
E-2		**The following actions are taken from E-2, "Faulted Steam Generator Isolation."**
		CAUTION **If a faulted S/G is NOT needed for RCS cooldown, it should remain isolated during subsequent recovery actions.**
	RO	1. **ENSURE** all MSIVs and MSIV bypasses CLOSED.
		NOTE If it is known that a steam leak exists in the Turbine building, the following step should not be performed until the affected steam header is depressurized.
	RO	2. **PLACE** steam dump controls OFF: • 1-HS-1-103A, STEAM DUMP FSV "A". • 1-HS-1-103B, STEAM DUMP FSV "B". ***Steam dumps are OFF based on E-0, Step 8 RNO actions.***
	RO	3. **CHECK** for at least one Intact S/G: • Any S/G pressure controlled or rising, OR • Any S/G pressure greater than P-sat for RCS incore temperature. ***RO determines that SG 1, 3, and 4 are intact.***
	RO	4. **IDENTIFY** Faulted S/G based on ANY of the following: • Any S/G pressure dropping in an uncontrolled manner, OR • Any S/G pressure less than 120 psig, OR • S/G enclosure temps high: 1) T1002A for 2 and 3, 2) T1003A for 1 and 4. OR • Local indication of break in any of the following: 1) Main steam lines, 2) Main feedwater lines, 3) Other secondary piping. ***RO identifies SG 2 as the faulted SG.***

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Event Description: A small steam leak on steam generator 2 develops in containment which progresses to a steam line break. Automatic safety injection fails to actuate. Requires re-entry into E-0, "Reactor Trip or Safety Injection," then a transition to E-2, "Faulted Steam Generator Isolation." 1A Containment Spray pump shaft shears 10 seconds after start. A-A and B-B Air Return fans fail to start on Phase B signal. 1B Containment Spray Pmp trips 9 minutes after start. Requires entry into FR-Z.1, "High Containment Pressure."

Time	Position	Applicant's Actions or Behavior

CAUTION

- **If the turbine-driven AFW pump is the only available source of feed flow, steam supply to the turbine-driven AFW pump must be maintained from one SG.**
- **RCS cooldown requires the availability of at least one S/G.**

FR-Z.1

The 1A Containment Spray pump starts, but the pump shaft shears 10 seconds later. The 1B Containment Spray pump trips 9 minutes after it starts from high-high containment pressure. With containment pressure greater than 2.81 psid, conditions for an ORANGE path on Containment Pressure exist. The applicants will implement FR-Z.1, "High Containment Pressure," at this point.

CAUTION

If ECA-1.1, Loss of RHR Sump Recirculation, is in effect, the number of cntmt spray pumps to be operated is directed in ECA-1.1 rather than in this instruction.

NOTE

Adverse containment setpoints [ADV] should be used where provided due to Phase B actuation.

Time	Position	Applicant's Actions or Behavior
	BOP	1. **ENSURE** cntmt spray operation: a. Cntmt spray signal ACTUATED. b. Cntmt spray pumps RUNNING. c. Cntmt spray valves 1-FCV-72-2 and 1-FCV-72-39 OPEN. d. Cntmt spray pump suction valves OPEN: • Valves from RWST: 1) 1-FCV-72-21 and 2) 1-FCV-72-22. OR • Valves from cntmt sump: 1) 1-FCV-72-44 and 2) 1-FCV-72-45. e. Cntmt spray flow: • 1-FI-72-34. • 1-FI-72-13. ***Both Containment Spray pumps are damaged and cannot be started at this point. SRO may request that Work Control evaluate the 1B Containment Spray pump motor for damage after the instantaneous overcurrent trip that was reported.***

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Event Description: A small steam leak on steam generator 2 develops in containment which progresses to a steam line break. Automatic safety injection fails to actuate. Requires re-entry into E-0, "Reactor Trip or Safety Injection," then a transition to E-2, "Faulted Steam Generator Isolation." 1A Containment Spray pump shaft shears 10 seconds after start. A-A and B-B Air Return fans fail to start on Phase B signal. 1B Containment Spray Pmp trips 9 minutes after start. Requires entry into FR-Z.1, "High Containment Pressure."

Time	Position	Applicant's Actions or Behavior
	BOP	2. **ENSURE** cntmt isolation: a. Phase A isolation: • Train A GREEN. • Train B GREEN. b. Cntmt vent isolation: • Train A GREEN. • Train B GREEN. c. Phase B isolation: • Train A GREEN. • Train B GREEN.
	BOP	3. **ENSURE** MSIVs and bypasses CLOSED.
	BOP	4. **PLACE** steam dump controls OFF: • 1-HS-1-103A, STEAM DUMP FSV "A." • 1-HS-1-103B, STEAM DUMP FSV "B."
	RO	5. **ENSURE** all four RCPs STOPPED.
	BOP	6. **MONITOR** EGTS operation: a. EGTS fans RUNNING. b. Filter bank dp between 5 and 9 inches of water.
	BOP	7. **ENSURE** ABGTS operation: a. ABGTS fans RUNNING. b. ABGTS dampers OPEN: • FCO-30-146A. • FCO-30-146B. • FCO-30-157A. • FCO-30-157B.

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Event Description: A small steam leak on steam generator 2 develops in containment which progresses to a steam line break. Automatic safety injection fails to actuate. Requires re-entry into E-0, "Reactor Trip or Safety Injection," then a transition to E-2, "Faulted Steam Generator Isolation." 1A Containment Spray pump shaft shears 10 seconds after start. A-A and B-B Air Return fans fail to start on Phase B signal. 1B Containment Spray Pmp trips 9 minutes after start. Requires entry into FR-Z.1, "High Containment Pressure."

Time	Position	Applicant's Actions or Behavior
		CRITICAL TASK 2 Manually start at least one Containment Air Return Fan prior to exiting FR-Z.1, "High Containment Pressure."
Critical Task 2	BOP	8. **WHEN** 10 minutes has elapsed since Phase B actuation, **THEN ENSURE** cntmt air return fans start. ***BOP determines from 1-XX-55-6E, CNTMT ISOL STATUS PNL, Window 102 AIR RET A FAN-30-38, and 1-XX-55-6F, CNTMT ISOL STATUS PNL, Window 102, AIR RET FAN-30-39 GREEN indicating lights LIT that neither of the air return fans are running. BOP checks elapsed time by observing data on the ALARM SCREEN and starts the fans manually.***
		CAUTION • **RCS cooldown requires the availability of at least one S/G.** • **If ALL S/Gs are Faulted, at least a minimum detectable feed flow to each S/G is required to limit thermal stress during subsequent S/G feed operations.**
	BOP	9. **CHECK** S/G pressures: • All S/G pressures controlled or rising. • All S/G pressures greater than 120 psig.
	BOP	9. **RESPONSE NOT OBTAINED:** **ISOLATE** Faulted S/G(s) not needed for cooldown. a. **ENSURE** the following valves CLOSED: • MSIV and MSIV bypasses • Feedwater isolation and bypass isolation valves • Feed reg and bypass reg valves • AFW level control valves • Local manual isolation for steam supply To TD AFP • PORV • S/G blowdown valve
	SRO	10. **DETERMINE** if RHR spray should be placed in service: a. **CHECK** the following conditions: • At least one hour has elapsed since the beginning of the accident. • Cntmt pressure is greater than 9.5 psig. • RHR suction is aligned to cntmt sump. • At least one charging pump and one SI pump running.

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Event Description: A small steam leak on steam generator 2 develops in containment which progresses to a steam line break. Automatic safety injection fails to actuate. Requires re-entry into E-0, "Reactor Trip or Safety Injection," then a transition to E-2, "Faulted Steam Generator Isolation." 1A Containment Spray pump shaft shears 10 seconds after start. A-A and B-B Air Return fans fail to start on Phase B signal. 1B Containment Spray Pmp trips 9 minutes after start. Requires entry into FR-Z.1, "High Containment Pressure."

Time	Position	Applicant's Actions or Behavior
		10. **RESPONSE NOT OBTAINED:** a. **WHEN** all conditions met, **THEN PERFORM** Substep 10b. ** **GO TO** Step 11.
	SRO	11. **RETURN TO** Instruction in effect.
EXAMINER: The following actions are taken from E-2, "Faulted Steam Generator Isolation."		
	BOP	5. **ISOLATE** Faulted S/G: a. **ISOLATE** AFW flow to Faulted S/G. b. **ENSURE** MFW ISOLATED to Faulted S/G: • MFW isolation and bypass isolation valves CLOSED. • MFW reg and bypass reg valves CLOSED. • MFPs TRIPPED. c. **ENSURE** Faulted S/G PORV CLOSED. d. **ENSURE** Faulted S/G blowdown ISOLATED.
NOTE TD AFW pump steam supply should NOT be aligned from a S/G with a known primary to secondary leak if other AFW sources are available.		
	BOP	6. **ENSURE** TD AFW pump being supplied from Intact S/G.
	BOP	7. **MONITOR** CST volume greater than 200,000 gal.
	BOP	8. **WHEN** RCS temperature is stable or rising following Faulted S/G blowdown, **THEN ADJUST** Intact S/G PORV controllers in AUTO to: • P-sat for the highest RCS temp (one or more RCPs running) **OR** • P-sat for the highest T-cold temp (no RCPs running)
	BOP	9. **CHECK** secondary side radiation: • S/G discharge monitors NORMAL. • Condenser vacuum exhaust rad monitors NORMAL. • S/G blowdown rad monitor recorders NORMAL trend prior to isolation. • S/G sample results by Chemistry.

Op Test No.:	NRC	Scenario #	5	Event #	6 and 7	Page	36	of 36

Event Description: A small steam leak on steam generator 2 develops in containment which progresses to a steam line break. Automatic safety injection fails to actuate. Requires re-entry into E-0, “Reactor Trip or Safety Injection,” then a transition to E-2, "Faulted Steam Generator Isolation.” 1A Containment Spray pump shaft shears 10 seconds after start. A-A and B-B Air Return fans fail to start on Phase B signal. 1B Containment Spray Pmp trips 9 minutes after start. Requires entry into FR-Z.1, “High Containment Pressure.”

Time	Position	Applicant's Actions or Behavior
	BOP	10. **CHECK** SI termination criteria: a. **CHECK** RCS subcooling greater than 65ºF [85ºF ADV]. ***RO determines that subcooling is greater than 85ºF ADV.*** b. **CHECK** secondary heat sink available with either: • Total feed flow to Intact S/Gs greater than 410 gpm, OR • At least one Intact S/G NR level greater than 29% [39% ADV]. ***BOP determines that a secondary heat sink is available.*** c. **CHECK** RCS pressure stable or rising. ***RO reports RCS pressure and trend. RCS pressure may be below the required 33% ADV value at this point.*** d. **CHECK** pzr level greater than 15% [33% ADV]. ***RO reports PZR level. PZR level may be below the required 33% ADV value at this point.*** e. **GO TO** ES-1.1,SI Termination.
	BOP	**11. GO TO** E-1, Loss of Reactor or Secondary Coolant.
EXAMINER: Terminate the scenario when the transition to either E-1, “Loss of Reactor or Secondary Coolant,” OR ES-1.1, “SI Termination” is made.		
END OF SCENARIO		

Facility:	**Watts Bar June 2011**	Scenario No.: 6	Op Test No.: **1**
Examiners:	______	Operators:	______ **SRO**
	______		______ **RO**
	______		______ **BOP**

Initial Conditions: 1.66×10^{-4}% power. RCS boron concentration is 1620 ppm. Train A/ Channel III Work Week.

Turnover: Continue with startup to log critical data at 10^{-2}% power. After logging critical data, raise power to 1-4% using GO-2, "Reactor Startup." Currently GO-2, "Reactor Startup," Section 5.3, "Reactor Startup," is complete to Step 23, ready for performance of Step 24.

Event No.	Malf. No.	Event Type*	Event Description
1	n/a	R-RO N-SRO/BOP	Raise power to 10^{-2}% power, stabilize, then log critical data. After logging critical data, raise power to 1-4% using GO-2, "Reactor Startup."
2	rp38c 100	C-RO TS-SRO	Eagle Rack 2 Loop processor - LCP Card Failure. Requires entry into AOI-44, "Eagle 21 Malfunctions." Requires entry into AOI-2, "Malfunction of Reactor Control System." Requires Tech Spec evaluation.
3	fw88a 100	C-BOP TS-SRO	1-LCV-3-164, SG 1 SUPPLY LCV-3-164A CNTL fails open, and SG 1 level rises. Attempts at manual control are unsuccessful and requires trip of the 1A-A MD AFW pump or manual isolation of flow path. Requires a Tech Spec evaluation.
4	cc05b	C-BOP	CCS supply to RCP 2 thermal barrier develops a leak. Requires entry into AOI-15, "Loss of Component Cooling Water (CCS)."
5	cv17b	C-RO	Loop 2 RCP #1 seal fails, requiring entry into AOI-24, "RCP Malfunctions During Pump Operations." Requires a reactor trip and shutdown of Loop 2 RCP.
6	ms01b 3 rp02b	M-All	After transition from E-0,"Reactor Trip or Safety Injection," to ES-0.1, "Reactor Trip Response," a small steam leak on steam generator 2 develops in containment which progresses to a steam line break. Automatic safety injection fails to actuate. Requires re-entry into E-0,"Reactor Trip or Safety Injection," then a transition to E-2, "Faulted Steam Generator Isolation."
7	cs11a cs06g cs06h cs01b	C-BOP	1A Containment Spray pump shaft shears 10 seconds after start. A-A and B-B Air Return fans fail to start on Phase B signal. 1B Containment Spray Pump trips 1 minute after start. Requires entry into FR-Z.1, "High Containment Pressure."

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

Scenario 6 - Summary

Initial Condition	1.66x10^{-4}% power. RCS boron concentration is 1620 ppm. Train A/ Channel III Work Week.

Turnover	Continue with startup to log critical data at 10^{-2}% power. After logging critical data, raise power to 1-4% using GO-2, "Reactor Startup." Currently GO-2, "Reactor Startup," Section 5.3, "Reactor Startup," is complete to Step 23, ready for performance of Step 24.

Event 1	Raise power to 10^{-2}% power, stabilize, then log critical data. After logging critical data, raise power to 1-4% using GO-2, "Reactor Startup."
Event 2	Eagle Rack 2 Loop processor - LCP Card Failure. Requires entry into AOI-44, "Eagle 21 Malfunctions." Requires entry into AOI-2, "Malfunction of Reactor Control System." Requires Tech Spec evaluation and entry LCO 3.3.1, Reactor Trip System Instrumentation and LCO3.3.3 Post Accident Monitoring (PAM) Instrumentation.
Event 3	1-LCV-3-164, SG 1 SUPPLY LCV-3-164A CNTL fails open, and SG 1 level rises. Attempts at manual control are unsuccessful and requires trip of the 1A-A MD AFW pump or manual isolation of flow path. Requires a Tech Spec evaluation.
Event 4	CCS supply to RCP 2 thermal barrier develops a leak. Requires entry into AOI-15, "Loss of Component Cooling Water (CCS)."
Event 5	Loop 2 RCP #1 seal fails, requiring entry into AOI-24, "RCP Malfunctions During Pump Operations." Requires a reactor trip and shutdown of Loop 2 RCP.
Event 6	After transition from E-0,"Reactor Trip or Safety Injection," the seal package on the Loop #2 RCP fails, requiring entry into AOI-6, "Small Reactor Coolant System Leak," from ES-0.1, "Reactor Trip Response," Step 15 RNO.
Event 7	During performance of AOI-6, "Small Reactor Coolant System Leak," the leak progresses to a small break loss-of-coolant-accident. Requires re-entry into E-0,"Reactor Trip or Safety Injection," E-1,"Loss of Reactor or Secondary Coolant," and a transition to ES-1.2, "Post LOCA Cooldown and Depressurization."
Event 8	1A Containment Spray pump shaft shears 10 seconds after start. A-A and B-B Air Return fans fail to start on Phase B signal. 1B Containment Spray Pump trips 1 minute after start. Requires entry into FR-Z.1, "High Containment Pressure."

Scenario 6 - Critical Task Summary

Critical Task	Manual safety injection is actuated upon discovery of the steam line break, prior to transition to E-2, "Faulted Steam Generator Isolation."
Critical Task 2	Manually start at least one Containment Air Return Fan prior to exiting FR-Z.1, "High Containment Pressure."

SIMULATOR SETUP INFORMATION

1. **ENSURE NRC Examination Security has been established.**

2. **RESET to Initial Condition 346 by performing the following actions:**

   a. **Select ICManager on the THUNDERBAR menu (right hand side of Instructor Console Screen).**

   b. **Locate IC# 346.**

   c. **Right "click" on IC# 346.**

   d. **Select Reset on the drop down menu.**

   e. **Right "click" on RESET.**

   f. **Enter the password for IC 346.**

   g. **Select "Yes" on the INITIAL CONDITION RESET pop-up window.**

   h. **Perform SWITCH CHECK.**

3. **SELECT Director on the THUNDERBAR menu (right hand side of Instructor Console Screen).**

4. **ENSURE the following information appears on the Director Screen:**

	Key	Description	Type	Event	Delay	Inserted	Ramp	Initial	Final	Value
	cs06g	air return fan a-a fail to start on phase b	M		00:00:00	00:00:00	00:00:00		Active	Active
	cs06h	air return fan b-b fail to start on phase b	M		00:00:00	00:00:00	00:00:00		Active	Active
	rp02b	auto si initiation signal failure	M		00:00:00	00:00:00	00:00:00		Active	Active
	cs11a	cs pump a sheared shaft	M	13	00:00:10		00:00:00		Active	InActive
	cs01b	containment spray system pump b trip	M	13	00:01:00		00:00:00		Active	InActive
	rp38c	eagle rack #2 loop proc - lcp card failure	M	2	00:00:00		00:00:00		100	0

SIMULATOR SETUP INFORMATION

	Key	Description	Type	Event	Delay	Inserted	Ramp	Initial	Final	Value
	lic-3-164csp	03950 sg1 remote level cntlr	O	3	00:00:00		00:00:30		100	31.9275
	cc05b	comp cool pipe break inside containment rcp#2 thermal barr hx	M	4	00:00:00		00:00:00		Active	InActive
	cv18a	rcp 2 seal failure rcp #1	M	5	00:00:00		00:01:00		1.5	0
	ms01b	main steam line break inside containment sg #2	M	6	00:00:00		00:00:00		3	0

5. **Place simulator in RUN and acknowledge any alarms.**

6. **ENSURE the "Train A Week - Channel 1" sign is placed on 1-M-30.**

7. **Place simulator in FREEZE.**

8. **ENSURE Watts Bar Nuclear Plant Unit 1 Reactivity Briefing Book (Simulator Copy) BOL (Beginning Of Life) is updated and on the desk, and that the BOL placards are on 1-M-6, below the Boric Acid and Primary Water Integrators. ENSURE Reactivity Plan for continuation of the reactor startup is available to the crew.**

9. **WHEN prompted by the Chief Examiner, place the Simulator in RUN.**

Exam Event No.	Simulator Event No.	Description/Role Play
1	n/a	Reactor startup to 1-4% power. ***ROLE PLAY: When contacted as Reactor Engineering, state that Mode 2 physics testing is NOT required. All Low Power Physics testing is complete per PET-201.***
2	2	Eagle Rack 2 Loop processor - LCP Card Failure. ***ROLE PLAY: When contacted as Work Control, acknowledge request to perform IMI-160.*** ***ROLE PLAY: When contacted as Work Control, repeat back request to prepare a package to troubleshoot and repair Loop 1 Temperature circuit.*** ***ROLE PLAY: When contacted as Work Control, the Console Operator will repeat back request to prepare a package to troubleshoot and repair 1-R-2.***
3	3	1-LCV-3-164 fails open, causing SG 1 level to rise. ***ROLE PLAY: When contacted, repeat back request to investigate 1-LCV-3-164. After 2 minutes, report back that 1-LCV-3-164A has failed open.*** ***ROLE PLAY: When contacted, repeat back request to isolate 1-LCV-3-164. Enter fwr39a to close the manual isolation valve. Report back that isolation valve is closed.*** ***ROLE PLAY: When contacted as Work Control, repeat back request to trouble shoot and repair 1-LCV-3-164 circuit.***
4	4	CCS supply to RCP 2 thermal barrier develops a leak. ***ROLE PLAY: NONE***
5	5	Loop 2 RCP #1 seal fails, requiring entry into AOI-24, "RCP Malfunctions During Pump Operations." ***ROLE PLAY: If contacted as Plant Management, state that RCP #2 should be removed from service as soon as possible.***
6	6	Small steam leak on steam generator 2 develops in containment which progresses to a steam line break. Automatic safety injection fails to actuate. ***ROLE PLAY: NONE.***

Exam Event No.	Simulator Event No.	Description/Role Play
7	n/a	1A Containment Spray pump shaft shears 10 seconds after start. A-A and B-B Air Return fans fail to start on Phase B signal. 1B Containment Spray Pump trips 1 minute after start. ***Role Play: When contacted as the Control Building AUO, state that the breaker for the 1B Containment Spray Pump tripped due to instantaneous overcurrent.*** ***Role Play: When contacted as the Auxiliary Building AUO, state that the 1A Containment Spray pump is severely damaged, and the shaft appears to be broken.***

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Event Description: Raise power to 10^{-2}% power, stabilize, then log critical data. After logging critical data, raise power to 1-4% using GO-2, "Reactor Startup."

Time	Position	Applicant's Actions or Behavior
GO-2		**The applicants will begin to raise reactor power using GO-2, "Reactor Startup," Section 5.3, "Reactor Startup," Step 24.**
	SRO	[24] **IF** TAVG is less than 561°F **AND** Alarm 94 A, TAVG-TREF DEVIATION, is LIT, **THEN INITIATE** 1-SI-68-34 (SR 3.4.2.1).
	RO	[25] **(þ) ADJUST** Control Rods and/or boron concentration to RAISE Reactor power, at a rate of less than 1 dpm, to 1 X 10-2 %.
	RO	[26] **STABILIZE** Reactor power at 1 X 10-2 %.
	SRO	[27] **RECORD** CRITICAL DATA: [27] **RECORD** CRITICAL DATA: Power Level: ______ % (1 NI 92 135A) ______ % (1 NI 92 136A) Rod Position: ______ (Bank) ______ (Steps) ______ RCS C_B ______ PPM Loop T_{AVG} ______ °F (1 TI 68 2E) ______ °F (1 TI 68 25E) ______ °F (1 TI 68 44E) ______ °F (1 TI 68 67E) ______ Initials ______ Date ______ Time
	SRO	[28] **IF** Actual Critical Rod Position is between 500 and 750 pcm from ECP, **THEN ENSURE** Reactor Engineering evaluates **AND** initiates a SR. ***SRO determines that this step is not applicable.***
	SRO	[29] **IF** Mode 2 physics testing required, **THEN ENSURE** that the Mode 2 and Mode 3 Surveillances are in effect during the duration of rod worth measurements (approx 8 hours) per PET-201, and **ENSURE** Reactor Engineering has performed the applicable low-power physics tests per PET-201. ***If contacted as Reactor Engineering, the Console Operator will repeat back the request and state that Mode low power physics testing is not required.***
NOTE If AFW is in service, Reactor power must be maintained within the capability of AFW to maintain SG levels.		
	BOP	[30] **EVALUATE** closing AFW Pumps Recirc Valves (refer to SOI-3.02, Section 8.9).
NOTE TAVG will vary as a function of reactor power until the unit is greater than 15% turbine load (C5) and the Tavg program is maintained by AUTO or manual rod control. The TAVG-TREF deviation alarm is expected as reactor power approaches 7% RTP.		
	RO	[31] **(þ) ADJUST** Control Rods or RCS CB to RAISE Reactor power, at a rate of less than 1 dpm, to between 1 and 4%.

Op Test No.:	NRC	Scenario #	6	Event #	1	Page	2	of	35

Event Description: Raise power to 10^{-2}% power, stabilize, then log critical data. After logging critical data, raise power to 1-4% using GO-2, "Reactor Startup."

Time	Position	Applicant's Actions or Behavior
	RO	[32] **STABILIZE** Reactor power between 1 and 4%: [32.1] **MAINTAIN** RCS Steam Dumps in Pressure Mode, set at 84% (1092 psig.), or SG PORVs set at 84%. [32.2] **(b) FOLLOW** Xenon by Rod movement or Boration to maintain control banks ABOVE the LO INSERTION LIMIT.
Cue Console Operator to insert Event 2.		

Op Test No.:	NRC	Scenario #	6	Event #	2	Page	3 of 35

Event Description: Eagle Rack 2 Loop processor - LCP Card Failure. Requires entry into AOI-44, "Eagle 21 Malfunctions." Requires entry into AOI-2, "Malfunction of Reactor Control System." Requires Tech Spec evaluation.

Time	Position	Applicant's Actions or Behavior
Indications: 92-A, PZR LEVEL HI/LO 93-A, RCS LOOP ΔT DEVIATION 94-A, TAVG-TREF DEVIATION 94-B TAVG-T AUCT DEVIATION 111-F, PROT SET I CHANNEL FAILURE 122-C, OVERPOWER ΔT TRIP ALERT 122-D, OVERPOWER ΔT TURB RUNBACK & C-4 ROD BLOCK 123-C, OVERTEMP ΔT TRIP ALERT 123-D, OVERTEMP ΔT TURB RUNBACK & C-3 ROD BLOCK		
	RO	May diagnose and announce the failure of Eagle Rack 1-R-2.
	RO	May diagnose and announce the failure of Loop 1 RTD.
	RO	May place 1-HIC-62-93A, CHARGING FLOW PZR LEVEL CONTROL in MANUAL and throttle closed to restore charging flow to normal.
	SRO	May enter and direct action of AOI-44, "Eagle 21 Malfunctions."
	SRO	May enter and direct actions of AOI-2,"Malfunction of Reactor Control System."
AOI-44		**The following actions are taken from AOI-44, "Eagle 21 Malfunctions," Section 3.1, "Protection Set Failure Identification."**
	RO	1. **IDENTIFY** rack associated with failure: • **REFER TO** ALARM printer. **OR** • **REFER TO** ICS computer screen: 1) **SELECT** NSSS AND BOP 2) **SELECT** EAGLE 21 MENU 3) **SELECT** EGLRCK [upper right of screen] 4) **DETERMINE** which rack has failure by red light next to any rack status ***RO determines that 1-R-2 has failed.***
NOTE Additional bistables lit in row may indicate a power or Logic Control Panel (LCP) failure. (PROT SET TROUBLE lights 19, 39, 59, & 79 are not bistables)		
	RO	2. **CHECK** bistable indications NORMAL.

Op Test No.: NRC	Scenario # 6	Event # 2				Page 4	of 35

Event Description: Eagle Rack 2 Loop processor - LCP Card Failure. Requires entry into AOI-44, "Eagle 21 Malfunctions." Requires entry into AOI-2, "Malfunction of Reactor Control System." Requires Tech Spec evaluation.

Time	Position	Applicant's Actions or Behavior
	SRO	2. **RESPONSE NOT OBTAINED:** **GO TO** Section 3.2, Response to LCP or Output Failure.

EXAMINER: The following action is taken from AOI-44, "Eagle 21 Malfunctions," Section 3.2, Response to LCP or Output Failure."

Position: SRO

IF FAILURE IN:	** GO TO
Protection Set I/Channel 1	
1-R-1	Section 3.2.1
1-R-2	Section 3.2.2
1-R-3	Section 3.2.3
1-R-4	Section 3.2.4

EXAMINER: The following actions are taken from AOI-44, "Eagle 21 Malfunctions," Section 3.2.2 Rack 1-R-2 Failure."

CAUTION

Complete failure of LCP results in inoperable control functions and frozen or failed analog outputs. Partial failure may affect analog outputs only.

Position: SRO

1. **PERFORM** COMPENSATORY MEASURES to defeat control functions:

COMPENSATORY MEASURES		
EQUIPMENT FAILED	**EQUIPMENT REQUIRING CONTROL**	**PROCEDURE**
Auctioneered Delta T and TAVG (CHNL I)	Loop LPT-68-2	AOI-2
Loops 1 & 2 RCS Wide Range T-Hot/T-Cold (Loops LPT-68-1&18, 24&41)	N/A	N/A
RCS Wide Range Pressure LPP-68-63 including 1-FCV-74-1 & 8 Interlock & ICCM	N/A	N/A
COMS LPS 1 & 2 PORV 340A	N/A	N/A
RVLIS and Subcooling Monitor 1-XI-68-100 & 1-TI-68-105	N/A	N/A

Op Test No.:	NRC	Scenario #	6	Event #	2	Page	5 of 35

Event Description: Eagle Rack 2 Loop processor - LCP Card Failure. Requires entry into AOI-44, "Eagle 21 Malfunctions." Requires entry into AOI-2, "Malfunction of Reactor Control System." Requires Tech Spec evaluation.

Time	Position	Applicant's Actions or Behavior
AOI-2		**The following actions are taken from AOI-2, "Malfunction of Reactor Control System," Section 3.2, "Continuous Rod Withdrawal/Insertion."**
	RO	1. **PLACE** control rods in MAN. ***Due to current plant conditions, rods are in MANUAL.***
	RO	2. **CHECK** control rod movement STOPPED.
	RO	3. **MAINTAIN** T-avg on PROGRAM. (Reference Attachment 1) • **USE** control rods. OR • **ADJUST** turbine load.
	RO	4. **CHECK** loop T-avg channels NORMAL. ***RO determines that Loop 1 RTD has failed.***
	RO	4. **RESPONSE NOT OBTAINED:** **DEFEAT** failed loop ΔT and loop T-avg channels by placing 1-XS-68-2D, ΔT CHANNEL DEFEAT, and 1-XS-68-2M, TAVG CHANNEL DEFEAT in failed channel position then PULL. ***RO will rotate 1-XS-68-2D and 1-HS-68-2M to the LOOP 1 position and then pull out the selector switch.*** **ENSURE** TR-68-2A placed to operable channel using.1-XS-68-2B, ΔT RCDR TR-68-2A LOOP SELECT [1-M-5]. ***1-XS-68-2B, ΔT RCDR TR-68-2A LOOP SELECT, is selected to LOOP 1 and must be selected to any other channel.*** **NOTIFY** Maintenance to implement IMI-160 for failed channel. ***SRO should request performance of IMI-160.*** **WHEN** at least 3 minutes have elapsed since failed T-avg channel is defeated, **THEN** a) **ENSURE** T-avg and T-ref within 1°F. b) **ENSURE** zero demand on control rod position indication [1-M-4]. c) **PLACE** rods in AUTO. ***Since the conditions for AUTO rod control do not exist, the rods will remain in MANUAL.***
	RO	5. **CHECK** Auct Tavg NORMAL on 1-TR-68-2B.
	RO	6. **CHECK** NIS power range channels NORMAL.
	BOP	7. **CHECK** the following: • Turbine impulse pressure channel 1-PI-1-73, NORMAL. • Tref and Auct Tavg NORMAL on 1-TR-68-2B (Reference Attachment 1)

Op Test No.:	NRC	Scenario #	6	Event #	2	Page	6	of 35

Event Description: Eagle Rack 2 Loop processor - LCP Card Failure. Requires entry into AOI-44, "Eagle 21 Malfunctions." Requires entry into AOI-2, "Malfunction of Reactor Control System." Requires Tech Spec evaluation.

Time	Position	Applicant's Actions or Behavior
	RO/BOP	8. **MONITOR** core power distribution parameters: • Power range channels. • Flux Indicators. • T-avg. • Loop ΔT. • Incore TCs. • Feed flow/Steam flow.
	SRO	9. **INITIATE** repairs to failed equipment.
	SRO	10. **REFER TO** Tech Specs: 3.1.1, Shutdown Margin. ***Not applicable*** 3.1.5, Rod Group Alignment Limits. ***Not applicable*** 3.1.6, Shutdown Bank Insertion Limits. ***Not applicable*** 3.1.7, Control Bank Insertion Limits. ***Not applicable*** 3.2.1, Heat Flux Hot Channel Factor. ***Not applicable*** 3.2.2, Nuclear Enthalpy Rise Hot Channel Factor. ***Not applicable*** 3.2.4, Quadrant Power Tilt Ratio. ***Not applicable*** 3.2.3, Axial Flux Difference. ***Not applicable*** 3.3.1, Reactor Trip System (RTS) Instrumentation. ***Function 6 Overtemperature ΔT, Condition W, With one channel inoperable (One channel may be bypassed for up to 12 hours for surveillance testing), place the channel in trip within 72 hours OR be in Mode 3 within 78 hours.*** ***Function 7 Overpower ΔT, Condition W, With one channel inoperable (One channel may be bypassed for up to 12 hours for surveillance testing), place the channel in trip within 72 hours OR be in Mode 3 within 78 hours.*** 3.3.2, Engineered Safety Features Actuation System (ESFAS) Instrumentation. ***Not applicable***

CAUTION

Allowing at least 5 minutes between any rod control input (i.e., T-avg, T-ref, or NIS) change and placing rods in AUTO, will help prevent undesired control rod movement.

	SRO	11. **NOTIFY** Chemistry of any reactor power changes greater than 15% in one hour. ***Due to the conditions at the time of the failure, the conditions of this step are not applicable.***

Op Test No.:	NRC	Scenario #	6	Event #	2	Page	7 of 35

Event Description: Eagle Rack 2 Loop processor - LCP Card Failure. Requires entry into AOI-44, "Eagle 21 Malfunctions." Requires entry into AOI-2, "Malfunction of Reactor Control System." Requires Tech Spec evaluation.

Time	Position	Applicant's Actions or Behavior
	SRO	12. **IF** loop ΔT and loop Tavg channels were defeated due to Tavg channel failure, and Tavg channel has been repaired, **THEN PUSH IN** 1-XS-68-2D, ΔT CHANNEL DEFEAT, and 1-XS-68-2M, TAVG CHANNEL DEFEAT, and select away from all ΔT and Tavg channels. ***Due to the conditions at the time of the failure, the conditions of this step are not applicable.***
		13. **WHEN** conditions allow auto rod control, **THEN**: a. **ENSURE** T-avg and T-ref within 1°F. b. **ENSURE** zero demand on control rod position indication [1-M-4]. c. **PLACE** rods in AUTO. ***Due to the conditions at the time of the failure, the conditions of this step are not applicable.***
		14. **WHEN** conditions allow auto pzr level control, **THEN ENSURE** pzr level returned to normal program, AND **PLACE** 1-FCV-62-93 in AUTO ***SRO directs the BOP to place 1-HIC-62-93A, CHARGING FLOW PZR LEVEL CONTROL in AUTO.***
		15. **RETURN TO** Instruction in effect. ***SRO returns to "Eagle 21 Malfunctions," Section 3.2.2 Rack 1-R-2 Failure," after completing compensatory actions of AOI-2, "Malfunction of Reactor Control System," Section 3.2, "Continuous Rod Withdrawal/Insertion."***

Op Test No.: NRC	Scenario # 6	Event # 2	Page 8 of 35				

Event Description: Eagle Rack 2 Loop processor - LCP Card Failure. Requires entry into AOI-44, "Eagle 21 Malfunctions." Requires entry into AOI-2, "Malfunction of Reactor Control System." Requires Tech Spec evaluation.

Time	Position	Applicant's Actions or Behavior
AOI-44		**The following actions are taken from AOI-44, "Eagle 21 Malfunctions," Section 3.2.2, "Rack 1-R-2 Failure."**
	RO	2. **ENSURE** 1-HS-68-340/AD, COPS BLOCK/ARM FOR PORV 340A in BLOCK.
	RO	3. **REFER** to Appendix A as necessary to compare expected bistable pattern with actual failure.
	SRO	4. **REFER TO** Tech Specs: • 3.3.1 for Modes 1 and 2 ***Function 6 Overtemperature ΔT, Condition W, With one channel inoperable (One channel may be bypassed for up to 12 hours for surveillance testing), place the channel in trip within 72 hours OR be in Mode 3 within 78 hours.*** ***Function 7 Overpower ΔT, Condition W, With one channel inoperable (One channel may be bypassed for up to 12 hours for surveillance testing), place the channel in trip within 72 hours OR be in Mode 3 within 78 hours.*** • 3.3.2 for Modes 1 and 2 ***Not applicable.*** • 3.3.3 for Modes 1, 2 and 3 ***Function 3, RCS Hot Leg Temperature, Condition C, One or more Functions with two required channels inoperable OR Functions 3, 4, 14, and 16 with one required channel inoperable, restore one channel to OPERABLE status within 7 days.*** ***Function 4, RCS Cold Leg Temperature Condition C (Same as above)*** ***Function 5, RCS Pressure (Wide Range) Condition A, One or more Functions with one required channel inoperable, restore required channel to OPERABLE status within 30 days.*** ***Function 6, Reactor Vessel Water Level, Condition A, One or more Functions with one required channel inoperable, restore required channel to OPERABLE status within 30 days.*** ***Function 22, Reactor Coolant System Subcooling Margin Monitor, (Same as above).*** • 3.3.12 for Modes 4, 5 and 6 when vessel head is on ***Not applicable.*** ***Based on the Tech Specs involves, no mode change is allowed (i.e., must maintain reactor power <5 %.)*** ***SRO may request support to evaluate applicability of 3.3.4, Remote Shutdown System.***
	SRO	5. **INITIATE** repairs to failed rack. ***When contacted as Work Control, the Console Operator will repeat back request to prepare a package to troubleshoot and repair 1-R-2.***

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Event Description: Eagle Rack 2 Loop processor - LCP Card Failure. Requires entry into AOI-44, "Eagle 21 Malfunctions." Requires entry into AOI-2, "Malfunction of Reactor Control System." Requires Tech Spec evaluation.

Time	Position	Applicant's Actions or Behavior
	RO	6. **CHECK** indications normal for other Eagle 21 rack(s). ***RO monitors ICS display to determine that other Eagle Racks are normal.***
	RO/BOP	7. **MONITOR** any alternate indications available for inputs lost to lit alarms.
	SRO	8. **RETURN TO** Instruction in effect.
	SRO	**Crew Brief** would typically be conducted for this event as time allows prior to the next event.
	SRO	**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).
Cue Console Operator to insert Event 3.		

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Event Description: 1-LCV-3-164, SG 1 SUPPLY LCV-3-164A CNTL fails open, and SG 1 level rises. Attempts at manual control are unsuccessful and requires trip of the 1A-A MD AFW pump or manual isolation of flow path. Requires a Tech Spec evaluation.

Time	Position	Applicant's Actions or Behavior
Indications: 63-F SG LEVEL DEVIATION 60-B SG 1 LEVEL HI 1-FI-3-163A AFW TO SG1 FLOW indicates high flow 1-FI-3-163B AFW TO SG 1 FLOW indicates high flow.		
	BOP	Diagnoses and announces failure of 1-LCV-3-164, SG1 SUPPLY LCV-3-164 CNTL.
	BOP	May shift 1-LIC-3-164A SG 1 SUPPLY FRM PMP A-A from AUTO to MANUAL to attempt to close 1-LCV-3-164.
	SRO	Enters and directs actions contained in ARI 63-F.
ARI 63-F		**The following actions are taken from ARI 63-F "SG LEVEL DEVIATION"**
	BOP	[1] **DETERMINE** which S/G has abnormal level. ***BOP determines from rapid level rise that SG 1 has abnormal level.***
	BOP	[2] **CHECK** steam flow/feed flow instrumentation to **VERIFY** level controls are restoring S/G levels to **NORMAL**. ***BOP determines from observing SG 1 level on 1-LI-3-42, 1-LI-3-39, 1-LI-3-38 (1-M-4), and AFW flow to SG 1 on 1-FI-3-163A and 1-FI-3-163B (1-M-3) that the 1-LCV-3-164A has failed OPEN.***

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Event Description: 1-LCV-3-164, SG 1 SUPPLY LCV-3-164A CNTL fails open, and SG 1 level rises. Attempts at manual control are unsuccessful and requires trip of the 1A-A MD AFW pump or manual isolation of flow path. Requires a Tech Spec evaluation.

Time	Position	Applicant's Actions or Behavior
	BOP	**[3] IF** level controls have malfunctioned, **THEN** **[3.1] PLACE** FW controls in manual. ***Places 1-LIC-3-174, SG 1 SUPPLY FRM T-D PMP, in MANUAL and moves slider to the left to close the valve. While closing 1-LIC-3-174, BOP observes AFW flow reduction. Determines SG 1 level is rising above normal level of 38% narrow range. Places 1-LIC-3-164A, SG 1 SUPPLY FRM PMP A-A, in MANUAL and moves slider to the left to close the valve and locks slider. Determines that 1-LCV-3-164 will NOT CLOSE. Diagnoses that 1-LCV-3-164 has failed OPEN.*** ***SRO may direct the BOP to place 1-HS-3-118A, AFW PMP A-A in STOP, PULL-TO-LOCK position.*** **[3.2] RESTORE** S/G level to normal and **GO TO** AOI-16, *LOSS OF NORMAL FEEDWATER.* ***SRO may dispatch Auxiliary Building AUO to locally close 1-LCV-3-164, or to locally close isolation valves associated with 1-LCV-3-164. When contacted to isolate 1-FCV-2-164, the Console Operator repeats back the request. The Console Operator will enter remote function fwr39a to close a manual isolation valve. 1-LCV-3-164A will continue to indicate full open.*** ***SRO determines that there are no actions contained in AOI-16 to address the AFW problem and continues to the next step.***
	SRO	**[4] IF** MFPT speed controls have malfunctioned, **THEN** **[4.1] PLACE** MFPT speed controls in manual. **[4.2] RESTORE** MFW/MS ΔP to program AND **GO TO** AOI-16, *LOSS OF NORMAL FEEDWATER.* ***SRO determines that this step is not applicable to the current failure and continues to the next step.***
	BOP	**[5] INITIATE** Service Request for corrective action, if necessary. ***Evaluates effect of the failure on Train A AFW, and determines that LCO 3.7.5, Auxiliary Feedwater (AFW) System, Condition B must be entered. Requires that the AFW train be restored to OPERABLE status within 72 hours.***

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Event Description: 1-LCV-3-164, SG 1 SUPPLY LCV-3-164A CNTL fails open, and SG 1 level rises. Attempts at manual control are unsuccessful and requires trip of the 1A-A MD AFW pump or manual isolation of flow path. Requires a Tech Spec evaluation.

Time	Position	Applicant's Actions or Behavior
ARI 60-B		**The following actions are taken from ARI 60-B, "SG 1 LEVEL HIGH."**
	BOP	**[1] If** AFW system is in service, **THEN CHECK** AFW operation **AND** CONTROL level manually if necessary per SOI-3.02, AUXILIARY FEEDWATER SYSTEM. ***Places 1-LIC-3-174, SG 1 SUPPLY FRM T-D PMP, in MANUAL and moves slider to the left to close the valve. While closing 1-LIC-3-174, BOP observes AFW flow reduction. Determines SG 1 level is rising above normal level of 38% narrow range. Places 1-LIC-3-164A, SG 1 SUPPLY FRM PMP A-A, in MANUAL and moves slider to the left to close the valve and locks slider. Determines that 1-LCV-3-164 will NOT CLOSE. Diagnoses that 1-LCV-3-164 has failed OPEN.*** ***SRO may direct the BOP to place 1-HS-3-118A, AFW PMP A-A in STOP, PULL-TO-LOCK position.*** ***SRO may dispatch Auxiliary Building AUO to locally close 1-LCV-3-164, or to locally close isolation valves associated with 1-LCV-3-164. When contacted to isolate 1-FCV-2-164, the Console Operator repeats back the request. The Console Operator will enter remote function fwr39a to close a manual isolation valve. 1-LCV-3-164A will continue to indicate full open.***
	SRO	**[2]** PLACE 1-FC-3-35 and/or 1-FC-3-35A in MANUAL AND RESTORE S/G level to program. ***SRO determines this step is not applicable since S/G level control is not on Main or Bypass feed reg valves.***
	SRO	**[3] REFER** TO AOI-16, LOSS OF NORMAL FEEDWATER. ***SRO determines that reference to AOI-16, "Loss of Normal Feedwater," is not applicable.***
	BOP	**[4] DETERMINE** cause of Hi Level AND INITIATE corrective action, if necessary. ***When the SRO contacts Work Control, the Console Operator will repeat back request for a troubleshooting and repair package***
	SRO	Evaluate Tech Specs ***Evaluates effect of the failure on Train A AFW, and determines that LCO 3.7.5, Auxiliary Feedwater (AFW) System, Condition B must be entered. Requires that the AFW train be restored to OPERABLE status within 72 hours.***
	SRO	**Crew Brief -** conduct for this event as time allows prior to the next event.

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Event Description: 1-LCV-3-164, SG 1 SUPPLY LCV-3-164A CNTL fails open, and SG 1 level rises. Attempts at manual control are unsuccessful and requires trip of the 1A-A MD AFW pump or manual isolation of flow path. Requires a Tech Spec evaluation.

Time	Position	Applicant's Actions or Behavior
	SRO	**Notifications** should be addressed as applicable if not specifically addressed by the procedure or in the crew brief.
	SRO	Operations Management - Shift Manager. Maintenance Personnel – Maintenance Shift Supervisor (MSS). (**Note:** Maintenance notification may be delegated to the Shift Manager).
Console Operator enters Event 4		

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Event Description: CCS supply to RCP 2 thermal barrier develops a leak. Requires entry into AOI-15, "Loss of Component Cooling Water (CCS)."

Time	Position	Applicant's Actions or Behavior
Indications: 237-B, RCP 1 THRM BAR RET FLOW LO 238-B, RCP 2 THRM BAR RET FLOW LO 239-B, RCP 3 THRM BAR RET FLOW LO 240-B, RCP 4 THRM BAR RET FLOW LO		
	BOP	Diagnoses and announces thermal barrier leakage.
	BOP	May request that the RO monitor RCP seal parameters normal, since thermal barrier flow has been lost
	BOP	May stop pull-to-lock the TBBPs and then isolate the thermal barrier flowpath into and out of containment.
	SRO	May enter and direct actions of ARI 237A, 237-B, RCP 1 THRM BAR RET FLOW LO.
	SRO	Enters and directs actions of AOI-15, "Loss of Component Cooling Water (CCS)."
ARI 237-B		**The following actions are taken from ARI 238-B, RCP 2 THRM BAR RET FLOW LO.**
	RO	**[1] IF** Phase B initiated, **THEN GO TO** Emergency Instructions.
	BOP	**[2] CHECK** 1-FI-70-105, TH BAR 2 FLOW [0-M-27B], and **COMPARE** with other RCPs. ***BOP determines that RCP 2 thermal barrier flow is abnormal.***
	BOP	**[3] ENSURE** TB Booster Pump ON.
	BOP	**[4] ENSURE** the following TB isolation valves OPEN: • 1-FCV-70-133 and -134, THERMAL BAR SUP CIV–ϕB • 1-FCV-70-87 and -90, THERMAL BAR RET CIV–ϕB
	BOP	**[5] IF** flow NOT restored, **THEN** **[a] ENSURE** RCP 1 seal water flow between 8 and 13 gpm. **[b] MONITOR** RCP temps on computer. **[c] REFER TO** AOI-15, *LOSS OF COMPONENT COOLING WATER (CCS).* **[d] ADJUST** 1-THV-70-684A per TI-31.08, *FLOW BALANCING VALVES SETPOINTS.*

Op Test No.:	NRC	Scenario #	6	Event #	4	Page	15	of	35

Event Description: CCS supply to RCP 2 thermal barrier develops a leak. Requires entry into AOI-15, "Loss of Component Cooling Water (CCS)."

Time	Position	Applicant's Actions or Behavior
AOI-15		**The following actions are taken from AOI-15, "Loss of Component Cooling Water (CCS)."**
	BOP	1. **CHECK** CCS pumps status: a. **CHECK** any CCS pump TRIPPED or running pump NOT pumping forward: • ERCW/CCS Motor tripout alarm, • Low header pressure (train A or B), • Multiple low flow alarms.
	BOP	1. **RESPONSE NOT OBTAINED:** a. **GO TO** Caution prior to Step 2.
CAUTION **A closed surge tank vent valve may cause a positive or negative tank pressure, giving an erroneous level indication.**		
	BOP	2. **CHECK** 1-FCV-70-66, U1 Surge Tank Vent, OPEN. ***BOP observes the GREEN indicating light DARK and RED indicating light LIT on 1-HS-70-66, U1 SURGE TANK VENT.***
	BOP	3. **IF** surge tank level less than 57%, **THEN ENSURE** 1-LCV-70-63, U1 Surge Tank Makeup LCV, OPEN (Refer to SOI-70.01 as required if makeup not available).
	BOP	4. **MONITOR** A and B side surge tank levels greater than 10%.
	SRO	5. IF RHR Shutdown Cooling is in service, **THEN GO TO** AOI-14, Loss Of RHR Shutdown Cooling.
CAUTION **CCP may survive for only 10 to 12 minutes after loss of CCS to lube oil cooler.**		
	SRO	6. **MONITOR** the following for Unit 1 CCS Train A: • U-1 CCS Train A level • ERCW flow to CCS Hx A **IF** loss of either is imminent, **THEN PERFORM** the following: ***SRO determines that loss of level is NOT imminent and continues to the next step.***
	SRO	7. **MONITOR** the following for Unit 1 CCS Train B: • U-1 CCS Train B level • ERCW flow to CCS Hx C **IF** loss of either is imminent, **THEN STOP** and **LOCKOUT** the following Train B equipment: ***SRO determines that loss of level is NOT imminent and continues to the next step.***

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Event Description: CCS supply to RCP 2 thermal barrier develops a leak. Requires entry into AOI-15, "Loss of Component Cooling Water (CCS)."

Time	Position	Applicant's Actions or Behavior
	BOP	8. **CHECK** all RCP upper and lower oil cooler flows NORMAL: • Upper Cooler flow: 150-220 gpm • Lower Cooler flow: 5-10 gpm ***BOP determines that the RCP upper and lower oil cooler flows are within the ranges provided in the step.***
		CAUTION **Seal injection water must be maintained to all RCPs following isolation of thermal barriers.**
	BOP	9. **CHECK** Thermal Barrier Hx flows NORMAL. • Thermal Barrier flow 40-50 gpm ***BOP determines that thermal barrier heat exchanger flows are ABNORMAL.***
	BOP	9. **RESPONSE NOT OBTAINED:** **IF** flow abnormally high or low indicating possible line break, **THEN**: a. **ENSURE** Thermal Barrier Booster pumps STOPPED. ***BOP places 1-HS-70-130A, THRM BAR BSTR PMP 1B (TBBP) in the STOP, PULL-TO-LOCK. BOP places 1-HS-70-131A, THRM BAR BSTR PMP 1B (TBBP) in the STOP, PULL-TO-LOCK position.*** b. **ENSURE** the following isol valves CLOSED: • 1-FCV-70-133 or 1-FCV-70-134, Thermal Barrier Supply CIV. • 1-FCV-70-87 or 1-FCV-70-90, Thermal Barrier Return CIV. ***BOP places one thermal barrier supply and one thermal barrier return isolation valve in the CLOSE position.*** c. **IF** RCP lower bearing temp rising uncontrolled (180 °F max), **THEN REFER TO** AOI-24, Reactor Coolant Pump Seal Abnormalities. ***RO may use ICS RCP parameter screen to monitor RCP lower bearing temperatures.***
	BOP	10. **CHECK** 1A ESF Supply Header flow NORMAL, 1-FI-70-159A. • Normal ~100 gpm with RHR out of service.
	BOP	11. **CHECK** 1B ESF Supply Header flow NORMAL, 1-FI-70-165A. • Normal 5000-6000 gpm with RHR in service.
	BOP	12. **CHECK** SFP Hx A flow NORMAL, 0-FI-70-20. • Normal 2700-3500 gpm with SFP Hx A in service.

Op Test No.:	NRC	Scenario #	6	Event #	4	Page	17	of 35

Event Description: CCS supply to RCP 2 thermal barrier develops a leak. Requires entry into AOI-15, "Loss of Component Cooling Water (CCS)."

Time	Position	Applicant's Actions or Behavior
EXAMINER: The following indication is NOT simulated. Provide cue that 0-FI-70-6 SFP Hx B is off-scale high at this time.		
	BOP	13. **CHECK** SFP Hx B flow NORMAL, 0-FI-70-6. • Normal top of scale with SFP Hx B in service (may require local observation to determine if leak exists).
	BOP	14. **IF** leak location can be isolated, **THEN RETURN** CCS surge tank to normal level (refer to SOI-70.01).
	BOP	15. **EVALUATE** affected equipment operation USING Appendix A. ***SRO may assign the performance of Appendix A to the BOP.***
	BOP	16. **WHEN** CCS returned normal, **THEN** • **CHECK** only one CCS pump per Train. • **CHECK** one TBBP running. ***With thermal barrier heat exchanger flow path isolated, the SRO determines that step performance is not applicable at this time.***
	SRO	17. **REFER TO** Tech Specs 3.7.7, Component Cooling Water System (CCS). ***SRO determines that LCO 3.7.7 is not applicable. SRO enters OR 14.10 for thermal barrier booster pump loss.***
	SRO	18. **INITIATE** repairs.
	SRO	19. **WHEN** repairs are complete, **THEN**: ***SRO determines that the conditions on the step will not be met and continues to the next step.***
	SRO	20. **RETURN TO** Instruction in effect.
	SRO	**Crew Brief** would typically be conducted for this event as time allows prior to the next event.
	SRO	**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).
Cue Console Operator to insert Event 5.		

Op Test No.: NRC Scenario # 6 Event # 5

Event Description: Loop 2 RCP #1 seal fails, requiring entry into AOI-24, "RCP Malfunctions During Pump Operations." Requires a reactor trip and shutdown of Loop 2 RCP.

Time	Position	Applicant's Actions or Behavior
Indications: 100-D RCP SEAL LEAK OFF FLOW HI 1-FR-68-24 SEAL LEAKOFF - HI RANGE indicates a rising trend, continuing until the recorder is at full scale.		
	RO	Diagnoses and announces the high seal return flow on RCP 2.
	RO	Refers to 100-D RCP SEAL LEAK OFF FLOW HI
	SRO	Enters and directs actions of AOI-24,"RCP Malfunctions During Pump Operation."
AOI-24		**The following actions are taken from AOI-24, "RCP Malfunctions During Pump Operation," Section 3.3, "#1 seal leakoff flow HIGH."**
CAUTION **A seal leakoff rise to greater than 2.0 gpm AFTER experiencing low leakoff of less than 0.8 gpm may indicate seal degradation. Plant Management should be notified of leakoff trends.**		
NOTE 1 Anytime #1 seal leakoff flow exceeds the values shown on Attachment 1, system engineering should be requested to perform an evaluation of the #1 seal condition.		
NOTE 2 During plant startup after seal maintenance, the #1 seal may require 24 hours of run time before the seal seats fully and operates normally.		
NOTE 3 The #1 seal return should be isolated between 3 and 5 minutes after tripping an RCP to allow for pump coastdown.		
	RO	1. **MONITOR** #1 seal leakoff equal to or greater than 6.0 gpm.
EXAMINER: Depending on the speed of crew actions, temperatures may be dropping at step 2 and they may continue to step 3. As time passes, this monitor step will send the SRO to section 3.2, step 2.		
	RO	2. **MONITOR** RCPs lower bearing and #1 seal outlet temp STABLE or DROPPING.
	SRO	2. **RESPONSE NOT OBTAINED:** **GO TO** Subsection 3.2, Step 2

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Event Description: Loop 2 RCP #1 seal fails, requiring entry into AOI-24, "RCP Malfunctions During Pump Operations." Requires a reactor trip and shutdown of Loop 2 RCP.

Time	Position	Applicant's Actions or Behavior
	SRO	3. **REFER TO** appropriate instruction to initiate a controlled shutdown to Mode 3 while continuing with this instruction: • AOI-39, Rapid Load Reduction. • GO-4, Normal Power Operation. • GO-5, Unit Shutdown From 30% Reactor Power to Hot Standby. ***Due to plant conditions, GO-5, "Unit Shutdown From 30% Reactor Power to Hot Standby," is the appropriate instruction.***
NOTE RCP shutdown time is based on an orderly reactor shutdown and may be delayed or expedited based on ongoing evaluations of current plant conditions, other pump parameters and efforts to restore seal leakoff flows to normal.		
	SRO	4. **REMOVE** RCP from service: • Within 8 hrs, OR • As directed by Plant Management. ***If the SRO contacts Plant Management, repeat back information provided and direct removal of the RCP as soon as possible.***
EXAMINER: AOI-24,"RCP Malfunctions During Pump Operation," Attachment 2, "RCP Immediate Shutdown Criteria," is contained as Attachment 1.		
	RO	5. **MONITOR** RCP immediate shutdown required: • **REFER TO** ATTACHMENT 2, RCP Immediate Shutdown Criteria. **GO TO** Subsection 3.2, Step 2.
EXAMINER: The following actions are taken from AOI-24, "RCP Malfunctions During Pump Operation," Section 3.2, "RCP tripped or shutdown required."		
NOTE 1 Malfunctions addressed by this procedure require RCP shutdown as soon as possible.		
NOTE 2 Exceeding any of the limits listed on Attachment 2 of this procedure will require immediate shutdown of the affected RCP		
NOTE 3 Malfunctions resulting in high #1 seal leakoff will require closing #1 seal return FCV following RCP coastdown		
	SRO	1. **CHECK** RCP tripped

Op Test No.:	NRC	Scenario #	6	Event #	5	Page	20 of 35

Event Description: Loop 2 RCP #1 seal fails, requiring entry into AOI-24, "RCP Malfunctions During Pump Operations." Requires a reactor trip and shutdown of Loop 2 RCP.

Time	Position	Applicant's Actions or Behavior
	SRO	1. **RESPONSE NOT OBTAINED:** **MONITOR** RCP immediate shutdown Criteria: • **REFER TO** ATTACHMENT 2, RCP Immediate Shutdown Criteria. 1) **IF** RCP immediate shutdown required, **THEN GO TO** Step 2.
	RO	2. **CHECK** unit in Mode 1 or 2
NOTE Control room staff should brief on Steps 3 through 6 prior to tripping the reactor. This ensures that the affected RCP is stopped and that appropriate actions are taken when unit is removed from service.		
	SRO	3. **TRIP** the reactor, and **GO TO** E-0, Reactor Trip or Safety Injection, WHILE continuing with this instruction.
EXAMINER: RCP 2 may be tripped after confirmation of reactor trip in Step 1 of E-0, "Reactor Trip or Safety Injection," OR after performance of Step 4 of E-0.		
	RO	4. **STOP** and **LOCK OUT** affected RCP(s).
	SRO	5. **IF** in Mode 3, **THEN CHECK** any RCP Running
CAUTION If the RCP seal return flow control valve (FCV) is NOT closed within 5 minutes of stopping the RCP with excessive leakoff, seal damage may occur.		
	RO	6. **MONITOR** RCP seal leakoff less than 6 gpm per pump: • 1-FR-62-24 [RCP 1 & 2] • 1-FR-62-50 [RCP 3 & 4] • ICS "RCP DATA" • ICS "RCP SEALS"
EXAMINER: RCP 2 is the affected pump and requires that 1-FCV-68-22 be closed during the performance of Step 6 RESPONSE NOT OBTAINED.		
	RO	6. **RESPONSE NOT OBTAINED:** **WHEN** the RCP has coasted down (between 3 and 5 minutes), **THEN CLOSE** affected RCP seal return FCV: • 1-FCV-62-9 [RCP 1] • 1-FCV-62-22 [RCP 2] • 1-FCV-62-35 [RCP 3] • 1-FCV-62-48 [RCP 4]
	RO	7. **CHECK** RCPs 1 and 2 running.

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Event Description:	Loop 2 RCP #1 seal fails, requiring entry into AOI-24, "RCP Malfunctions During Pump Operations." Requires a reactor trip and shutdown of Loop 2 RCP.

Time	Position	Applicant's Actions or Behavior
	RO	7. **RESPONSE NOT OBTAINED:** **CLOSE** affected loop's pressurizer spray valve. ***RO places 1-PIC-68-340B, LOOP 2 SPRAY CONTROL in MANUAL and moves the toggle to the left to CLOSE the valve.***

Op Test No.:	NRC	Scenario #	6	Event #	5	Page	22	of	35

Event Description: Loop 2 RCP #1 seal fails, requiring entry into AOI-24, "RCP Malfunctions During Pump Operations." Requires a reactor trip and shutdown of Loop 2 RCP.

Time	Position	Applicant's Actions or Behavior
	E-0	**The following actions are taken from E-O, Reactor Trip or Safety Injection."**
		NOTE Steps 1 thru 4 are **IMMEDIATE ACTION STEPS.** Status Trees / SPDS should be monitored when transitioned to another instruction.
	RO	1. **ENSURE** reactor trip: • Reactor trip and bypass breakers OPEN. ***RO checks 1-52RTB, RX TRIP BKR A RED indicating light LIT on panel 1-M-4.*** ***RO checks 1-52RTB, RC TRIP BKR B RED indicating light LIT on panel 1-M-4*** ***RO checks 1-52BYA, BYPASS BKR A lights DARK*** ***RO checks 1-52BYB, BYPASS BKR B lights dark*** • RPIs at bottom of scale. ***RO observes 1-MON 85 5000/1 CERPI Monitor 1 and 1-MON-85 5000/2 CERPI MONITOR 2 for indication that all SHUTDOWN and CONTROL bank rods are inserted.*** • Neutron flux DROPPING. ***RO observes neutron flux trending down on 1-NR-92-145, NEUTRON FLUX LEVEL RECORDER. May also observe levels decreasing on 1-NI-92-135A, CH I NEUTRON MON % PWR, and 1-NI-92-136A, CH II NEUTRON MON % PWR.***
	RO	2. **ENSURE** Turbine Trip: • All turbine stop valves CLOSED ***RO observes that indicating lights on 1-XX-47-1000 EHC CONTROL for individual throttle and governor valves are GREEN.***
	RO	3. **CHECK** 6.9 kV shutdown boards: a. At least one board energized from: • CSST (offsite), OR • D/G (blackout). ***When observed by the RO during IMMEDIATE OPERATOR ACTIONS, both shutdown boards are energized, based on 1-EI-57-39, 6.9 SDB 1A-A VOLTS indicating approximately 7000 volts and 1-EI-57-66, 6.9 SDB 1B-B VOLTS indicating approximately 7000 volts.***

Event Description: Loop 2 RCP #1 seal fails, requiring entry into AOI-24, "RCP Malfunctions During Pump Operations." Requires a reactor trip and shutdown of Loop 2 RCP.

Time	Position	Applicant's Actions or Behavior
	RO	4. **CHECK** SI actuated: a. Any SI annunciator LIT. ***RO determines that NO SI annunciator is LIT.***
	SRO	4. **RESPONSE NOT OBTAINED:** **DETERMINE** if SI required: a. **IF** ANY of the following exists: • S/G press less than 675 psig, OR • RCS press less than 1870 psig, OR • Cntmt press greater than 1.5 psig **THEN ACTUATE** SI manually. ***RO observes plant conditions and determines that SI actuation criteria are NOT MET at this time.*** **IF** SI **NOT** required, **THEN GO TO** ES-0.1, Reactor Trip Response.

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Event Description: Loop 2 RCP #1 seal fails, requiring entry into AOI-24, "RCP Malfunctions During Pump Operations." Requires a reactor trip and shutdown of Loop 2 RCP.

Time	Position	Applicant's Actions or Behavior
ES-0.1		**The following actions are taken from ES-0.1, "Reactor Trip Response."**
		CAUTION **Plant conditions, AFW pump start signals and flow requirements should be evaluated as time allows.**
	RO	1. **MONITOR** SI actuation criteria: • **IF** SI actuation occurs during the performance of this Instruction, **THEN ** GO TO** E-0, Reactor Trip or Safety Injection.
	BOP	2. **CHECK** Generator PCBs OPEN.
	RO	3. **MONITOR** RCS temperature stable at or trending to 557°F using: • RCS Loop T-avg with any RCP running. .OR • RCS Loop T-cold with RCPs out-of-service.
	BOP	4. **ENSURE** AFW operation: a. AFW established: • Both MD AFW pumps RUNNING. • TD AFW pump RUNNING. • LCVs in AUTO or controlled in MANUAL. ***If 1A-A MD AFW pump was secured due to the earlier failure of 1-LCV-3-164, the pump will remain in the STOP, PULL-TO-LOCK position for the duration of the scenario.*** ***If 1-LCV-3-164 was isolated due to the earlier failure, it will remain isolated for the duration of the scenario.*** b. Heat sink available: • Total feed flow greater than 410 gpm, OR • At least one S/G NR level greater than 29%.
	BOP	5. **CHECK** MFW status: a. **CHECK** RCS T-avg less than 564°F. b. **ENSURE** MFW isolation: • MFW isolation and bypass isolation valves CLOSED. • MFW reg and bypass reg valves CLOSED. • MFP A and B TRIPPED. • Standby MFP STOPPED. • Cond demin pumps TRIPPED. • Cond booster pumps TRIPPED.

Op Test No.:	NRC	Scenario #	6	Event #	5	Page	25 of 35

Event Description: Loop 2 RCP #1 seal fails, requiring entry into AOI-24, "RCP Malfunctions During Pump Operations." Requires a reactor trip and shutdown of Loop 2 RCP.

Time	Position	Applicant's Actions or Behavior
	RO	6. **ENSURE** all control and shutdown rods fully inserted: • RPIs at bottom scale. ***RO observes 1-MON 85 5000/1 CERPI Monitor 1 and 1-MON-85 5000/2 CERPI MONITOR 2 for indication that all SHUTDOWN and CONTROL bank rods are inserted.***
	SRO	7. **ANNOUNCE** reactor trip over PA system
	BOP	8. **MONITOR** S/G levels: a. At least one S/G NR level greater than 29%. b. S/G NR levels less than 50% and controlled.
	BOP	9. **CONTROL** S/G NR levels between 29% and 50%.
EXAMINER: AOI-17, "Turbine Trip," Section 3.3, "BOP Realignment," is contained as Attachment 2.		
	BOP	10. **INITIATE** BOP realignment: • **REFER TO** AOI-17, Turbine Trip.
	RO	11. **MONITOR** pzr pressure: a. Pzr pressure greater than 1870 psig. b. Pzr pressure trending to 2235 psig.
Cue Console Operator to insert Event 6.		

Op Test No.:	NRC	Scenario #	6	Event #	6 and 7	Page	26 of 35

Event Description: A small steam leak on steam generator 2 develops in containment which progresses to a steam line break. Automatic safety injection fails to actuate. Requires re-entry into E-0, "Reactor Trip or Safety Injection," then a transition to E-2, "Faulted Steam Generator Isolation." 1A Containment Spray pump shaft shears 10 seconds after start. A-A and B-B Air Return fans fail to start on Phase B signal. 1B Containment Spray Pump trips 1 minute after start. Requires entry into FR-Z.1, "High Containment Pressure."

Time	Position	Applicant's Actions or Behavior
Indications: 144-A, ICE COND INLET DOOR OPEN Containment pressure rising. Steam pressure lowering. RCS temperature lowering.		
	RO	Diagnoses and announces the steam leak inside containment.
	RO	Determines that automatic safety injection failed to actuate and manually actuates the signal.
	SRO	Re-enters and directs actions of E-0, "Reactor Trip or Safety Injection."
E-0		**The following actions are taken from E-O, "Reactor Trip or Safety Injection." The applicants re-enter E-0, "Reactor Trip or Safety Injection," after the safety injection is actuated.**
EXAMINER: Per TI-12.04, "User's Guide For Abnormal And Emergency Operating Instructions," Section 2.2.4, "Immediate Operator Actions," C.1.4 states "When re-entering E-0 from another EOI, the first 4 high level steps must be reconfirmed, it is NOT necessary to re-perform each low level action."		
NOTE Steps 1 thru 4 are **IMMEDIATE ACTION STEPS.** Status Trees / SPDS should be monitored when transitioned to another instruction.		
	RO	1. **ENSURE** reactor trip: • Reactor trip and bypass breakers OPEN. • RPIs at bottom of scale. • Neutron flux DROPPING.
	RO	2. **ENSURE** Turbine Trip: • All turbine stop valves CLOSED.
	RO	3. **CHECK** 6.9 kV shutdown boards: a. At least one board energized from: CSST (offsite), OR D/G (blackout).

Op Test No.:	NRC	Scenario #	6	Event #	6 and 7	Page 27	of 35

Event Description: A small steam leak on steam generator 2 develops in containment which progresses to a steam line break. Automatic safety injection fails to actuate. Requires re-entry into E-0, "Reactor Trip or Safety Injection," then a transition to E-2, "Faulted Steam Generator Isolation." 1A Containment Spray pump shaft shears 10 seconds after start. A-A and B-B Air Return fans fail to start on Phase B signal. 1B Containment Spray Pump trips 1 minute after start. Requires entry into FR-Z.1, "High Containment Pressure."

Time	Position	Applicant's Actions or Behavior
		CRITICAL TASK 1 Manual safety injection is actuated upon discovery of the steam line break, prior to transition to E-2, "Faulted Steam Generator Isolation."
	RO	4. **CHECK** SI actuated: a. Any SI annunciator **LIT**. ***RO will announce that the window 70-A, SI ACTUATED is LIT. May also announce that FIRST OUT 76-G SI MANUAL is LIT.*** b. Both trains SI **ACTUATED**. • 1-XX-55-6C • 1-XX-55-6D
		EXAMINER: E-0, "Reactor Trip or Safety Injection," Appendixes A and B are included as Attachment 3.
	BOP	5. **PERFORM** Appendixes A and B , E-0, pages 16-30 ***BOP is assigned to perform actions contained in the Appendices. A separate copy of the Appendices is contained in this package for Examiner use.***
	SRO	6. **ANNOUNCE** reactor trip and safety injection over PA system.
	RO	7. **ENSURE** secondary heat sink available with either: • Total AFW flow greater than 410 gpm, OR ***It is expected that Adverse Containment (>2.81 psig) conditions will exist soon after the entry into E-0. When announced, the crew will use the bracketed parameter values.*** • At least one S/G NR level greater than 29% [39% ADV].
	RO	8. **MONITOR** RCS temperature stable at or trending to 557°F using: • RCS Loop T-avg with any RCP running, **OR** • RCS Loop T-cold with RCPs out-of-service.

Op Test No.:	NRC	Scenario #	6	Event #	6 and 7	Page	28	of	35

Event Description: A small steam leak on steam generator 2 develops in containment which progresses to a steam line break. Automatic safety injection fails to actuate. Requires re-entry into E-0, "Reactor Trip or Safety Injection," then a transition to E-2, "Faulted Steam Generator Isolation." 1A Containment Spray pump shaft shears 10 seconds after start. A-A and B-B Air Return fans fail to start on Phase B signal. 1B Containment Spray Pump trips 1 minute after start. Requires entry into FR-Z.1, "High Containment Pressure."

Time	Position	Applicant's Actions or Behavior
	RO	8. **RESPONSE NOT OBTAINED:** **IF** temp less than 557°F, **THEN ENSURE** steam dumps and S/G PORVs CLOSED. **IF** cooldown continues, **THEN CONTROL** total AFW flow to maintain greater than 410 gpm UNTIL NR level in at least one S/G greater than 29% [39% ADV]. **IF** cooldown continues after AFW flow is controlled, **THEN** • **PLACE** steam dump controls OFF. • **CLOSE** MSIVs. • **ENSURE** MSIV bypasses CLOSED. **IF** RCS temp greater than 564°F, **THEN ENSURE** either steam dumps or S/G PORVs OPEN.
	RO	9. **ENSURE** excess letdown valves CLOSED: • 1-FCV-62-54 • 1-FCV-62-55 ***RO observes GREEN indicating lights LIT on handswitches 1-HS-62-54A, EXCESS LTDN ISOL, and 1-HS-62-55A, EXCESS LTDN.***
	RO	10. **CHECK** pzr PORVs and block valves: a. Pzr PORVs CLOSED. b. At least one block valve OPEN. ***RO observes 1-HS-68-340AA, PZR PORV 340A, GREEN indicating light is LIT, RED indicating light is DARK.*** ***RO observes 1-HS-68-334A, PZR PORV 334, GREEN indicating light is LIT, RED indicating light is DARK.*** ***RO observes 1-HS-68-333A, BLOCK VLV FOR PORV 340A, GREEN indicating light is DARK, RED indicating light is LIT.*** ***RO observes 1-HS-68-332A, BLOCK VLV FOR PORV 334, GREEN indicating light is DARK, RED indicating light is LIT.***
	RO	11. **CHECK** pzr safety valves CLOSED: • EVALUATE tailpipe temperatures and acoustic monitors. ***RO observes response of 1-TI-68-330, SAFETY 68-563 TAILPIPE TEMP, 1-TI-68-329, SAFETY 68-564 TAILPIPE TEMP, and 1-TI-68-328, SAFETY 68-565, stable at approximately 110°F.*** ***BOP may observe 1-XI-68-363, PZR VALVES ACOUSTIC MONITOR indicating lights are DARK for 1-XI-68-363 (68-563), 1-XI-68-364 (68-564) and 1-XI-68-365 (68-565).***

Op Test No.:	NRC	Scenario #	6	Event #	6 and 7	Page	29	of	35

Event Description: A small steam leak on steam generator 2 develops in containment which progresses to a steam line break. Automatic safety injection fails to actuate. Requires re-entry into E-0, "Reactor Trip or Safety Injection," then a transition to E-2, "Faulted Steam Generator Isolation." 1A Containment Spray pump shaft shears 10 seconds after start. A-A and B-B Air Return fans fail to start on Phase B signal. 1B Containment Spray Pump trips 1 minute after start. Requires entry into FR-Z.1, "High Containment Pressure."

Time	Position	Applicant's Actions or Behavior
	RO	12. **CHECK** pzr sprays CLOSED. ***RO observes the GREEN indicating lights are LIT for 1-XI-68-340B, PZR SPRAY LOOP 2 and 1-XI-68-340D, PZR SPRAY LOOP 1.***
NOTE Seal injection flow should be maintained to all RCPs.		
	RO	13. **CHECK** if RCPs should remain in service: a. Phase B signals DARK [MISSP].
		13.a. **RESPONSE NOT OBTAINED:** a. **STOP** all RCPs. ** **GO TO** Step 14.
	RO	14. **CHECK** S/G pressures: • All S/G pressures controlled or rising. ***RO observes PAM pressure instruments on SG 1 through 4 (black labels) and determines that pressures are dropping. May also observe trends on 1-PR-1-2, SG 1 & 2 PRESS PSIG, and 1-PR-1-23, SG 3 & 4 PRESS PSIG to assess this step.*** • All S/G pressures greater than 120 psig. ***RO observes PAM pressure instruments on SG 1 through 4 (black labels) and determines that pressures are greater than 120 psig*** ***SG 2 is diagnosed as the faulted steam generator, based on steam pressure response after MSIVs are closed.***
	RO	14. **RESPONSE NOT OBTAINED:** **IF** S/G pressure low OR dropping uncontrolled, **THEN GO TO** E-2, Faulted Steam Generator Isolation.

Op Test No.:	NRC	Scenario #	6	Event #	6 and 7	Page	30	of	35

Event Description: A small steam leak on steam generator 2 develops in containment which progresses to a steam line break. Automatic safety injection fails to actuate. Requires re-entry into E-0, "Reactor Trip or Safety Injection," then a transition to E-2, "Faulted Steam Generator Isolation." 1A Containment Spray pump shaft shears 10 seconds after start. A-A and B-B Air Return fans fail to start on Phase B signal. 1B Containment Spray Pump trips 1 minute after start. Requires entry into FR-Z.1, "High Containment Pressure."

Time	Position	Applicant's Actions or Behavior
E-2		**The following actions are taken from E-2, "Faulted Steam Generator Isolation."**
		CAUTION **If a faulted S/G is NOT needed for RCS cooldown, it should remain isolated during subsequent recovery actions.**
	RO	1. **ENSURE** all MSIVs and MSIV bypasses CLOSED.
		NOTE If it is known that a steam leak exists in the Turbine building, the following step should not be performed until the affected steam header is depressurized.
	RO	2. **PLACE** steam dump controls OFF: • 1-HS-1-103A, STEAM DUMP FSV "A". • 1-HS-1-103B, STEAM DUMP FSV "B". ***Steam dumps are OFF based on E-0, Step 8 RNO actions.***
	RO	3. **CHECK** for at least one Intact S/G: • Any S/G pressure controlled or rising, OR • Any S/G pressure greater than P-sat for RCS incore temperature. ***RO determines that SG 1, 3, and 4 are intact.***
	RO	4. **IDENTIFY** Faulted S/G based on ANY of the following: • Any S/G pressure dropping in an uncontrolled manner, OR • Any S/G pressure less than 120 psig, OR • S/G enclosure temps high: 1) T1002A for 2 and 3, 2) T1003A for 1 and 4. OR • Local indication of break in any of the following: 1) Main steam lines, 2) Main feedwater lines, 3) Other secondary piping. ***RO identifies SG 2 as the faulted SG.***

Op Test No.: NRC	Scenario # 6	Event # 6 and 7	Page 31 of 35

Event Description: A small steam leak on steam generator 2 develops in containment which progresses to a steam line break. Automatic safety injection fails to actuate. Requires re-entry into E-0, "Reactor Trip or Safety Injection," then a transition to E-2, "Faulted Steam Generator Isolation." 1A Containment Spray pump shaft shears 10 seconds after start. A-A and B-B Air Return fans fail to start on Phase B signal. 1B Containment Spray Pump trips 1 minute after start. Requires entry into FR-Z.1, "High Containment Pressure."

Time	Position	Applicant's Actions or Behavior

CAUTION

- **If the turbine-driven AFW pump is the only available source of feed flow, steam supply to the turbine-driven AFW pump must be maintained from one SG.**
- **RCS cooldown requires the availability of at least one S/G.**

FR-Z.1

The 1A Containment Spray pump starts, but the pump shaft shears 10 seconds later. The 1B Containment Spray pump trips one minute after it starts from high-high containment pressure. With containment pressure greater than 2.81 psid, conditions for an ORANGE path on Containment Pressure exist. The applicants will implement FR-Z.1, "High Containment Pressure," at this point.

CAUTION

If ECA-1.1, Loss of RHR Sump Recirculation, is in effect, the number of cntmt spray pumps to be operated is directed in ECA-1.1 rather than in this instruction.

NOTE

Adverse containment setpoints [ADV] should be used where provided due to Phase B actuation.

Time	Position	Applicant's Actions or Behavior
	BOP	1. **ENSURE** cntmt spray operation: a. Cntmt spray signal ACTUATED. b. Cntmt spray pumps RUNNING. c. Cntmt spray valves 1-FCV-72-2 and 1-FCV-72-39 OPEN. d. Cntmt spray pump suction valves OPEN: • Valves from RWST: 1) 1-FCV-72-21 and 2) 1-FCV-72-22. OR • Valves from cntmt sump: 1) 1-FCV-72-44 and 2) 1-FCV-72-45. e. Cntmt spray flow: • 1-FI-72-34. • 1-FI-72-13. ***Both Containment Spray pumps are damaged and cannot be started at this point. SRO may request that Work Control evaluate the 1B Containment Spray pump motor for damage after the instantaneous overcurrent trip that was reported.***

Op Test No.:	NRC	Scenario #	6	Event #	6 and 7	Page	32	of	35

Event Description: A small steam leak on steam generator 2 develops in containment which progresses to a steam line break. Automatic safety injection fails to actuate. Requires re-entry into E-0, "Reactor Trip or Safety Injection," then a transition to E-2, "Faulted Steam Generator Isolation." 1A Containment Spray pump shaft shears 10 seconds after start. A-A and B-B Air Return fans fail to start on Phase B signal. 1B Containment Spray Pump trips 1 minute after start. Requires entry into FR-Z.1, "High Containment Pressure."

Time	Position	Applicant's Actions or Behavior
	BOP	2. **ENSURE** cntmt isolation: a. Phase A isolation: • Train A GREEN. • Train B GREEN. b. Cntmt vent isolation: • Train A GREEN. • Train B GREEN. c. Phase B isolation: • Train A GREEN. • Train B GREEN.
	BOP	3. **ENSURE** MSIVs and bypasses CLOSED.
	BOP	4. **PLACE** steam dump controls OFF: • 1-HS-1-103A, STEAM DUMP FSV "A." • 1-HS-1-103B, STEAM DUMP FSV "B."
	RO	5. **ENSURE** all four RCPs STOPPED.
	BOP	6. **MONITOR** EGTS operation: a. EGTS fans RUNNING. b. Filter bank dp between 5 and 9 inches of water.
	BOP	7. **ENSURE** ABGTS operation: a. ABGTS fans RUNNING. b. ABGTS dampers OPEN: • FCO-30-146A. • FCO-30-146B. • FCO-30-157A. • FCO-30-157B.

Op Test No.:	NRC	Scenario #	6	Event #	6 and 7	Page	33	of	35

Event Description: A small steam leak on steam generator 2 develops in containment which progresses to a steam line break. Automatic safety injection fails to actuate. Requires re-entry into E-0, "Reactor Trip or Safety Injection," then a transition to E-2, "Faulted Steam Generator Isolation." 1A Containment Spray pump shaft shears 10 seconds after start. A-A and B-B Air Return fans fail to start on Phase B signal. 1B Containment Spray Pump trips 1 minute after start. Requires entry into FR-Z.1, "High Containment Pressure."

Time	Position	Applicant's Actions or Behavior

CRITICAL TASK 2

Manually start at least one Containment Air Return Fan prior to exiting FR-Z.1, "High Containment Pressure."

Time	Position	Applicant's Actions or Behavior
Critical Task 2	BOP	8. **WHEN** 10 minutes has elapsed since Phase B actuation, **THEN ENSURE** cntmt air return fans start. ***BOP determines from 1-XX-55-6E, CNTMT ISOL STATUS PNL, Window 102 AIR RET A FAN-30-38, and 1-XX-55-6F, CNTMT ISOL STATUS PNL, Window 102, AIR RET FAN-30-39 GREEN indicating lights LIT that neither of the air return fans are running. BOP checks elapsed time by observing data on the ALARM SCREEN and starts the fans manually.***

CAUTION

- **RCS cooldown requires the availability of at least one S/G.**
- **If ALL S/Gs are Faulted, at least a minimum detectable feed flow to each S/G is required to limit thermal stress during subsequent S/G feed operations.**

Time	Position	Applicant's Actions or Behavior
	BOP	9. **CHECK** S/G pressures: • All S/G pressures controlled or rising. • All S/G pressures greater than 120 psig.
	BOP	9. **RESPONSE NOT OBTAINED:** **ISOLATE** Faulted S/G(s) not needed for cooldown. a. **ENSURE** the following valves CLOSED: • MSIV and MSIV bypasses • Feedwater isolation and bypass isolation valves • Feed reg and bypass reg valves • AFW level control valves • Local manual isolation for steam supply To TD AFP • PORV • S/G blowdown valve
	SRO	10. **DETERMINE** if RHR spray should be placed in service: a. **CHECK** the following conditions: • At least one hour has elapsed since the beginning of the accident. • Cntmt pressure is greater than 9.5 psig. • RHR suction is aligned to cntmt sump. • At least one charging pump and one SI pump running.

Op Test No.:	NRC	Scenario #	6	Event #	6 and 7	Page	34	of 35

Event Description: A small steam leak on steam generator 2 develops in containment which progresses to a steam line break. Automatic safety injection fails to actuate. Requires re-entry into E-0, "Reactor Trip or Safety Injection," then a transition to E-2, "Faulted Steam Generator Isolation." 1A Containment Spray pump shaft shears 10 seconds after start. A-A and B-B Air Return fans fail to start on Phase B signal. 1B Containment Spray Pump trips 1 minute after start. Requires entry into FR-Z.1, "High Containment Pressure."

Time	Position	Applicant's Actions or Behavior
		10. **RESPONSE NOT OBTAINED:** a. **WHEN** all conditions met, **THEN PERFORM** Substep 10b. ** **GO TO** Step 11.
	SRO	11. **RETURN TO** Instruction in effect.
EXAMINER: The following actions are taken from E-2, "Faulted Steam Generator Isolation."		
	BOP	5. **ISOLATE** Faulted S/G: a. **ISOLATE** AFW flow to Faulted S/G. b. **ENSURE** MFW ISOLATED to Faulted S/G: • MFW isolation and bypass isolation valves CLOSED. • MFW reg and bypass reg valves CLOSED. • MFPs TRIPPED. c. **ENSURE** Faulted S/G PORV CLOSED. d. **ENSURE** Faulted S/G blowdown ISOLATED.
NOTE TD AFW pump steam supply should NOT be aligned from a S/G with a known primary to secondary leak if other AFW sources are available.		
	BOP	6. **ENSURE** TD AFW pump being supplied from Intact S/G.
	BOP	7. **MONITOR** CST volume greater than 200,000 gal.
	BOP	8. **WHEN** RCS temperature is stable or rising following Faulted S/G blowdown, **THEN ADJUST** Intact S/G PORV controllers in AUTO to: • P-sat for the highest RCS temp (one or more RCPs running) **OR** • P-sat for the highest T-cold temp (no RCPs running)
	BOP	9. **CHECK** secondary side radiation: • S/G discharge monitors NORMAL. • Condenser vacuum exhaust rad monitors NORMAL. • S/G blowdown rad monitor recorders NORMAL trend prior to isolation. • S/G sample results by Chemistry.

Op Test No.:	NRC	Scenario #	6	Event #	6 and 7	Page	35	of 35

Event Description: A small steam leak on steam generator 2 develops in containment which progresses to a steam line break. Automatic safety injection fails to actuate. Requires re-entry into E-0, "Reactor Trip or Safety Injection," then a transition to E-2, "Faulted Steam Generator Isolation." 1A Containment Spray pump shaft shears 10 seconds after start. A-A and B-B Air Return fans fail to start on Phase B signal. 1B Containment Spray Pump trips 1 minute after start. Requires entry into FR-Z.1, "High Containment Pressure."

Time	Position	Applicant's Actions or Behavior
	BOP	10. **CHECK** SI termination criteria: a. **CHECK** RCS subcooling greater than 65°F [85°F ADV]. ***RO determines that subcooling is greater than 85°F ADV.*** b. **CHECK** secondary heat sink available with either: • Total feed flow to Intact S/Gs greater than 410 gpm, OR • At least one Intact S/G NR level greater than 29% [39% ADV]. ***BOP determines that a secondary heat sink is available.*** c. **CHECK** RCS pressure stable or rising. ***RO reports RCS pressure and trend. RCS pressure may be below the required 33% ADV value at this point.*** d. **CHECK** pzr level greater than 15% [33% ADV]. ***RO reports PZR level. PZR level may be below the required 33% ADV value at this point.*** e. **GO TO** ES-1.1,SI Termination.
	BOP	**11. GO TO** E-1, Loss of Reactor or Secondary Coolant.

EXAMINER: Terminate the scenario when the transition to either E-1, "Loss of Reactor or Secondary Coolant," OR ES-1.1, "SI Termination" is made.

END OF SCENARIO

SHIFT TURNOVER CHECKLIST
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SHIFT TURNOVER CHECKLIST

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☐ SM
☒ US/MCR Unit 1
☐ UO Unit ______
☐ AUO Station ______
☐ STA (STA Function) ______

______________________ Off-going - Name

______________________ On-coming - Name

Part 1 - Completed by off-going shift / Reviewed by on-coming shift: RCS Cb = 1030 ppm

- Abnormal equipment lineup / conditions:
  None
- SI/Test in progress/planned: (including need for conduct of evolution briefings)
- Major Activities/Procedures in progress/planned:
  Train A/Channel III Work Week. Continue with reactor startup, using GO-2, "Reactor Startup" Section 5.3, at step 24.
-
- Radiological changes in plant during shift:

Part 2 - Completed by on-coming shift prior to assuming duties

☐ Review station rounds / Abnormal reading (AUOs only)
☐ Review Narrative Logs (previous day and carry-over items)
☐ Current qualification status
☐ Review the current controlling Reactivity Management Plans (N/A for AUOs)
☐ Review current TS/TRM/ODCM/FPR Required Actions (N/A for AUOs)
☐ Walkdown MCR Control Boards with off-going Operator (N/A for AUOs, as applicable for SM/STAs)
☐ SR/PER reviews complete for previous shift (SM/US/STA)
Relief Time: ______________ Relief Date: ______________

Part 3 - Completed by on-coming shift. These items may be reviewed after assuming duties:

☐ Review Operator Workarounds, Burdens and Challenges (applicable Unit/Station)
☐ Review applicable ODMI actions (first shift of shift week)
☐ Review changes in Standing / Shift Orders (since last shift worked)
☐ Review changes to TACFs issued (since last shift worked) (N/A for AUOs)
☐ Review Control Room Deficiencies (first shift of shift week) (N/A for AUOs)
☐ Review Component Deviation Log (N/A for AUOs)

SHIFT TURNOVER CHECKLIST

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SHIFT TURNOVER CHECKLIST

Page 1 **of** 1

- ☐ SM
- ☐ US/MCR Unit 1
- ☒ UO Unit
- ☐ AUO Station
- ☐ STA (STA Function)

Off-going - Name

On-coming - Name

Part 1 - Completed by off-going shift / Reviewed by on-coming shift: RCS Cb = 1696 ppm

- Abnormal equipment lineup / conditions:

  None

- SI/Test in progress/planned: (including need for conduct of evolution briefings)

- Major Activities/Procedures in progress/planned:

  Train A/Channel III Work Week. Continue with reactor startup, using GO-2, "Reactor Startup" Section 5.3, at step 24.

- Radiological changes in plant during shift:

Part 2 - Completed by on-coming shift prior to assuming duties

- ☐ Review station rounds / Abnormal reading (AUOs only)
- ☐ Review Narrative Logs (previous day and carry-over items)
- ☐ Current qualification status
- ☐ Review the current controlling Reactivity Management Plans (N/A for AUOs)
- ☐ Review current TS/TRM/ODCM/FPR Required Actions (N/A for AUOs)
- ☐ Walkdown MCR Control Boards with off-going Operator (N/A for AUOs, as applicable for SM/STAs)
- ☐ SR/PER reviews complete for previous shift (SM/US/STA)

Relief Time: ____________ Relief Date: ________

Part 3 - Completed by on-coming shift. These items may be reviewed after assuming duties:

- ☐ Review Operator Workarounds, Burdens and Challenges (applicable Unit/Station)
- ☐ Review applicable ODMI actions (first shift of shift week)
- ☐ Review changes in Standing / Shift Orders (since last shift worked)
- ☐ Review changes to TACFs issued (since last shift worked) (N/A for AUOs)
- ☐ Review Control Room Deficiencies (first shift of shift week) (N/A for AUOs)
- ☐ Review Component Deviation Log (N/A for AUOs)

Scenario 6
Attachment 1

AOI-24, “RCP Malfunctions During Pump Operation.”

Attachment 2, “RCP Immediate Shutdown Criteria.”

Attachment 2
(Page 1 of 1)

RCP IMMEDIATE SHUTDOWN CRITERIA

NOTE Exceeding any of the following setpoints will require an immediate pump shutdown. Operating limits can be found in SOI 68.02. This list is immediate shutdown criteria only.

A. Shaft vibration greater than 20 mils or 15 mils with a rate of rise equal to 1 mil/hr (alarm at 15 mils). [Indicators located on 0-PNL-52-R139, Aux Inst Rm.]

B. Frame vibration greater than 5 mils or 3 mils with a rate of rise of 0.2 mil/hr. [Readings taken by Maint. at Aux Bldg L-Panels, el.737.]

C. Motor windings temp greater than 302°F.

D. Motor bearing temp greater than 195°F.

E. Pump bearing temp greater than 225°F.

F. Loss of CCS to oil coolers for greater than 10 minutes.

G. No. 1 seal outlet temp greater than 225°F.

H. No. 1 seal flow HIGH with rising pump bearing or #1 seal leakoff temperatures.

I. No. 1 seal ΔP less than or equal to 200 psid.

Scenario 6
Attachment 2

AOI-17, “Turbine Trip.”

Section 3.3, “BOP Realignment.”

Step	Action/Expected Response	Response Not Obtained

3.3 BOP Realignment

CAUTION Performance of this instruction should not be allowed to delay or interfere with actions required by applicable emergency procedures or abnormal operating procedures.

NOTES

- Control room operators may initiate shutdown of pumps and equipment from the bench board immediately after a trip. Performance of this instruction will subsequently verify proper secondary equipment alignment.
- Steps in this section and items in Attachment 1 may be performed out of sequence.
- Attachment 1 may be initiated as soon as Turbine has tripped while MCR completes Section 3.2. Initiation of Attachment 1 may be part of briefing for preplanned Turbine trip with performance to begin when NAUO is notified of Turbine trip by UO.

1. **DISPATCH** turbine building NAUO to perform Attachment 1.

2. **NOTIFY** condensate demineralizer NAUO prior to Operator initiated press changes in condensate.

3. **REMOVE** generator excitation from service:

   a. **PLACE** voltage regulator to TEST.

   b. **OPEN** exciter field breaker.

   c. **PLACE** exciter regulator control to OFF.

Step	Action/Expected Response	Response Not Obtained

3.3 BOP Realignment (continued)

Step	Action/Expected Response	Response Not Obtained
4.	**MONITOR** main turbine:	
	a. **VERIFY** seal oil backup pump running.	a. **ENSURE** seal oil backup pump 1-HS-47-61D in NORMAL (T7J/729 behind MTOT)
	b. **ENSURE** turning gear oil pump RUNNING.	
	c. **WHEN** less than 600 rpm, **THEN** **ENSURE** bearing lift oil pump RUNNING.	
	d. **WHEN** turbine is at ZERO RPM, **THEN** **ENSURE** turbine on turning gear.	
	e. **MAINTAIN** MTOT lube oil temp between 95°F° and 100°F (may require RCW isolation if TCV has excessive leakage).	
	f. **MAINTAIN** GENERATOR H2 (Cold Gas) temp 95°F (may require RCW isolation if TCV has excessive leakage).	
	g. **ENSURE** Gland Steam Spillover Bypass valve is CLOSED using 1-HS-47-191A.	
5.	**ALIGN** MSRs:	
	a. **PUSH** RESET on MSR control panel.	
	b. **CLOSE** MSR HP steam and bypass isol.	
	c. **ENSURE** MSR warming valves CLOSED.	
	d. **OPEN** MSR startup vents.	
	e. **CLOSE** MSR operating vents.	

Step	Action/Expected Response	Response Not Obtained
3.3	**BOP Realignment (continued)**	
6.	**CHECK** MSIVs OPEN.	**IF** vacuum is to be maintained, **THEN** **ENSURE** auxiliary boiler is aligned for steam seals.
7.	**ENSURE** adequate FW press: a. **ENSURE** two hotwell pumps RUNNING. b. **IF** FW isolation reset, **THEN** **ENSURE** one condensate booster pump RUNNING if needed for unit conditions. c. **ENSURE** CNDS demin pumps OFF. d. **STOP** #3 HDT pumps, and **CLOSE** the discharge valves to condensate heater strings. Notify NAUO performing Attachment 1 that #3 HDT pumps are stopped. e. **STOP** #7 HDT pumps, and **CLOSE** the discharge valves to condensate heater strings.	
8.	**SHUTDOWN** any MFW pump NOT required.	
9.	**SHUTDOWN** any RCW pumps NOT required.	
10.	**SHUTDOWN** any CCW pumps NOT required.	

3.3 BOP Realignment (continued)

11. **ALIGN** extraction steam valves and drain valves:

    a. **CLOSE** #1 and #2 Heater extraction steam valves.

    b. **ENSURE** turbine drain valves OPEN.

    c. **OPEN** MFW pump turbine drain valves.

12. **PERFORM** as required:

    a. **OBTAIN** switching instructions from NEAD, and **OPEN** main generator PCB(s) MODs.

    b. **PULL-TO-LOCK** bus duct cooling fans.

    c. **VERIFY** MTOT and seal oil temps STABLE and trending to 95°F.

13. **IF** MFW isolated to steam generators, **THEN** **REQUEST** Chem Lab sample condensate and feedwater prior to re-admitting water to S/Gs from condensate-feedwater system.

14. **IF** EGTS started, **THEN** **SHUTDOWN** one train after 1 to 2 hours and place in P-AUTO:

    - **REFER TO** SOI-65.02, Emergency Gas Treatment System, section on Auto EGTS Actuation.

Step	Action/Expected Response	Response Not Obtained

3.3 BOP Realignment (continued)

15. **IF** ABGTS started,
THEN
SHUTDOWN one train after 1 to 2 hours and place in P-AUTO:

- **REFER TO** SOI-30.06, Auxiliary Building Gas Treatment System, section on Auto Start of ABGTS

CAUTION Rx trip bkrs must be cycled to allow reset of MFW when isolated by SI, HI-HI S/G level, or flood level in MS valve vault room. If any SI signal is present with Auto SI blocked, cycling Rx trip bkrs will initiate SI actuation.

16. **IF** MFW **NOT** in service,
THEN
ESTABLISH MFW:

- **REFER TO** Attachment 2, Establishing MFW Following Reactor Trip.

Step	Action/Expected Response	Response Not Obtained
17.	**CHECK** S/G NR levels between 38% and 50%.	**IF** S/G level can NOT be maintained, **THEN** **START** M-D AFW pumps.

18. **RETURN TO** applicable Instruction.

End of Subsection

Scenario 6
Attachment 3

E-0, “Reactor Trip or Safety Injection”

Appendix A and B
Attachments 1 through 5

Appendix A
(Page 1 of 9)

Equipment Verification

Step	Action/Expected Response	Response Not Obtained
1.	**ENSURE** PCBs OPEN: • PCB 5084. • PCB 5088.	**OPEN** manually.
2.	**ENSURE** AFW pump operation: • Both MD AFW pumps RUNNING. • TD AFW pump RUNNING. • LCVs in AUTO, OR controlled in MANUAL.	**ESTABLISH** at least one train AFW operation.
3.	**ENSURE** MFW isolation: • MFW isolation and bypass isolation valves CLOSED. • MFW reg and bypass reg valves CLOSED. • MFP A and B TRIPPED. • Standby MFP STOPPED. • Cond demin pumps TRIPPED. • Cond booster pumps TRIPPED.	Manually **CLOSE** valves **AND** **STOP** pumps, as necessary. **IF** any valves can **NOT** be closed, **THEN** **CLOSE** #1 heater outlet valves.

Appendix A
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Equipment Verification

Step	Action/Expected Response	Response Not Obtained
4.	**MONITOR** ECCS operation:	
	a. Charging pumps RUNNING.	a. Manually **START** charging pumps.
	b. Charging pump alignment: • RWST outlets 1-LCV-62-135 and 1-LCV-62-136 OPEN. • VCT outlets 1-LCV-62-132 and 1-LCV-62-133 CLOSED. • Charging 1-FCV-62-90 and 1-FCV-62-91 CLOSED.	b. **ENSURE** at least one valve in each set aligned.
	c. RHR pumps RUNNING.	c. Manually **START** RHR pumps.
	d. SI pumps RUNNING.	d. Manually **START** SI pumps.
	e. BIT alignment: • Outlets 1-FCV-63-25 and 1-FCV-63-26 OPEN. • Flow thru BIT.	e. **ENSURE** at least one valve aligned, and flow thru BIT.
	f. RCS pressure greater than 1650 psig.	f. **ENSURE** SI pump flow. **IF** RCS press drops to less than 150 psig, **THEN** **ENSURE** RHR pump flow.

Appendix A
(Page 3 of 9)

Equipment Verification

Step	Action/Expected Response	Response Not Obtained
5.	**CHECK** cntmt isolation: a. Phase A isolation: • Train A GREEN. • Train B GREEN. b. Cntmt vent isolation: • Train A GREEN. • Train B GREEN.	**ACTUATE** Phase A and Cntmt Vent Isolation signal, **OR** Manually **CLOSE** valves and dampers as necessary.

Appendix A
(Page 4 of 9)

Equipment Verification

Step	Action/Expected Response	Response Not Obtained
6.	**CHECK** cntmt pressure: • Phase B DARK [MISSP]. • Cntmt Spray DARK [MISSP]. • Cntmt press less than 2.8 psig.	**PERFORM** the following: 1) **ENSURE** Phase B actuated. 2) **ENSURE** Cntmt Spray actuated. 3) **ENSURE** cntmt spray pumps running. 4) **ENSURE** cntmt spray flow. 5) **ENSURE** Phase B isolation: • Train A GREEN. • Train B GREEN • Manually **CLOSE** valves and dampers as necessary. 6) **STOP** all RCPs. 7) **ENSURE** MSIVs and bypasses CLOSED. 8) **PLACE** steam dump controls OFF. 9) **WHEN** 10 minutes has elapsed since Phase B actuated, **THEN** **ENSURE** air return fans start. 10) **USE** adverse cntmt [ADV] setpoints where provided.
7.	**DISPATCH** AUO to perform Attachment 1 (E-0), Ice Condenser AHU Breaker Operation.	

Appendix A
(Page 5 of 9)
Equipment Verification

Step	Action/Expected Response	Response Not Obtained
8.	**CHECK** plant radiation NORMAL: • S/G blowdown rad recorder 1-RR-90-120 NORMAL prior to isolation [M-12]. • Condenser vacuum exhaust rad recorder 1-RR-90-119 NORMAL prior to trip [M-12]. • 1-RR-90-106 and 1-RR-90-112 radiation recorders NORMAL prior to isolation [M-12]. • S/G main steamline discharge monitors NORMAL [M-30]. • Upper and Lower containment high range monitors NORMAL [M-30]. • **NOTIFY** Unit Supervisor conditions NORMAL.	**NOTIFY** Unit Supervisor IMMEDIATELY.
9.	**ENSURE** all D/Gs RUNNING.	**EMERGENCY START** D/Gs
10.	**ENSURE** ABGTS operation:	
	a. ABGTS fans RUNNING.	a. Manually **START** fans.
	b. ABGTS dampers OPEN: • FCO-30-146A. • FCO-30-146B. • FCO-30-157A. • FCO-30-157B.	b. Locally **OPEN** dampers.

Appendix A
(Page 6 of 9)

Equipment Verification

Step	Action/Expected Response	Response Not Obtained
11.	**ENSURE** at least four ERCW pumps RUNNING, one on each shutdown board preferred.	Manually **START** pumps as necessary.
12.	**ENSURE** ERCW supply valves OPEN to running D/Gs.	**IF** ERCW can **NOT** be aligned to running D/G, **THEN** **EMERGENCY STOP** affected D/G.
13.	**ENSURE** 0-FCV-67-152, CCS HX C ALT DISCH TO HDR B, is open to position A.	Manually **OPEN** 0-FCV-67-152 to position A.
14.	**CLOSE** 0-FCV-67-144, CCS HX C DISCH TO HDR A.	
15.	**MONITOR** EGTS operation: • EGTS fans RUNNING. • **ENSURE** dampers OPEN - **VERIFY** filter bank dp between 5 and 9 inches of water.	Manually **START** fans **AND** **OPEN** dampers.
16.	**ENSURE** CCS pumps RUNNING: • 1A-A CCS pump. • 1B-B CCS pump. • C-S or 2B-B CCS pump.	Manually **START** pumps as necessary.
17.	**DISPATCH** AUO to shutdown Upper and Lower CNTMT rad monitors USING SOI-90.02.Gaseous Process Radiation Monitors	

Appendix A
(Page 7 of 9)

Equipment Verification

Step	Action/Expected Response	Response Not Obtained
18.	**WHEN** Attachment 1 is complete (Ice Condenser AHU Breakers OPEN), **THEN** **ENERGIZE** hydrogen igniters [1-M-10]: • 1-HS-268-73 ON. • 1-HS-268-74 ON.	

NOTE The following equipment is located on 1-M-9.

Step	Action/Expected Response	Response Not Obtained
19.	**CHECK** CNTMT PURGE fans STOPPED.	**STOP** fans **AND** **PLACE** handswitch in PULL-TO-LOCK.
20.	**CHECK** FUEL HANDLING EXH fans STOPPED, Fuel and Cask loading dampers CLOSED:	**STOP** fans **AND** **PLACE** handswitch in PULL-TO-LOCK, **THEN** Manually **CLOSE** dampers.
21.	**ENSURE** AB GEN SUPPLY and EXH fans STOPPED.	**STOP** fans **AND** **PLACE** handswitch in PULL-TO-LOCK.

NOTE Dampers 1-HS-30-158 and 2-HS-30-270 remain open during ABI.

Step	Action/Expected Response	Response Not Obtained
22.	**ENSURE** AB GEN SUP & EXH dampers CLOSED.	Manually **CLOSE** dampers.

Appendix A
(Page 8 of 9)

Equipment Verification

Step	Action/Expected Response	Response Not Obtained
23.	**ENSURE** MCR & SPREAD RM FRESH AIR dampers CLOSED: • FCV-31-3. • FCV-31-4.	Manually **CLOSE** dampers.
24.	**ENSURE** at least one CB EMER CLEANUP fan RUNNING and associated damper OPEN:	
	• CB EMERG CLEANUP FAN A-A, **OR** • Fan B-B RUNNING..	Manually **START** fan.
	• FCO-31-8, OPEN. **OR** • FCO-31-7, OPEN	**NOTIFY** TSC if at least one damper **NOT** OPEN.
25.	**ENSURE** at least one CB EMER PRESS fan RUNNING and associated damper OPEN:	
	• CB EMERG PRESS FAN A-A, **OR** FAN B-B RUNNING.	Manually **START** fan.
	• FCO-31-6, OPEN. **OR** • FCO-31-5, OPEN.	**NOTIFY** TSC if at least one damper NOT OPEN.

Appendix A
(Page 9 of 9)

Equipment Verification

Step	Action/Expected Response	Response Not Obtained
26.	**ENSURE** Control Building fans STOPPED and dampers CLOSED:	
	• SPREADING ROOM SUPPLY and EXH FANS AND dampers. • TOILET & LKR RM EXHAUST FAN AND dampers.	Manually **STOP** fans **AND** **NOTIFY** TSC if any damper **NOT** CLOSED.
27.	**INITIATE** Appendix B (E-0), Phase B Pipe Break Contingencies.	

Appendix B
(Page 1 of 1)

Phase B Pipe Break Contingencies

Step	Action/Expected Response	Response Not Obtained
1.	**CHECK** PHASE B actuated. [MISSP - 1-XX-55-6C, -6D]	**WHEN** PHASE B actuation occurs, **THEN** **GO TO** step 2.
2.	**ENSURE** 1-FCV-32-110 CLOSED. [CISP - 1-XX-55-6E] (A-train, window 13)	**DISPATCH** AUO to perform Attachment 2 (E-0).
3.	**ENSURE** 1-FCV-67-107 CLOSED. [CISP - 1-XX-55-6E] (A -train, window 43)	**DISPATCH** AUO to perform Attachment 3 (E-0).
4.	**ENSURE** 1-FCV-70-92 CLOSED. [CISP - 1-XX-55-6E] (A -train, window 73)	**DISPATCH** AUO to perform Attachment 4 (E-0).
5.	**ENSURE** 1-FCV-70-140 CLOSED. [CISP - 1-XX-55-6F] (B -train, window 74)	**DISPATCH** AUO to perform Attachment 5 (E-0).

Attachment 1
(Page 1 of 1)
Ice Condenser AHU Breaker Operation

OPEN the following to remove power from ice condenser air handling units AND **REPORT** completion to UO:

BOARD	COMPT	NOMENCLATURE
480 V Reactor Vent Board 1A-A	13D	1-BKR-232-A000/13D ICE COND 1-AHU-61-1/4/8/12/16/20/24/28
480 V Reactor Vent Board 1A-A	14D	1-BKR-232-A000/14D ICE COND 1-AHU-61-3/7/11/15/19/23/27
480 V Reactor Vent Board 1B-B	13D	1-BKR-232-B000/13D ICE COND 1-AHU-61-2/6/10/14/18/22/26/30
480 V Reactor Vent Board 1B-B	14D	1-BKR-232-B000/14D ICE COND 1-AHU-61-5/9/13/17/21/25/29

Attachment 2
(Page 1 of 1)

Control Air Isolation

A. **CLOSE** 0-ISV-32-1013 - CONTROL AIR EL 713 AB HDR ISOL [A6/S EL. 713] (chain operated - behind Fuel and Waste Handling Bd. A).

B. **IF** 0-ISV-32-1013 CANNOT BE CLOSED,
THEN

OPEN and **DISCONNECT** C&SS air compressor breakers:

1. 0-BKR-32-25 [480V SD BD 1A2-A, C/3D]
2. 0-BKR-32-26 [480V SD BD 1B1-B, C/3D]
3. 0-BKR-32-27 [480V AUX BLDG COM BD, C/6C]
4. 0-BKR-32-4900A [480V TURB BLDG COM BD, C/6C]

Attachment 3
(Page 1 of 1)
ERCW Isolation

UNLOCK AND CLOSE 1-ISV-67-523B, LOWER CNTMT VENT CLR 1B &1D ERCW SUP ISOL [A2U/692] (U-1 penetration room - North of AB Pipe Chase Cooler 1B-B in overhead)

Attachment 4
(Page 1 of 1)
CCS Return Isolation

CLOSE 1-ISV-70-700, RCP OIL COOLER CCS RETURN ISOLATION [A4/V EL. 710 U-1 Penetration Room] (approximately 10 ft. North of Penetration Room Cooler 1B-B on mezzanine above RHR Sump Valve Room)

Attachment 5
(Page 1 of 1)

CCS Supply Isolation

CLOSE 1-ISV-70-516, REACTOR BUILDING CCS SUPPLY ISOLATION [A6/T EL. 737] (Behind Elevator approximately 2 ft. west on mezzanine above "A" CCS Heat Exchanger)

Facility:	**Watts Bar June 2011**	Scenario No.: **7**	Op Test No.:	**1**
Examiners:	____________	Operators:	____________	**SRO**
	____________		____________	**RO**
	____________		____________	**BOP**

Initial Conditions: 100% Reactor Power, BOL conditions. RCS boron concentration is 1030 ppm. Control Bank D is at 220 steps.

Turnover: Train B/Channel II Work Week. 1B-B CCP is out-of-service for motor winding inspection and repairs. LCO 3.5.2 and TR 3.1.4 were entered 4 hours ago. Expected return to service in 18 hours. 1A MFP has an oil system problem and is to be removed from service as soon as possible. Load reduction to 80% at 4%/minute is to be conducted using AOI-39,"Rapid Load Reduction." The Standby Main Feed Pump is in service.

Event No.	Malf. No.	Event Type*	Event Description
1	n/a	R- RO N-SRO/BOP	Load reduction conducted using AOI-39, "Rapid Load Reduction."
2	rd09	C-RO	During the rapid load reduction (at approximately 90% power), the control rods fail to move in AUTOMATIC, requiring entry into AOI-2, "Malfunction of Reactor Control System."
3	fw06	C-BOP TS-SRO	After power is reduced to 80%, 1A-A MFP is manually tripped. The Standby Main Feedwater pump trips on instantaneous overcurrent. Requires entry into AOI-16, "Loss of Normal Feedwater." Requires a manual power reduction to 800 MWe. Requires a Tech Spec Evaluation.
4	th09 0.000001	C-RO TS-SRO	High RCS activity (DE-131 at 17μci/gm) is reported by the Chemistry Lab. Requires entry into AOI-28, "High Activity in Reactor Coolant." Requires a Tech Spec evaluation.
5	rc09b rp01b rprt1 close	C-RO	Loop 2 RCP shaft shears, causing low flow, then reverse flow in Loop 2. Automatic reactor trip fails to occur. Reactor Trip switch RT-1 (1-M-4) fails to cause a reactor trip. Requires reactor trip to be initiated from RT-2 (1-M-6). Requires entry into E-0, "Reactor Trip or Safety Injection."
6	ed06a	C-BOP	1A-A 6.9 KV Shutdown Board trips on differential relay operation when the reactor trips.
7	si08d	C-BOP	1B-B Safety Injection pump fails to automatically start on the safety injection signal. Requires manual start by BOP.
8	th04b	M-All	Pressurizer safety valve fails partially open 30 seconds after the reactor trip. Requires transition to E-1, "Loss of Reactor or Secondary Coolant," and transition to ES-1.2, "Post-LOCA Cooldown and Depressurization."

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

Scenario 7 - Summary

Initial Condition	100% Reactor Power, BOL conditions. RCS boron concentration is 1030 ppm. Control Bank D is at 220 steps.

Turnover	Train B/Channel II Work Week. 1B-B CCP is out-of-service for motor winding inspection and repairs. LCO 3.5.2 and TR 3.1.4 were entered 4 hours ago. Expected return to service in 18 hours. 1A MFP has an oil system problem and is to be removed from service as soon as possible. Load reduction to 80% at 4%/minute is to be conducted using AOI-39,"Rapid Load Reduction." The Standby Main Feed Pump is in service.

Event 1	Load reduction conducted using AOI-39, "Rapid Load Reduction."
Event 2	During the rapid load reduction (at approximately 90% power), the control rods fail to move in AUTOMATIC, requiring entry into AOI-2, "Malfunction of Reactor Control System."
Event 3	After power is reduced to 80%, 1A-A MFP is manually tripped. The Standby Main Feedwater pump trips on instantaneous overcurrent. Requires entry into AOI-16, "Loss of Normal Feedwater." Requires a Tech Spec Evaluation of Axial Flux Difference.
Event 4	High RCS activity (DE-131 at 17μci/gm) is reported by the Chemistry Lab. Requires entry into AOI-28, "High Activity in Reactor Coolant." Requires a Tech Spec evaluation.
Event 5	Loop 2 RCP shaft shears, causing low flow, then reverse flow in Loop 2. Automatic reactor trip fails to occur. Reactor Trip switch RT-1 (1-M-4) fails to cause a reactor trip. Requires reactor trip to be initiated from RT-2 (1-M-6). Requires entry into E-0, "Reactor Trip or Safety Injection."
Event 6	1A-A 6.9 KV Shutdown Board trips on differential relay operation when the reactor trips.
Event 7	1B-B Safety Injection pump fails to automatically start on the safety injection signal. Requires manual start by BOP.
Event 8	Pressurizer safety valve fails open 30 seconds after the reactor trip. Requires transition to E-1, "Loss of Reactor or Secondary Coolant," and transition to ES-1.2, "Post-LOCA Cooldown and Depressurization."

Scenario 7 - Critical Task Summary

Critical Task 1	Manually trip the reactor from the control room prior to entry into FR-S.1, "Nuclear Power Generation/ATWS."
Critical Task 2	Manually start at least one intermediate-head ECCS pump (Safety Injection Pump) before transition out of E-0, "Reactor Trip or Safety Injection."

SIMULATOR SETUP INFORMATION

1. ENSURE NRC Examination Security has been established.

2. RESET to Initial Condition 347 by performing the following actions:

   a. Select ICManager on the THUNDERBAR menu (right hand side of Instructor Console Screen).

   b. Locate IC# 347.

   c. Right "click" on IC# 347.

   d. Select Reset on the drop down menu.

   e. Right "click" on RESET.

   f. Enter the password for IC 347.

   g. Select "Yes" on the INITIAL CONDITION RESET pop-up window.

   h. Perform SWITCH CHECK.

3. SELECT Director on the THUNDERBAR menu (right hand side of Instructor Console Screen).

4. ENSURE the following information appears on the Director Screen:

	Key	Description	Type	Event	Delay	Inserted	Ramp	Initial	Final	Value
	rprt1	rprt1 manual reactor trip close-trip sw	O		00:00:00	00:00:00	00:00:00		close	close
	rp01b	automatic reactor trip signal failure (atws)	M		00:00:00	00:00:00	00:00:00		Active	Active
	si08d	failure of auto si and blackout signals sip 1b-b	M		00:00:00	00:00:00	00:00:00		Active-	Active
	cvr03	power removal centrifugal charging pump b	O		00:00:00	00:00:00	00:00:00		off	off
	cv01b	charging pump b trip	M		00:00:00	00:00:00	00:00:00		Active	Active

SIMULATOR SETUP INFORMATION

	Key	Description	Type	Event	Delay	Inserted	Ramp	Initial	Final	Value
	th04b	pzr safety failure sv-68-564	M	19	00:00:30	00:00:00	00:00:00		15	0
	ed06a	loss of 6.9 kv shutdown board bus 1a-a	A	19	00:00:00		00:00:00		Active	InActive
	rd09	rods fail to move in auto	M	2	00:00:00		00:00:00		Active	InActive
	fw06	electrical feed pump trip	M	21	00:00:00		00:00:00		Active	InActive
	th09	fuel cladding failure	M	4	00:00:00		00:00:00		1e-006	0
	rc09b	rcp loop 2 sheared shaft	M	5	00:00:00		00:00:00		Active	InActive

5. **Place simulator in RUN and acknowledge any alarms.**

6. **ENSURE Hold Order Tag is on 1-HS-62-104A, 1B CCP and the handswitch is in the "Stop, PULL-TO-LOCK" position.**

8. **ENSURE the "Train A Week - Channel 1" sign is placed on 1-M-30.**

9. **Place simulator in FREEZE.**

10. **ENSURE Watts Bar Nuclear Plant Unit 1 Reactivity Briefing Book (Simulator Copy) BOL (Beginning Of Life) is updated and on the desk, and that the BOL placards are on 1-M-6, below the Boric Acid and Primary Water Integrators. ENSURE Reactivity Plan for power maneuver is available to the crew.**

11. **WHEN prompted by the Chief Examiner, place the Simulator in RUN.**

Exam Event No.	Simulator Event No.	Description/Role Play
1	n/a	Rapid load reduction to 80% to remove 1A main feed pump from service. ***ROLE PLAY: If contacted as Work Control to tag out the 1A Main Feed Pump, acknowledge the request.*** ***ROLE PLAY: When contacted as the Load Coordinator, acknowledge report that Watts Bar Unit 1 is dropping load to 80% per AOI-39,"Rapid Load Reduction."*** ***ROLE PLAY: When contacted as Condensate Demineralizer AUO, acknowledge report of impending shutdown of pumps.*** ***ROLE PLAY: When contacted as Chemistry by the SRO, acknowledge report that Watts Bar Unit 1 is dropping load and that 1-SI-68-28 "Primary Chemistry Requirements" must be performed.***
2	2	During the rapid load reduction (at approximately 90% power), the control rods fail to move in AUTOMATIC. ***ROLE PLAY: If contacted as the Control Building AUO, repeat back request to visually inspect the rod control cabinets as the Control Building AUO. Report that there are no obvious alarm lights or problems.*** ***ROLE PLAY: When contacted as Work Control, repeat back request to prepare a package to troubleshoot and repair the rod control circuitry.***

Exam Event No.	Simulator Event No.	Description/Role Play
3	3	1A MFP shutdown and subsequent trip of the Standby Main Feed Pump. ***ROLE PLAY: When contacted as Turbine Building AUO, acknowledge report, and then state that 1-PIC-3-40 is set at 1200 psia and is closed. Use fwr47 to adjust 1-PIC-3-40 setpoint to 1200 psia.*** ***ROLE PLAY: When contacted as Turbine Building AUO, acknowledge report, and then state that 1-ISV-3-580 is open.*** ***ROLE PLAY: When contacted as Turbine Building AUO, will acknowledge report, and then state that the local vibration monitors have been reset.*** ***ROLE PLAY: When contacted as Turbine Building AUO, acknowledge report, and then state that 1A MFP return oil temperature is currently 151°F.*** ***ROLE PLAY: If contacted as an AUO to check the Standby Main Feed Pump, state that there is no visible damage to the pump.*** ***ROLE PLAY: If contacted as an AUO to check the breaker for the Standby Main Feed Pump, state that the breaker has tripped on instantaneous overcurrent.***
4	4	High RCS Activity reported by chemistry. ***ROLE PLAY: When instructed by the lead examiner, call the main control room as the Chemistry Department and report that RCS has Dose Equivalent Iodine-131 at 17 μci/gm. Report that second sample confirmed results.*** ***ROLE PLAY: When contacted as Chemistry to perform Isotopic Analysis of the RCS, acknowledge the request.*** ***ROLE PLAY: When contacted as Reactor Engineering to implement TI-7.004, "Fuel Integrity Assessment Program," acknowledge the request.*** ***ROLE PLAY: When contacted as Radiation Protection, acknowledge the report that there may be radiological changes due to adjusting letdown flow.*** ***ROLE PLAY: When contacted as Chemistry to evaluate the Cation Demin, report that it should not be placed in service at this time.***

Exam Event No.	Simulator Event No.	Description/Role Play
5	**5**	Loop 2 RCP shaft shears resulting in a reactor trip. ***ROLE PLAY: When contacted, acknowledge the request to shutdown the Upper and Lower Containment Radiation monitors sampling pumps, and inform the requestor that the sample pumps are off.*** ***ROLE PLAY: When contacted, acknowledge the request to open the Ice Condenser AHU breakers, and inform the requestor that the breakers are open.***
6	**6**	1A-A 6.9 kV Shutdown Board trips on differential relay operation when the reactor trips. ***ROLE PLAY: When contacted as the Control Building AUO, repeat back request to investigate the 1A-A 6.9 KV Shutdown Board, report that the differential lockout relay has operated, and that there is extensive damage to the board. There is no fire.*** ***ROLE PLAY: When contacted as Work Control, acknowledge the request to have a maintenance team go to the 1A-A 6.9 KV Shutdown Board to assess the damage, and to plan repairs.***
7	**7**	1B-B Safety Injection Pump fails to automatically start on the safety injection signal. ***ROLE PLAY: If contacted as Work Control, acknowledge the request to repair the automatic start circuitry of the 1B-B Safety Injection Pump.***

Exam Event No.	Simulator Event No.	Description/Role Play
8	**8**	A pressurizer safety valve fails partially open 30 seconds after the reactor trip, requiring entry into E-1. ***ROLE PLAY: When contacted, acknowledge the need to perform E-1 Appendix A, B, and C. Use remote function sir01 to complete E-1 Appendix A (place power on CLA outlet valves). Use remote sir14 to complete E-1 Appendix B (place power on 1-FCV-63-1. Use remote function sir06 to complete E-1 Appendix C (place power on 1-FCV-63-22). After remote functions are entered, report that the Appendices are complete.*** ***ROLE PLAY: When contacted as Chemistry, acknowledge request to sample steam generators for activity.*** ***ROLE PLAY: When contacted as Radiation Protection, acknowledge request to survey steam lines and blowdown lines.*** ***ROLE PLAY: When contacted as the Auxiliary Building AUO, acknowledge the request to check low analyzer temperature lights. Report back that the lights are NOT LIT.***

Op Test No.:	NRC	Scenario #	7	Event #	1	Page	1 of 27
Event Description:	Load reduction conducted using AOI-39, "Rapid Load Reduction."						

Time	Position	Applicant's Actions or Behavior

AOI-39

The following actions are taken from AOI-39, "Rapid Load Reduction," section 3.2, "Power Reduction From Greater Than 50% Power," beginning at Step 1, as indicated in the Shift Turnover.

CAUTION

Over boration may result in excessive rod withdrawal, T-avg lower than desired, and AFD oscillations.

NOTE

- Rod Control should remain in automatic for T-avg Control
- Reactivity Briefing Sheet, "Thumb Rules" (page 3), lists boration flows and volumes for different reduction rates.
- Effect of boration will lag behind turbine load reduction and can be compensated for by temporarily increasing boric acid flow rate above recommended rate.

Time	Position	Applicant's Actions or Behavior
	RO	1. **INITIATE** a manual boration: a. **DETERMINE** recommended boration flow rate and volume from Reactivity Briefing Sheet: b. **INITIATE** normal boration: 1) **ADJUST** BA flow controller, 1-FC-62-139, to desired flow rate. 2) **ADJUST** BA batch counter 1-FQ-62-139 to required quantity. 3) **PLACE** mode selector 1-HS-62-140B to BOR. 4) **(ρ) PLACE** VCT makeup control 1-HS-62-140A, to START. 5) **VERIFY** desired boric acid flow indicated on 1-FI-62-139.

CAUTION

- **Condenser Backpressure limits are on page 5.**
- **TURBINE MANUAL Operation requires continuous operator monitoring and control.**
- **LOSS OF CONDENSER VACUUM may be made worse if steam dumps are actuated. AOI-11 requires T-ave and T-ref be maintained within 3°F.**

NOTE

If the initiating condition is corrected, the power reduction may be terminated

Op Test No.:	NRC	Scenario #	7	Event #	1	Page	2	of 27

Event Description: Load reduction conducted using AOI-39, "Rapid Load Reduction."

Time	Position	Applicant's Actions or Behavior
	BOP	2. **ESTABLISH** a turbine load reduction rate less than or equal to 5%/min: a. **PLACE** turbine in IMP IN b. **SET** a desired load in the SETTER with the REFERENCE CONTROL. c. **SET** the LOAD RATE at less than or equal to 5%/min. d. **(ρ) DEPRESS** GO pushbutton.
NOTE AFD green target band can be monitored using ICS Turn On code DOGHOUSE.		
	RO	3. **MONITOR** rod position: • Rods above Lo-Lo insertion limit • AFD within Target Band
	SRO	4. **REFER TO** EPIP-1, Emergency Plan Classification Flowchart
	SRO	5. **NOTIFY** the Load Coordinator of the required load reduction and expected ramp rate. ***When Load Coordinator is contacted by the SRO, the Console Operator will acknowledge report that Watts Bar Unit 1 is dropping load to 80% per AOI-39, "Rapid Load Reduction."***
NOTE If reactor power is stabilized at a lower level a drop in Tavg will occur due to Xenon build up. Dilution may be required to maintain power level.		
	RO	6. **MONITOR** Tavg and Tref: • Tavg trending to Tref. • Mismatch less than 5°F. ***When the control rod failure occurs, a Tavg - Tref mismatch will occur. The SRO may direct entry into the RNO column and direct the RO to place rods in MANUAL.***
	RO	**6. RESPONSE NOT OBTAINED** **CONTROL** Tavg with Control Rods in manual. **IF** Tavg and Tref mismatch can NOT be maintained less than 5°F,**THEN TRIP** reactor, and ** **GO TO** E-0, Reactor Trip or Safety Injection.
	SRO	7. **CHECK** rate of power reduction is rapid enough for existing plant conditions. ***SRO determines that the current rate of power reduction is rapid enough for current conditions and continues to step 8.***

Op Test No.: NRC Scenario # 7 Event # 1 Page 3 of 27

Event Description: Load reduction conducted using AOI-39, "Rapid Load Reduction."

Time	Position	Applicant's Actions or Behavior
	BOP	8. **NOTIFY** Cnds Demin AUO of impending pmp shutdowns. ***When Condensate Demineralizer AUO is contacted by the BOP, the Console Operator will acknowledge report of impending shutdown of pumps.***
	SRO	9. **WHEN** rated thermal power change exceeds 15% in one hour, **THEN NOTIFY** Chemistry to initiate 1-SI-68-28. ***When Chemistry is contacted by the SRO, the Console Operator will acknowledge report that Watts Bar Unit 1 is dropping load and that 1-SI-68-28, "Primary Chemistry Requirements" must be performed.***
	SRO	When power is less than or equal to 80%, the SRO will direct the BOP to trip the 1A MFP.
At approximately 90% reactor power, Cue Console Operator to insert Event 2.		

Op Test No.: NRC Scenario # 7 Event # 2 Page 4 of 27

Event Description: During the rapid load reduction (at approximately 90% power), the control rods fail to move in AUTOMATIC, requiring entry into AOI-2, "Malfunction of Reactor Control System."

Time	Position	Applicant's Actions or Behavior
Indications: Rod insertion fails to initiate OR insertion stops when failure is inserted.		
	RO	Diagnoses and announces the failure of the rods to insert when demand for insertion exists.
	RO	May place rod control in MANUAL after observing that Window 86-A CONTROL RO URGENT FAILURE is DARK, and then insert rods to maintain Tavg within 3°F of Tref.
	SRO	Enters and directs the actions of AOI-2, "Malfunction of Reactor Control System."
AOI-2		**The following actions are taken from AOI-2, "Malfunction of Reactor Control System," Section 3.6, "Failure of the Control Rods to Move on Demand."**
	RO	1. **CHECK** CONTROL ROD URGENT alarm LIT [86-A]. ***RO determines that alarm 86-A is not lit and enters the RNO for step 1.***
	RO	1. **RESPONSE NOT OBTAINED** **IF** CONTROL ROD URGENT FAILURE alarm DARK, **THEN PLACE** control rods in MAN, AND **GO TO** NOTE prior to Step 16. ***RO places 1-RBSS, ROD BANK SELECT in the MAN position.*** ***If the Control Building AUO is contacted by the SRO, the Console Operator will repeat back request to visually inspect the rod control cabinets. Report that there are no obvious alarm lights or problems.***
NOTE Steps 16, 17 and 18 are to be performed for control rod problems other than Urgent Failures.		
	RO	16. **CHECK** for the C-5 LOW TURB IMPULSE PRESS ROD BLOCK [66-A] Alarm window DARK. ***RO observes 66-A, C-5 LOW TURB IMPULSE PRESS ROD BLOCK is DARK.***

Op Test No.:	NRC	Scenario #	7	Event #	2	Page	5 of 27

Event Description: During the rapid load reduction (at approximately 90% power), the control rods fail to move in AUTOMATIC, requiring entry into AOI-2, "Malfunction of Reactor Control System."

Time	Position	Applicant's Actions or Behavior
	RO	17. **CHECK** for the following rod stop alarm windows DARK: • INTERMED RANGE HI FLUX ROD WD STOP [82-B]. ***RO observes 82-B, INTERMED RANGE HI FLUX ROD WD STOP on 1-XX-55-4B [1-M-4] is DARK.*** • POWER RANGE OVERPOWER ROD WD STOP [83-A]. ***RO observes 83-A, POWER RANGE OVERPOWER ROD WD STOP on 1-XX-55-4B [1-M-4] is DARK.*** • C-11 BANK D AUTO WITHDRAWAL BLOCKED [64-F]. ***RO observes 64-F, C-11 BANK D AUTO WITHDRAWAL BLOCKED on 1-XX-55-4A [1-M-4] is DARK.*** • OVERPOWER ΔT TURB RUNBACK & C-4 ROD BLOCK [122-D]. ***RO observes 122-D, C OVERPOWER ΔT TURB RUNBACK & C-4 ROD BLOCK on 1-XX-55-6B [1-M-4] is DARK.*** • OVERTEMP ΔT TURB RUNBACK & C-3 ROD BLOCK [123-D]. ***RO observes 123-D OVERTEMP ΔT TURB RUNBACK & C-3 ROD BLOCK on 1-XX-55-6B [1-M-4] is DARK.***
	RO	18. **IF** rod stop alarms are clear **AND** control rods will move in manual, **THEN**: a. **ENSURE** T-avg and T-ref within 3°F. b. **INITIATE** repairs to auto rod control system. ***When Work Control is contacted by the SRO, the Console Operator will repeat back request to prepare a package to troubleshoot and repair the rod control circuitry.***
CAUTION **Allowing at least 5 minutes between any rod control input (i.e., T-avg, T-ref, or NIS) change and placing rods in AUTO, will help prevent undesired control rod movement.**		
	RO	19. **WHEN** conditions allow auto rod control, **THEN**: a. **ENSURE** T-avg and T-ref within 1□F. b. **ENSURE** zero demand on control rod position indication [1-M-4]. c. **PLACE** rods in AUTO. ***SRO determines that the rods will remain in MANUAL until informed of completion of repairs.***

Op Test No.:	NRC	Scenario #	7	Event #	2	Page	6	of	27

Event Description: During the rapid load reduction (at approximately 90% power), the control rods fail to move in AUTOMATIC, requiring entry into AOI-2, "Malfunction of Reactor Control System."

Time	Position	Applicant's Actions or Behavior
		20. **NOTIFY** Chemistry of any reactor power changes greater than 15% in one hour. ***AOI-39, "Rapid Load Reduction," addressed the need to contact Chemistry for load change samples. IF Chemistry is contacted by the SRO, the Console Operator will acknowledge report that Watts Bar Unit 1 is dropping load and that power change samples must be performed.***
		21. **RETURN TO** Instruction in effect.
	SRO	**Crew Brief** would typically be conducted for this event as time allows prior to the next event.
	SRO	**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).
The next malfunction will be entered automatically when the 1A-A MFP is tripped.		

Op Test No.: NRC	Scenario # 7 Event # 3 Page 7 of 27
Event Description:	After power is reduced to 80%, 1A-A MFP is shutdown. The Standby Main Feedwater pump trips upon start. Requires entry into AOI-16, "Loss of Normal Feedwater." Requires a Tech Spec Evaluation of Axial Flux Difference.

Time	Position	Applicant's Actions or Behavior

SOI-2&3.01 **The following actions are taken from SOI-2&3.01, "Condensate and Feedwater System," Section 7.3.1, "TDMFP Shutdown."**

CAUTIONS

1) Failure to have at least 1 MFP reset will trip the unit and start Aux Feedwater.
2) Tripping either MFP with runback circuitry armed will cause a BOP runback and Auto Start of Standby Main Feedwater Pump. Impulse pressure equivalent to 67% (PIS-47-13RLY1) load enables auto start circuit while 85% load (PIS-47-13 RLY3) arms the runback circuitry.

NOTES

1) Tripping a MFP above 40% load closes its condenser inlet & outlet MOVs.
2) Runback circuitry may be verified at 1-L-262 [729, T3J] using display PIS-47-13RLY1 or RLY3. RLY1 indicates Turbine load >67%, and RLY3 indicates Turbine Load >85%. PIS-47-13 indicates actual impulse pressure and provides relay lights to signify when relay is closed.
3) During MFP shutdown, critical speeds may cause Vibration Alert Lights to come on briefly.
4) Signoffs for non-selected MFPs may be **N/A'd**.
5) Section 8.9 provides guidelines for replacing TDMFP with SMFP.
6) In Mode 1, entry into Tech Spec 3.3.2 condition J may be suspended for up to 4 hours when removing one of two Turbine Driven Main Feedwater Pumps (TDMFWP) from service. Refer to Tech Spec 3.3.2 table 3.3.2-1.
7) In Mode 2, trip function of all Turbine Driven Main Feedwater Pumps (TDMFWP) is required when one or more (TDMFWP) is supplying feedwater to the Steam Generators. Refer to Tech Spec 3.3.2 condition J.

Time	Position	Applicant's Actions or Behavior
	BOP	[1] ENSURE 1-PIC-3-40 set at 1200 psia, and 1-PCV-3-40 CLOSED. ***When Turbine Building AUO is contacted by the BOP, the Console Operator will acknowledge report, and then state that 1-PIC-3-40 is set at 1200 psia and is closed.***
	SRO	[2] **ENSURE** recirc manual isolation open for MFP to be shutdown: A. 1-ISV-3-580, MAIN FEEDWATER PUMP A RECIRC ISOL. ***When Turbine Building AUO is contacted by the BOP, the Console Operator will acknowledge report, and then state that 1-ISV-3-580 is open.*** B. 1-ISV-3-581, MAIN FEEDWATER PUMP B RECIRC ISOL.
	BOP	[3] **ENSURE** local vibration monitors reset at 1-L-792 [el. 755]. ***When Turbine Building AUO is contacted by the BOP, the Console Operator will acknowledge report, and then state that the local vibration monitors have been reset.***

Op Test No.:	NRC	Scenario #	7	Event #	3	Page	8	of 27

Event Description: After power is reduced to 80%, 1A-A MFP is shutdown. The Standby Main Feedwater pump trips upon start. Requires entry into AOI-16, "Loss of Normal Feedwater." Requires a Tech Spec Evaluation of Axial Flux Difference.

Time	Position	Applicant's Actions or Behavior
	SRO	[4] **(p) PLACE** selected MFP speed control in MANUAL, and **LOWER** speed slowly [1-M-3]: A. 1-SIC-46-20A, MFPT A- SPEED CONTROL ***BOP places 1-SIC-46-20A in MANUAL by moving the toggle switch up, and then lowers speed by moving the toggle switch to the left while observing 1-SI-46-20A, MFPT A SPEED.*** B. 1-SIC-46-20B, MFPT B- SPEED CONTROL ***Not applicable.***
NOTE As speed is lowered, the recirc valve for the pump being removed from service will open, causing a sudden shift of load to the pump remaining in service.		
	SRO	[5] **ENSURE** proper operation of recirc valves as pump unloads
	BOP	[6] **IF** other MFP is in service, **THEN ENSURE** the other MFP assumes the load. ***BOP observes 1-SI-46-20B 1B MFP SPEED and 1-FI-3-84 MFWP B FLOW rising as 1A MFP speed is lowered.***
	BOP	[7] **IF** MFP A is being SHUT DOWN, **THEN MONITOR** its supervisory instruments while unloading: A. MFPT Vibration, less than 3 mils [ICS mimic MFPTVIBA]. B. MFWP Vibration, less than 4 mils [ICS mimic MFPTVIBA]. C. Thrust Bearing, less than 7 mils (either direction) [ICS mimic MFPTVIBA].
	BOP	[8] **IF** MFP B is being SHUT DOWN, **THEN MONITOR** its MFPT and Pump Bearing Vibration on ICS while unloading: ***Step is not applicable.***
CAUTION Failure to have at least 1 MFP reset will trip the turbine and start Aux Feedwater.		
	SRO	[9] **MAINTAIN** return oil temp 140 to 160°F: A. 1-TIC-24-56A, MFPT OIL COOLER 1A1/1A2 RCW OUTLET TEMP [T1H/708], Panel 1-L-255. ***When Turbine Building AUO is contacted by the BOP, the Console Operator will acknowledge report, and then state that return oil temperature is currently 151°F.*** B. 1-TIC-24-56B, MFPT OIL COOLER 1B1/1B2 RCW OUTLET TEMP [T1H/708], Panel 1-L-259.

Op Test No.: NRC Scenario # 7 Event # 3

Event Description: After power is reduced to 80%, 1A-A MFP is shutdown. The Standby Main Feedwater pump trips upon start. Requires entry into AOI-16, "Loss of Normal Feedwater." Requires a Tech Spec Evaluation of Axial Flux Difference.

Time	Position	Applicant's Actions or Behavior
		[10] **ENSURE** both MFPs RESET. ***BOP observes 1-HS-46-9A, MFPT A TRIP-RESET and 1-HS-46-35A MFPT B TRIP-RESET, GREEN indicating light DARK, RED indicating light LIT***
		[11] **(ρ) WHEN** MFP turbine speed is approx 3,300 rpm, **THEN TRIP** the MFP Turbine [1-M-3]: A. 1-HS-46-9A, MFPT A TRIP-RESET. ***BOP rotates 1-HS-46-9A, MFPT A TRIP-RESET to the right to the TRIP position. BOP observes GREEN indicating light LIT and RED indicating light DARK on 1-HS-46-9A.*** B. 1-HS-46-36A, MFPT B TRIP-RESET.
EXAMINER: When the 1A MFP is tripped in Step 11.A, the Standby Main Feedwater Pump will trip.		

Op Test No.:	NRC	Scenario #	7	Event #	3	Page	10 of 27

Event Description: After power is reduced to 80%, 1A-A MFP is shutdown. The Standby Main Feedwater pump trips upon start. Requires entry into AOI-16, "Loss of Normal Feedwater." Requires a Tech Spec Evaluation of Axial Flux Difference.

Time	Position	Applicant's Actions or Behavior
14-E, M-1 THRU M-6 MOTOR TRIPOUT 63-F, SG LEVEL DEVIATION		
	BOP	Diagnoses and announces the trip of the Standby Main Feed Pump.
	BOP	May reduce turbine load to less than 800 MWe (67%) using the valve position limiter to lower power to within feed capability.
	SRO	May enter and direct actions of AOI-16, "Loss of Normal Feedwater."
AOI-16		**The following actions are taken from AOI-16, "Loss of Normal Feedwater," Section 3.3, "Loss of Standby MFP With Main Turbine in Service."**
	SRO	1. (ρ) **IF** loss of S/G level is imminent, **THEN TRIP** reactor, and **GO TO** E-0, Reactor Trip or Safety Injection. ***SRO determines that S/G level trend does not indicate a rapid loss and continues to Step 2.***
	SRO	2. **IF** both MFWPs in service, **THEN:** a. **INITIATE** repairs on Standby MFWP. b. **RETURN TO** Instruction in effect. ***SRO determines that only one MFWP is in service and continues to step 3.***
	BOP	3. **CHECK** one MFWP in service. ***BOP observes that 1A MFP is in service.***
CAUTION Runback may result in exceeding Tech Spec 3.2.3 limits on Axial Flux Difference (AFD).		
	SRO	4. **CHECK** turbine load less than 800 MWe (67%). ***SRO determines that power is greater than 67% and enters the RNO for step 4.***
	BOP	4. **RESPONSE NOT OBTAINED** (ρ) **REDUCE** turbine load to within MFWP capability with valve position limiter. ***BOP depresses the valve position limiter decrease pushbutton and reduces generator load to less than 800WWe.***
	RO	(ρ) **IF** AFD is outside limits, **THEN INITIATE** boration to return AFD within limits. ***After the runback occurs, the SRO will enter Tech Spec LCO 3.2.3, Axial Flux Difference, Condition A, requiring power to be reduced to less than 50% RTP if AFD is not restored to within limits within 30 minutes. Boration will be in accordance with TI-7.012, approximately 262 gallons of boron.***

Op Test No.: NRC Scenario # 7 Event # 3

Event Description: After power is reduced to 80%, 1A-A MFP is shutdown. The Standby Main Feedwater pump trips upon start. Requires entry into AOI-16, "Loss of Normal Feedwater." Requires a Tech Spec Evaluation of Axial Flux Difference.

Time	Position	Applicant's Actions or Behavior
	RO	5. **MONITOR** reactor power controlled to match turbine power. ***RO must manually insert control rods since the AUTOMATIC rod control function is failed.***
	BOP	6. **ENSURE** adequate feed flow for existing conditions: • Feed flow greater than or equal to steam flow. • S/G levels returning to program. ***BOP determines that adequate feedwater flow exists by observing feedwater flow at or slightly above steam flow, and SG levels slowly rising.***
	SRO	7. **IF** reactor power dropped by greater than or equal to 15% in one hour, **THEN NOTIFY** Chemistry to initiate power change sampling requirements. ***SRO had contacted Chemistry for power change samples previously during the initial power reduction.***
	BOP	8. **IF** C-7 LOSS OF LOAD STM DUMP INTERLOCK annunciator LIT [66E], **THEN** a. **ENSURE** steam dump valves have zero demand. ***BOP observes 1-XI-1-33 STEAM DUMP DEMAND [1-M-4] is indication zero.*** b. **RESET** loss-of-load interlock with steam dump mode switch. ***BOP places 1-HS-1-103D STEAM DUMP MODE in the RESET position, then returns the handswitch to the TAVG position.***
	BOP	9. **CHECK** VALVE POS LIMIT LIGHT LIT. ***BOP observes VALVE POS LIMIT RED indicating light is LIT.***
	BOP	10. **(ρ) REDUCE** turbine load setpoint using REFERENCE CONTROL ▼ (lower) AND GO button until VALVE POS LIMIT LIGHT not LIT, **THEN SET** valve position limiter to 95%. ***Since the turbine controls are in IMP-IN mode, the BOP must first select IMP-OUT mode, then continue with steps to return the valve position limiter to normal.***
	SRO	11. **RETURN TO** Instruction in effect. ***When Work Control is contacted by the SRO, the Console Operator will repeat back request to prepare a package to tag the 1A MFP for repairs, and for a troubleshooting and repair package for the Standby Main Feedwater pump. If contacted as the Turbine Building AUO, repeat back request to determine cause of Standby Main Feedwater pump trip, repeat back request. Report that the Standby Main Feedwater pump tripped on instantaneous overcurrent.***

Op Test No.:	NRC	Scenario #	7	Event #	3	Page	12	of	27

Event Description: After power is reduced to 80%, 1A-A MFP is shutdown. The Standby Main Feedwater pump trips upon start. Requires entry into AOI-16, "Loss of Normal Feedwater." Requires a Tech Spec Evaluation of Axial Flux Difference.

Time	Position	Applicant's Actions or Behavior
	SRO	**Crew Brief** would typically be conducted for this event as time allows prior to the next event.
	SRO	**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).
Cue Console Operator to call as Chemistry to report high RCS activity, Event 4.		

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Event Description: High RCS activity is reported by the Chemistry Lab. Requires entry into AOI-28, "High Activity in Reactor Coolant." Requires a Tech Spec evaluation.

Time	Position	Applicant's Actions or Behavior
Indications: Chemistry Lab reports Dose Equivalent I-131 is at 17µci/g, and has been confirmed by a second sample. Isotopic Sampling is in progress.		
	SRO	Enters and directs the actions of AOI-28, "High Activity In Reactor Coolant."
AOI-28		**The following actions are taken from AOI-28, "High Activity In Reactor Coolant," Section 3.0.**
	BOP	1. **MONITOR** area radiation and recorder 1-RR-90-1 NORMAL.
	SRO	2. **ENSURE** Chemistry is performing Isotopic Analysis of the RCS. ***When Chemistry is contacted by the SRO, the Console Operator will acknowledge need to perform isotopic analysis. Report back that the sampling is in progress.***
	SRO	3. **NOTIFY** Reactor Engineering to implement TI-7.004, Fuel Integrity Assessment Program. ***When Reactor Engineering is contacted by the SRO, the Console Operator will acknowledge need to implement TI-7.004, Fuel Integrity Assessment Program.***
	SRO	4. **CHECK** analysis in Step 2. Confirm high RCS activity. ***Report from Chemistry stated that a confirmatory sample had been taken.***
	SRO	5. **REFER** to Tech Spec 3.4.16, RCS Specific Activity and monitor plant conditions for continued operation ***T/S 3.4.16 Condition A, With DOSE EQUIVALENT I-131 > 0.265 µCi/gm, verify Dose Equivalent I-131 is ≤ 21 µCi/gm once per 4 hours and restore DOSE EQUIVALENT I-131 to limit within 48 hours.***
	SRO	6. **REFER TO** EPIP-1 Emergency Plan Classification Flowchart. ***SRO contacts the Shift Manager to perform EPIP-1, Emergency Plan Classification Flowchart.***
NOTE Charging may need to be augmented prior to raising letdown flow.		
	RO	7. **PLACE** CVCS Mixed Bed demin in service at 120 gpm, 1-FI-62-82, LETDOWN FLOW [1-M-6], using SOI-62.01, "Charging and Letdown", or SOI-62.04, "CVCS Purification System".

Op Test No.:	NRC	Scenario #	7	Event #	4	Page	14 of 27

Event Description: High RCS activity is reported by the Chemistry Lab. Requires entry into AOI-28, "High Activity in Reactor Coolant." Requires a Tech Spec evaluation.

Time	Position	Applicant's Actions or Behavior

SOI-62.01

The following actions are taken from SOI-62.01, "CVCS-Charging and Letdown" Section 6.3, "Adjusting Letdown Flow.

WARNING

Increasing letdown flow may increase radiation levels along letdown flowpaths.

CAUTION

Flashing in the letdown line may occur if 1-PCV-62-81 is opened excessively.

NOTE

Maximum letdown flow is 120 gpm.

Time	Position	Applicant's Actions or Behavior
	SRO	[1] **NOTIFY** Radiation Protection of potential changes in radiological conditions due to adjusting letdown flow. ***When Radiation Protection is contacted by the SRO, the Console Operator will acknowledge need to perform surveys due to changes in letdown flow.***
	RO	[2] **PLACE** 1-HIC-62-81A, LETDOWN PRESS CNTL, in MANUAL and **ADJUST** to between 40% and 50% **OPEN** if using 75 gpm orifice (20-30% **OPEN** if using 45 gpm orifice). ***1-HIC-62-81A, LETDOWN PRESS CONTROL is placed in MANUAL by lifting the toggle switch from the "AUTO" position, the toggle is pushed to the right to open the valve to 40-50% (as read on the controller).***

NOTE

If letdown flow is to be raised, charging flow should first be raised by approximately the amount that letdown will be raised, to prevent high letdown temperature out of the regenerative heat exchanger and prevent bringing in annunciator 110-A, REGEN HX LTDN LINE TEMP HI.

Time	Position	Applicant's Actions or Behavior
	RO	[3] **IF** letdown is to be raised, **THEN**, **ADJUST** 1-HIC-62-89A, CHARGING HDR RCP SEALS FLOW CONTROL, and 1-HIC-62-93A, CHARGING FLOW PZR LEVEL CONTROL, to raise charging flow to prevent high letdown temperature out of the REGEN HX, and **MAINTAIN** between 8 and 13 gpm RCP Seal flow. ***1-HIC-62-93A, CHARGING FLOW PZR LEVEL CONTROL is opened to raise charging flow above 75 gpm while 1-HIC-62-89A, CHG HDR - RCP SEALS FLOW CONTROL is closed to maintain RCP seal flow between 8 and 13 gpm.***

CAUTION

When swapping letdown orifices, steps [4] and [5] must be performed concurrently to prevent flashing in the letdown line.

Op Test No.: NRC	Scenario # 7	Event # 4		Page 15 of 27

Event Description: High RCS activity is reported by the Chemistry Lab. Requires entry into AOI-28, "High Activity in Reactor Coolant." Requires a Tech Spec evaluation.

Time	Position	Applicant's Actions or Behavior
	SRO	[4] **CLOSE** Letdown Orifice(s) FCV(s) to be isolated (**N/A** orifices **NOT** selected): ***SRO determines that the step is not applicable, since an additional orifice is to be placed in service.***
	RO	[5] **WHEN** either of the following conditions exist: • Letdown pressure begins to reduce, **OR** • It is desired to place an additional letdown orifice in service, **THEN PLACE and HOLD** handswitch for Letdown Orifice(s) to be placed in service, to OPEN (**N/A** orifices **NOT** opened):

NOMENCLATURE	LOCATION	UNID	PERF INITIAL
LETDOWN ORIFICE A 45 GPM CIV-ØA	1-M-6	1-HS-62-72A	
LETDOWN ORIFICE B 75 GPM CIV-ØA	1-M-6	1-HS-62-73A	
LETDOWN ORIFICE C 75 GPM CIV-ØA	1-M-6	1-HS-62-74A	
LETDOWN ORIFICE 5 GPM CIV-ØA	1-M-6	1-HS-62-76A	

To achieve 120 gpm letdown flow, 1-HS-62-72A will be opened in combination with the 75 gpm orifice already in service.

Time	Position	Applicant's Actions or Behavior
	RO	[6] **ADJUST** 1-HIC-62-89A, CHARGING HDR RCP SEALS FLOW CONTROL, and 1-HIC-62-93A, CHARGING FLOW PZR LEVEL CONTROL, to control charging flow at the desired rate, and **MAINTAIN** between 8 and 13 gpm RCP Seal flow. ***1-HIC-62-93A, CHARGING FLOW PZR LEVEL CONTROL is opened to raise charging flow above 75 gpm while 1-HIC-62-89A, CHG HDR - RCP SEALS FLOW CONTROL is closed to maintain RCP seal flow between 8 and 13 gpm.***
	RO	[7] **ADJUST** 1-HIC-62-81A, LETDOWN PRESS CONTROL, to maintain between 320 and 350 psig. ***1-HIC-62-81A, LETDOWN PRESS CONTROL toggle switch is moved to the right to close the valve and raise pressure to 320 psig.***

NOTE

During periods of high river water temperature, river water temperature will limit the ability of TCV-70-192 to control letdown temperature at lower temperatures. Refer to P & L 3.0C.

Op Test No.: NRC	Scenario # 7	Event # 4			Page 16	of 27	

Event Description: High RCS activity is reported by the Chemistry Lab. Requires entry into AOI-28, "High Activity in Reactor Coolant." Requires a Tech Spec evaluation.

Time	Position	Applicant's Actions or Behavior
	RO	[8] **PLACE** 1-HIC-62-78A, LETDOWN HX OUTLET TEMP TCV-70-192 CNTL, in MANUAL, and **ADJUST** 1-HIC-62-78A to maintain less than 127°F **AND MAINTAIN** 1-TCV-70-192 less than full open. ***1-HIC-62-78A, LETDOWN HX OUTLET TEMP TCV-70-192 CNTL, is placed in MANUAL by lifting the toggle switch up to the MANUAL position.***
	RO	[9] **PLACE** the following valves in AUTO, if desired (**N/A** valve(s) **NOT** placed in AUTO): [9.1] 1-HIC-62-81A, LETDOWN PRESS CONTROL. ***1-HIC-62-81A is placed in AUTO by pushing the toggle switch down to the AUTO position.*** [9.2] 1-HIC-62-78A, LETDOWN HX OUTLET TEMP TCV-70-192 CNTL ***1-HIC-62-78A, LETDOWN HX OUTLET TEMP TCV-70-192 CNTL, is placed in AUTO by pushing the toggle switch down to the AUTO position.***
	RO	[10] **STABILIZE** Charging and Letdown.
	RO	[11] **WHEN** PZR level is in PROGRAM, **THEN ENSURE** level control in AUTO.
EXAMINER: The following actions are taken from AOI-28, "High Activity In Reactor Coolant," Section 3.0.		
	SRO	8. **CHECK** Chemistry has determined that the Cation Demin should be placed in service. ***When Chemistry is contacted by the SRO, the Console Operator will acknowledge need to determine if the cation demin is to be placed in service. Report back that the cation demin is not required at this time.***
	SRO	**8. RESPONSE NOT OBTAINED** **GO** to step 10.
	SRO	10. **REQUEST** Chemistry to monitor demin outlets to determine cleanup effectiveness. ***When Chemistry is contacted by the SRO, the Console Operator will acknowledge need to monitor demin outlets for cleanup effectiveness. Report back that sampling will begin.***
	SRO	11. **RETURN** to procedure in effect.
	SRO	**Crew Brief** would typically be conducted for this event as time allows prior to the next event.

Op Test No.:	NRC	Scenario #	7	Event #	4	Page	17 of 27

Event Description: High RCS activity is reported by the Chemistry Lab. Requires entry into AOI-28, "High Activity in Reactor Coolant." Requires a Tech Spec evaluation.

Time	Position	Applicant's Actions or Behavior
	SRO	**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).
Cue Console Operator to insert Event 5.		

Op Test No.:	NRC	Scenario #	7	Event #	5, 6	Page	18	of 27

Event Description: Loop 2 RCP shaft shears, causing low flow, then reverse flow in Loop 2. Automatic reactor trip fails to occur. Reactor Trip switch RT-1 (1-M-4) fails to cause a reactor trip. Requires reactor trip to be initiated from RT-2 (1-M-6). Requires entry into E-0, "Reactor Trip or Safety Injection." 1A-A 6.9 KV Shutdown Board trips on differential relay operation when the reactor trips.

Time	Position	Applicant's Actions or Behavior
Indications: 76-D, OVERTEMP ΔT 78-D, ONE LOOP FLOW LO 58-B, SG2 FEEDWATER FLOW HI 93-A, RCS LOOP ΔT DEVIATION 94-A, AUCT TAVG-TREF DEVIATION		
	RO	Diagnoses and announces loss of flow in Reactor Coolant Loop 2.
	RO	Determines that a reactor trip should have occurred, and initiates a trip using 1-RT-1, REACTOR TRIP on 1-M-4. When trip is unsuccessful, RO initiates a trip using 1-RT-2, REACTOR TRIP on 1-M-6. When second trip switch is operated, the reactor trips.
	RO	Performs Immediate Operator Actions of E-0, "Reactor Trip or Safety Injection."
	BOP	Performs Immediate Operator Actions of E-0, "Reactor Trip or Safety Injection."
	SRO	Enters and directs actions of E-0, "Reactor Trip or Safety Injection."

Op Test No.: NRC Scenario # 7 Event # 5, 6 Page 19 of 27

Event Description: Loop 2 RCP shaft shears, causing low flow, then reverse flow in Loop 2. Automatic reactor trip fails to occur. Reactor Trip switch RT-1 (1-M-4) fails to cause a reactor trip. Requires reactor trip to be initiated from RT-2 (1-M-6). Requires entry into E-0, "Reactor Trip or Safety Injection." 1A-A 6.9 KV Shutdown Board trips on differential relay operation when the reactor trips.

Time	Position	Applicant's Actions or Behavior

E-0 **The following actions are taken from E-0, "Reactor Trip or Safety Injection."**

NOTE

- Steps 1 thru 4 are **IMMEDIATE ACTION STEPS**
- Status Trees / SPDS should be monitored when transitioned to another instruction.

CRITICAL TASK 1

Manually trip the reactor from the control room prior to entry into FR-S.1, "Nuclear Power Generation/ATWS."

CRITICAL TASK 1	RO	1. **ENSURE** reactor trip: • Reactor trip and bypass breakers OPEN. **RESPONSE NOT OBTAINED:** Manually **TRIP** reactor. ***RO places 1-RT-1, REACTOR TRIP on 1-M-4 in the TRIP position and observes that the reactor trip breakers do NOT open.*** ***RO places 1-RT-2, REACTOR TRIP on 1-M-6 in the TRIP position and observes that the reactor trip breakers OPEN.***
		• Reactor trip and bypass breakers OPEN. ***RO checks 1-52RTB, RX TRIP BKR A RED indicating light LIT on panel 1-M-4.*** ***RO checks 1-52RTB, RC TRIP BKR B RED indicating light LIT on panel 1-M-4*** ***RO checks 1-52BYA, BYPASS BKR A lights DARK*** ***RO checks 1-52BYB, BYPASS BKR B lights dark*** • RPIs at bottom of scale. ***RO observes 1-MON 85 5000/1 CERPI Monitor 1 and 1-MON-85 5000/2 CERPI MONITOR 2 for indication that all SHUTDOWN and CONTROL bank rods are inserted.*** • Neutron flux DROPPING. ***RO observes neutron flux trending down on 1-NR-92-145, NEUTRON FLUX LEVEL REXCORDER. May also observe levels decreasing on 1-NI-92-135A, CH I NEUTRON MON % PWR, and 1-NI-92-136A, CH II NEUTRON MON % PWR.***
	RO	2. **ENSURE** Turbine Trip: • All turbine stop valves CLOSED. ***RO observes that indicating lights on 1-XX-47-1000 EHC CONTROL for individual throttle and governor valves are GREEN.***

Op Test No.: NRC Scenario # 7 Event # 5, 6 Page 20 of 27

Event Description: Loop 2 RCP shaft shears, causing low flow, then reverse flow in Loop 2. Automatic reactor trip fails to occur. Reactor Trip switch RT-1 (1-M-4) fails to cause a reactor trip. Requires reactor trip to be initiated from RT-2 (1-M-6). Requires entry into E-0, "Reactor Trip or Safety Injection." 1A-A 6.9 KV Shutdown Board trips on differential relay operation when the reactor trips.

Time	Position	Applicant's Actions or Behavior
		EXAMINER: At the time of the trip, the 1A-A 6.9 KV Shutdown Board trips on differential relay operation.
	RO	3. **CHECK** 6.9 kV shutdown boards: a. At least one board energized from: CSST (offsite), OR D/G (blackout). ***When observed by the RO during IMMEDIATE OPERATOR ACTIONS, 1-EI-57-66, 6.9 SDB 1B-B VOLTS, indicates approximately 7000 volts. 1-EI-57-39, 6.9 SDB 1A-A VOLTS indicates approximately 0 volts.*** ***When contacted as the Control Building AUO, the Console Operator repeats back request and reports that the 1A-A 6.9 KV Shutdown board tripped on differential relay operation. There is damage to the board, but no fire.***
	RO	4. CHECK SI actuated: a. Any SI annunciator LIT. b. Both trains SI ACTUATED. • 1-XX-55-6C • 1-XX-55-6D
		4.RESPONSE NOT OBTAINED **DETERMINE** if SI required: a. **IF** ANY of the following exists: • S/G press less than 675 psig, **OR** • RCS press less than 1870 psig, **OR** • Cntmt press greater than 1.5 psig **THEN ACTUATE** SI manually. **IF** SI **NOT** required, **THEN ** GO TO** ES-0.1, Reactor Trip Response. ***Since the PZR Safety valve opens 30 seconds after the reactor trip, the discovery of the need to initiate a safety injection may occur during the performance of this RNO.***

Op Test No.:	NRC	Scenario #	7	Event #	7, 8	Page	21 of 27

Event Description: Pressurizer safety valve fails partially open 30 seconds after the reactor trip. Requires transition to E-1, "Loss of Reactor or Secondary Coolant," and transition to ES-1.2, "Post-LOCA Cooldown and Depressurization." 1B-B Safety Injection pump fails to automatically start on the safety injection signal. Requires manual start by BOP.

Time		Applicant's Actions or Behavior

EXAMINER: E-0, "Reactor Trip or Safety Injection," Appendixes A and B are included as Attachment 1.

CRITICAL TASK 2

Manually start at least one intermediate-head ECCS pump (Safety Injection Pump) before transition out of E-0, "Reactor Trip or Safety Injection."

CRITICAL TASK 2	BOP	5. **PERFORM** Appendixes A and B, E-0, pages 16-30. ***Handout for E-0 contains copy for EXAMINER assigned to BOP.*** ***During performance of Appendix A, the BOP will discover the failure of the 1B Safety Injection pump to automatically start. The BOP will start the 1B-B SI pump during the performance of Appendix A, Step 4.d.***
	SRO	6. **ANNOUNCE** reactor trip and safety injection over PA system.
	RO	7. **ENSURE** secondary heat sink available with either: • Total AFW flow greater than 410 gpm, ***BOP observes that AFW flow is greater than 410 gpm, and reports that the 1B-B MD AFW and the TD AFW Pumps are running and that the 1A-A AFW pump has no power.*** OR • At least one S/G NR level greater than 29% [39% ADV].
	RO	8. **MONITOR** RCS temperature stable at or trending to 557°F using: • RCS Loop T-avg with any RCP running, **OR** • RCS Loop T-cold with RCPs out-of-service.
	RO	8. **RESPONSE NOT OBTAINED:** **IF** temp less than 557°F, **THEN ENSURE** steam dumps and S/G PORVs CLOSED. **IF** cooldown continues, **THEN CONTROL** total AFW flow to maintain greater than 410 gpm UNTIL NR level in at least one S/G greater than 29% [39% ADV]. **IF** cooldown continues after AFW flow is controlled, **THEN** • **PLACE** steam dump controls OFF. • **CLOSE** MSIVs. • **ENSURE** MSIV bypasses CLOSED. **IF** RCS temp greater than 564°F, **THEN ENSURE** either steam dumps or S/G PORVs OPEN.

Op Test No.:	NRC	Scenario #	7	Event #	7, 8	Page	22	of	27

Event Description: Pressurizer safety valve fails partially open 30 seconds after the reactor trip. Requires transition to E-1, "Loss of Reactor or Secondary Coolant," and transition to ES-1.2, "Post-LOCA Cooldown and Depressurization." 1B-B Safety Injection pump fails to automatically start on the safety injection signal. Requires manual start by BOP.

Time		Applicant's Actions or Behavior
	RO	9. **ENSURE** excess letdown valves CLOSED • 1-FCV-62-54 • 1-FCV-62-55
	RO	10. **CHECK** pzr PORVs and block valves: a. Pzr PORVs CLOSED. ***RO observes 1-HS-68-340AA, PZR PORV 340A, GREEN indicating light is LIT, RED indicating light is DARK.*** ***RO observes 1-HS-68-334A, PZR PORV 334, GREEN indicating light is LIT, RED indicating light is DARK.*** b. At least one block valve OPEN. ***RO observes 1-HS-68-333A, BLOCK VLV FOR PORV 340A, GREEN indicating light is DARK, RED indicating light is LIT.*** ***RO observes 1-HS-68-332A, BLOCK VLV FOR PORV 334, GREEN indicating light is DARK, RED indicating light is LIT.***
	RO	11. **CHECK** pzr safety valves CLOSED: • **EVALUATE** tailpipe temperatures and acoustic monitors. ***RO observes response of 1-TI-68-330, SAFETY 68-563 TAILPIPE TEMP, 1-TI-68-329, SAFETY 68-564 TAILPIPE TEMP, and 1-TI-68-328, SAFETY 68-565, rising with 68-564 at the highest temperature.*** ***BOP may observe 1-XI-68-363, PZR VALVES ACOUSTIC MONITOR indicating lights are LIT for 1-XI-68-363 (68-563), 1-XI-68-364 (68-564) and 1-XI-68-365 (68-565).***
	SRO	11. **RESPONSE NOT OBTAINED:** **IF** RCS pressure less than 2485 psig, **AND** Pzr safety valve open, **THEN GO TO** E-1, Loss of Reactor or Secondary Coolant.

Op Test No.: NRC	Scenario # 7	Event # 7, 8

Event Description: Pressurizer safety valve fails partially open 30 seconds after the reactor trip. Requires transition to E-1, "Loss of Reactor or Secondary Coolant," and transition to ES-1.2, "Post-LOCA Cooldown and Depressurization." 1B-B Safety Injection pump fails to automatically start on the safety injection signal. Requires manual start by BOP.

Time		Applicant's Actions or Behavior
E-1		**The following actions are taken from E-1, "Loss of Reactor or Secondary Coolant."**
		NOTE Seal injection flow should be maintained to all RCPs.
	RO	1. **CHECK** if RCPs should remain in service: a. Phase B DARK [MISSP]. b. RCS pressure greater than 1500 psig.
	RO	1. **RESPONSE NOT OBTAINED:** b. **ENSURE** at least one Charging pump or SI pump injecting. **WHEN** injection flow established, **THEN STOP** all RCPs. ***RO stops the RCPs after confirming that the 1B-B SI pump is running.***
	SRO	2. **REFER TO** EPIP-1, Emergency Plan Classification Flowchart.
		NOTE Time since initiation of event is defined by performance of Step 3.
	SRO	3. **RECORD** current time to mark initiation of LOCA and determination of time for hot leg recirc.
	RO	4. **CHECK** S/G pressures: • All S/G pressures controlled or rising. ***RO observes PAM pressure instruments on SG 1 through 4 (black labels) and determines that pressures are controlled. May also observe trends on 1-PR-1-2, SG 1 & 2 PRESS PSIG, and 1-PR-1-23, SG 3 & 4 PRESS PSIG to assess this step.*** • All S/G pressures greater than 120 psig. ***RO observes PAM pressure instruments on SG 1 through 4 (black labels) and determines that pressures are greater than 120 psig.***
	RO	5. **MAINTAIN** Intact S/G NR levels: a. **MONITOR** levels greater than 29% [39% ADV]. ***RO informs the SRO that S/G narrow range levels are controlled after observing PAM narrow range level instruments (black labels).*** b. **CONTROL** intact S/G levels between 29% and 50% [39% and 50% ADV]. ***RO acknowledges the need to control SG levels between 39 and 50 %.***

Op Test No.:	NRC	Scenario #	7	Event #	7, 8	Page	24	of 27

Event Description: Pressurizer safety valve fails partially open 30 seconds after the reactor trip. Requires transition to E-1, "Loss of Reactor or Secondary Coolant," and transition to ES-1.2, "Post-LOCA Cooldown and Depressurization." 1B-B Safety Injection pump fails to automatically start on the safety injection signal. Requires manual start by BOP.

Time		Applicant's Actions or Behavior
EXAMINER: The status of secondary radiation may have already been reported as normal by the BOP during performance of E-0 Appendix A.		
	BOP	6. **CHECK** secondary radiation: • S/G discharge monitors NORMAL. • Condenser vacuum exhaust rad monitors NORMAL. • S/G blowdown rad monitor recorders NORMAL trend prior to isolation. ***BOP reports secondary radiation was normal prior to isolation.***
	BOP	7. **ENSURE** cntmt hydrogen analyzers in service: • **PLACE** 1-HS-43-200A in ANALYZE [M-10]. ***BOP places 1-HS-43-200A, H2 ANALYZER A FAN to the ANALYZE position on panel 1-M-10.*** • **PLACE** 1-HS-43-210A in ANALYZE [M-10]. ***BOP places 1-HS-43-200A, H2 ANALYZER A FAN to the ANALYZE position on panel 1-M-10.*** • **CHECK** low flow lights **NOT** lit [M-10]. ***BOP checks 1-XI-43-200, LO FLOW - ANAL A, WHITE indicating light is DARK.*** ***BOP checks 1-XI-43-210, LO FLOW - ANAL B, WHITE indicating light is DARK.*** • **LOCALLY CHECK** low analyzer temp lights **NOT** lit **AND RESET** local alarm panel. [North wall of Train A 480V SD Bd rm]. ***When contacted as the Control Building AUO the Console Operator repeat back request to check low analyzer temp lights, and reports that the lights are NOT LIT.***
	RO	8. **MONITOR** pzr PORVs and block valves: a. Pzr PORVs CLOSED. ***RO observes handswitch 1-HS-68-340AA, PZR PORV 340A GREEN light is LIT and 1-HS-68-334A, PZR PORV 334 GREEN light is LIT.*** b. At least one block valve OPEN. ***RO observes handswitch 1-HS-68-333A, BLOCK VLV FOR PORV 340A RED indicating light is LIT.***
	RO	9. **DETERMINE** if cntmt spray should be stopped: a. **MONITOR** cntmt pressure less than 2.0 psig.

Event Description: Pressurizer safety valve fails partially open 30 seconds after the reactor trip. Requires transition to E-1, "Loss of Reactor or Secondary Coolant," and transition to ES-1.2, "Post-LOCA Cooldown and Depressurization." 1B-B Safety Injection pump fails to automatically start on the safety injection signal. Requires manual start by BOP.

Time		Applicant's Actions or Behavior
	RO	9. **RESPONSE NOT OBTAINED:** a. **WHEN** cntmt pressure is less than 2.0 psig, **THEN PERFORM** Substeps 9b thru e.
EXAMINER: Step 9 actions are provided here, since the conditions of the steps may be satisfied at any point.		
	RO	b. **CHECK** at least one cntmt spray pump RUNNING. c. **RESET** cntmt spray signal. d. **STOP** cntmt spray pumps, **AND PLACE** in A-AUTO. e. **CLOSE** cntmt spray discharge valves 1-FCV-72-2 and 1-FCV-72-39.
	BOP	10. **ENSURE** both pocket sump pumps STOPPED [M-15]: • 1-HS-77-410. • 1-HS-77-411. ***BOP observes handswitch 1-HS-77-410, POCKET SUMP PMP A GREEN indicating light is LIT, and 1-HS-77-411, POCKET SUMP PMP B GREEN indicating light is LIT.***
	RO	11. **CHECK** SI termination criteria: a. **CHECK** RCS subcooling greater than 65°F [85°F ADV].
	SRO	11. **RESPONSE NOT OBTAINED:** a. ** **GO TO** Caution prior to Step 12.
CAUTION **If offsite power is lost after SI reset, manual action will be required to restart the SI pumps and RHR pumps due to loss of SI start signal.**		
	RO	12. **RESET** SI and **CHECK** the following: ***RO resets SI signal by depressing 1-HS-63-134A, SI RESET TR A and 1-HS-63-134B one at a time.*** • SI ACTUATED permissive DARK. ***RO observes and reports that Window 70-A, SI ACTUATED is DARK.*** • AUTO SI BLOCKED permissive LIT. ***RO observes and reports that Window 70-B, AUTO SI BLOCKED is DARK.***
	RO	13. **DETERMINE** if RHR pumps should be stopped: a. **CHECK** RCS pressure greater than 150 psig. b. **CHECK** RHR suction aligned from RWST. c. **CHECK** RCS pressure stable or rising.

Op Test No.:	NRC	Scenario #	7	Event #	7, 8	Page	26	of 27

Event Description: Pressurizer safety valve fails partially open 30 seconds after the reactor trip. Requires transition to E-1, "Loss of Reactor or Secondary Coolant," and transition to ES-1.2, "Post-LOCA Cooldown and Depressurization." 1B-B Safety Injection pump fails to automatically start on the safety injection signal. Requires manual start by BOP.

Time		Applicant's Actions or Behavior
	BOP	13. **RESPONSE NOT OBTAINED:** c. **ENSURE** CCS from RHR heat exchanger 1-FCV-70-153 and 1-FCV-70-156 OPEN. **CLOSE** SFP heat exchanger A CCS supply 0-FCV-70-197. **GO TO** Step 14.
	RO	14. **CHECK** pressure in all S/Gs controlled or rising. ***RO observes PAM pressure instruments on SG 1 through 4 (black labels) and determines that pressures are controlled. May also observe trends on 1-PR-1-2, SG 1 & 2 PRESS PSIG, and 1-PR-1-23, SG 3 & 4 PRESS PSIG to assess this step.***
	RO	15. **CHECK** RCS pressure stable or dropping. ***RO observes RCS pressure on 1-XI-68-100, RVLIS - ICCM PLASMA DISPLAY and/or 1-XI-68-110, RVLIS - ICCM PLASMA DISPLAY and determines that pressure is dropping.***
	BOP	16. **MONITOR** electrical board status: a. **CHECK** offsite power available. b. **CHECK** all shutdown boards ENERGIZED by offsite power.
EXAMINER: SOI-43.01, "Loss of Unit 1 Train A Shutdown Boards," is contained as Attachment 2.		
		RESPONSE NOT OBTAINED b. **ENERGIZE** shutdown boards USING: • SOI-211 Shutdown Boards **OR** • AOI-43 Loss of Shutdown Boards ***SRO assigns SOI-43.01, "Loss of Unit 1 Train A Shutdown Boards," to the BOP for performance on a "not to interfere basis."*** **OR** • SOI-82 Diesel Generators
		c. **PLACE** any unloaded D/G in standby USING SOI-82 Diesel Generators.
EXAMINER: AOI-17, "Turbine Trip," Section 3.3, "BOP Realignment" is contained as Attachment 4.		
	BOP	17. **INITIATE** BOP realignment: • **REFER TO** AOI-17, Turbine Trip. ***SRO assigns AOI-17, "Turbine Trip" to the BOP for performance on a "not to interfere basis."***

Op Test No.: NRC	Scenario # 7	Event # 7, 8	Page 27 of 27	

Event Description: Pressurizer safety valve fails partially open 30 seconds after the reactor trip. Requires transition to E-1, "Loss of Reactor or Secondary Coolant," and transition to ES-1.2, "Post-LOCA Cooldown and Depressurization." 1B-B Safety Injection pump fails to automatically start on the safety injection signal. Requires manual start by BOP.

Time		Applicant's Actions or Behavior
EXAMINER: E-1, "Loss of Reactor or Secondary Coolant," Appendixes are contained as Attachment 4.		
	BOP	18. **INITIATE** 480V board room breaker alignments USING the following: • Appendix A (E-1), CLA Breaker Operation. • Appendix B (E-1), 1-FCV-63-1 Breaker Operation. • Appendix C (E-1), 1-FCV-63-22 Breaker Operation. ***When contacted as the Control Building AUO, the Console Operator will repeat back the request, and then report that Appendix A through C have been performed. Console Operator enters remote functions sir01, sir14 and sir06 to perform actions.***
	RO	19. **ENSURE** RHR available for cntmt sump recirculation: • Power to at least one operable RHR pump AVAILABLE. • Cntmt sump valve 1-FCV-63-72 or 1-FCV-63-73 to operable RHR pump AVAILABLE
	BOP	20. **EVALUATE** plant equipment status: • **REFER TO** Appendix D (E-1), Equipment Evaluation.
	BOP	21. **CHECK** Aux Bldg radiation for loss of RCS inventory outside cntmt: a. Area monitor recorders 1-RR-90-1 and 0-RR-90-12A Aux Bldg points NORMAL. b. Vent monitor recorder 0-RR-90-101 NORMAL trend prior to isolation.
	SRO	22. **NOTIFY** Chemistry of event status and plant conditions.
	RO	23. **DETERMINE** if RCS cooldown and depressurization is required: a. **CHECK** RCS pressure greater than 150 psig. b. **GO TO** ES-1.2, Post LOCA Cooldown and Depressurization.
EXAMINER: When the transition to ES-1.2 "Post LOCA Cooldown and Depressurization" is made, state that "another crew will continue from this point."		
END OF SCENARIO		

SHIFT TURNOVER CHECKLIST

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SHIFT TURNOVER CHECKLIST

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- ☐ SM
- ☒ US/MCR Unit 1
- ☐ UO Unit ____
- ☐ AUO Station ____
- ☐ STA (STA Function) ____

Off-going - Name

On-coming - Name

Part 1 - Completed by off-going shift / Reviewed by on-coming shift: RCS Cb = 1030 ppm

- Abnormal equipment lineup / conditions:

  1B-B CCP is out-of-service for motor winding inspection and repairs. LCO 3.5.2 and TR3.1.4 were entered 3 hours ago. Expected time for repairs is 16 hours. 1A MFP has an oil system problem and is to be removed from service as soon as possible. The Standby Main Feedwater Pump is in service.

- SI/Test in progress/planned: (including need for conduct of evolution briefings)

- Major Activities/Procedures in progress/planned:

  Load reduction to 78% to clear the runback signals at 4%/minute is to be conducted, using AOI-39,"Rapid Load Reduction." Current power is 100%. Control Bank D rods are at 220 steps.

-
- Radiological changes in plant during shift:

Part 2 - Completed by on-coming shift prior to assuming duties

- ☐ Review station rounds / Abnormal reading (AUOs only)
- ☐ Review Narrative Logs (previous day and carry-over items)
- ☐ Current qualification status
- ☐ Review the current controlling Reactivity Management Plans (N/A for AUOs)
- ☐ Review current TS/TRM/ODCM/FPR Required Actions (N/A for AUOs)
- ☐ Walkdown MCR Control Boards with off-going Operator (N/A for AUOs, as applicable for SM/STAs)
- ☐ SR/PER reviews complete for previous shift (SM/US/STA)

Relief Time: ____________ Relief Date: ____________

Part 3 - Completed by on-coming shift. These items may be reviewed after assuming duties:

- ☐ Review Operator Workarounds, Burdens and Challenges (applicable Unit/Station)
- ☐ Review applicable ODMI actions (first shift of shift week)
- ☐ Review changes in Standing / Shift Orders (since last shift worked)
- ☐ Review changes to TACFs issued (since last shift worked) (N/A for AUOs)
- ☐ Review Control Room Deficiencies (first shift of shift week) (N/A for AUOs)
- ☐ Review Component Deviation Log (N/A for AUOs)

SHIFT TURNOVER CHECKLIST

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SHIFT TURNOVER CHECKLIST

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☐ SM
☐ US/MCR Unit 1
☒ UO Unit ______ ______________ Off-going - Name
☐ AUO Station
☐ STA (STA Function) ______________ On-coming - Name

Part 1 - Completed by off-going shift / Reviewed by on-coming shift: RCS Cb = 1030 ppm

- Abnormal equipment lineup / conditions:
  1B-B CCP is out-of-service for motor winding inspection and repairs. LCO 3.5.2 and TR3.1.4 were entered 3 hours ago. Expected time for repairs is 16 hours. 1A MFP has an oil system problem and is to be removed from service as soon as possible. The Standby Main Feedwater Pump is in service.
- SI/Test in progress/planned: (including need for conduct of evolution briefings)
- Major Activities/Procedures in progress/planned:
  Load reduction to 78% to clear the runback signals at 4%/minute is to be conducted, using AOI-39,"Rapid Load Reduction." Current power is 100%. Control Bank D rods are at 220 steps.
-
- Radiological changes in plant during shift:

Part 2 - Completed by on-coming shift prior to assuming duties

☐ Review station rounds / Abnormal reading (AUOs only)
☐ Review Narrative Logs (previous day and carry-over items)
☐ Current qualification status
☐ Review the current controlling Reactivity Management Plans (N/A for AUOs)
☐ Review current TS/TRM/ODCM/FPR Required Actions (N/A for AUOs)
☐ Walkdown MCR Control Boards with off-going Operator (N/A for AUOs, as applicable for SM/STAs)
☐ SR/PER reviews complete for previous shift (SM/US/STA)

Relief Time: ______________ Relief Date: ______________

Part 3 - Completed by on-coming shift. These items may be reviewed after assuming duties:

☐ Review Operator Workarounds, Burdens and Challenges (applicable Unit/Station)
☐ Review applicable ODMI actions (first shift of shift week)
☐ Review changes in Standing / Shift Orders (since last shift worked)
☐ Review changes to TACFs issued (since last shift worked) (N/A for AUOs)
☐ Review Control Room Deficiencies (first shift of shift week) (N/A for AUOs)
☐ Review Component Deviation Log (N/A for AUOs)

Scenario 7
Attachment 1

E-0, “Reactor Trip or Safety Injection”

Appendix A and B
Attachments 1 through 5

Appendix A
(Page 1 of 9)

Equipment Verification

Step	Action/Expected Response	Response Not Obtained
1.	**ENSURE** PCBs OPEN: • PCB 5084. • PCB 5088.	**OPEN** manually.
2.	**ENSURE** AFW pump operation: • Both MD AFW pumps RUNNING. • TD AFW pump RUNNING. • LCVs in AUTO, OR controlled in MANUAL.	**ESTABLISH** at least one train AFW operation.
3.	**ENSURE** MFW isolation: • MFW isolation and bypass isolation valves CLOSED. • MFW reg and bypass reg valves CLOSED. • MFP A and B TRIPPED. • Standby MFP STOPPED. • Cond demin pumps TRIPPED. • Cond booster pumps TRIPPED.	Manually **CLOSE** valves **AND** **STOP** pumps, as necessary. **IF** any valves can **NOT** be closed, **THEN** **CLOSE** #1 heater outlet valves.

Appendix A
(Page 2 of 9)

Equipment Verification

Step	Action/Expected Response	Response Not Obtained
4.	**MONITOR** ECCS operation:	
	a. Charging pumps RUNNING.	a. Manually **START** charging pumps.
	b. Charging pump alignment: • RWST outlets 1-LCV-62-135 and 1-LCV-62-136 OPEN. • VCT outlets 1-LCV-62-132 and 1-LCV-62-133 CLOSED. • Charging 1-FCV-62-90 and 1-FCV-62-91 CLOSED.	b. **ENSURE** at least one valve in each set aligned.
	c. RHR pumps RUNNING.	c. Manually **START** RHR pumps.
	d. SI pumps RUNNING.	d. Manually **START** SI pumps.
	e. BIT alignment: • Outlets 1-FCV-63-25 and 1-FCV-63-26 OPEN. • Flow thru BIT.	e. **ENSURE** at least one valve aligned, and flow thru BIT.
	f. RCS pressure greater than 1650 psig.	f. **ENSURE** SI pump flow. **IF** RCS press drops to less than 150 psig, **THEN** **ENSURE** RHR pump flow.

Appendix A
(Page 3 of 9)
Equipment Verification

Step	Action/Expected Response	Response Not Obtained
5.	**CHECK** cntmt isolation: a. Phase A isolation: • Train A GREEN. • Train B GREEN. b. Cntmt vent isolation: • Train A GREEN. • Train B GREEN.	**ACTUATE** Phase A and Cntmt Vent Isolation signal, **OR** Manually **CLOSE** valves and dampers as necessary.

Appendix A
(Page 4 of 9)

Equipment Verification

Step	Action/Expected Response	Response Not Obtained
6.	**CHECK** cntmt pressure: • Phase B DARK [MISSP]. • Cntmt Spray DARK [MISSP]. • Cntmt press less than 2.8 psig.	**PERFORM** the following: 1) **ENSURE** Phase B actuated. 2) **ENSURE** Cntmt Spray actuated. 3) **ENSURE** cntmt spray pumps running. 4) **ENSURE** cntmt spray flow. 5) **ENSURE** Phase B isolation: • Train A GREEN. • Train B GREEN • Manually **CLOSE** valves and dampers as necessary. 6) **STOP** all RCPs. 7) **ENSURE** MSIVs and bypasses CLOSED. 8) **PLACE** steam dump controls OFF. 9) **WHEN** 10 minutes has elapsed since Phase B actuated, **THEN** **ENSURE** air return fans start. 10) **USE** adverse cntmt [ADV] setpoints where provided.
7.	**DISPATCH** AUO to perform Attachment 1 (E-0), Ice Condenser AHU Breaker Operation.	

Appendix A
(Page 5 of 9)

Equipment Verification

Step	Action/Expected Response	Response Not Obtained
8.	**CHECK** plant radiation NORMAL: • S/G blowdown rad recorder 1-RR-90-120 NORMAL prior to isolation [M-12]. • Condenser vacuum exhaust rad recorder 1-RR-90-119 NORMAL prior to trip [M-12]. • 1-RR-90-106 and 1-RR-90-112 radiation recorders NORMAL prior to isolation [M-12]. • S/G main steamline discharge monitors NORMAL [M-30]. • Upper and Lower containment high range monitors NORMAL [M-30]. • **NOTIFY** Unit Supervisor conditions NORMAL.	**NOTIFY** Unit Supervisor IMMEDIATELY.
9.	**ENSURE** all D/Gs RUNNING.	**EMERGENCY START** D/Gs
10.	**ENSURE** ABGTS operation:	
	a. ABGTS fans RUNNING.	a. Manually **START** fans.
	b. ABGTS dampers OPEN: • FCO-30-146A. • FCO-30-146B. • FCO-30-157A. • FCO-30-157B.	b. Locally **OPEN** dampers.

Appendix A
(Page 6 of 9)

Equipment Verification

Step	Action/Expected Response	Response Not Obtained
11.	**ENSURE** at least four ERCW pumps RUNNING, one on each shutdown board preferred.	Manually **START** pumps as necessary.
12.	**ENSURE** ERCW supply valves OPEN to running D/Gs.	**IF** ERCW can **NOT** be aligned to running D/G, **THEN** **EMERGENCY STOP** affected D/G.
13.	**ENSURE** 0-FCV-67-152, CCS HX C ALT DISCH TO HDR B, is open to position A.	Manually **OPEN** 0-FCV-67-152 to position A.
14.	**CLOSE** 0-FCV-67-144, CCS HX C DISCH TO HDR A.	
15.	**MONITOR** EGTS operation: • EGTS fans RUNNING. • **ENSURE** dampers OPEN - **VERIFY** filter bank dp between 5 and 9 inches of water.	Manually **START** fans **AND** **OPEN** dampers.
16.	**ENSURE** CCS pumps RUNNING: • 1A-A CCS pump. • 1B-B CCS pump. • C-S or 2B-B CCS pump.	Manually **START** pumps as necessary.
17.	**DISPATCH** AUO to shutdown Upper and Lower CNTMT rad monitors USING SOI-90.02.Gaseous Process Radiation Monitors	

Appendix A
(Page 7 of 9)

Equipment Verification

Step	Action/Expected Response	Response Not Obtained
18.	**WHEN** Attachment 1 is complete (Ice Condenser AHU Breakers OPEN), **THEN** **ENERGIZE** hydrogen igniters [1-M-10]: • 1-HS-268-73 ON. • 1-HS-268-74 ON.	

NOTE The following equipment is located on 1-M-9.

Step	Action/Expected Response	Response Not Obtained
19.	**CHECK** CNTMT PURGE fans STOPPED.	**STOP** fans **AND** **PLACE** handswitch in PULL-TO-LOCK.
20.	**CHECK** FUEL HANDLING EXH fans STOPPED, Fuel and Cask loading dampers CLOSED:	**STOP** fans **AND** **PLACE** handswitch in PULL-TO-LOCK, **THEN** Manually **CLOSE** dampers.
21.	**ENSURE** AB GEN SUPPLY and EXH fans STOPPED.	**STOP** fans **AND** **PLACE** handswitch in PULL-TO-LOCK.

NOTE Dampers 1-HS-30-158 and 2-HS-30-270 remain open during ABI.

Step	Action/Expected Response	Response Not Obtained
22.	**ENSURE** AB GEN SUP & EXH dampers CLOSED.	Manually **CLOSE** dampers.

Appendix A
(Page 8 of 9)

Equipment Verification

Step	Action/Expected Response	Response Not Obtained
23.	**ENSURE** MCR & SPREAD RM FRESH AIR dampers CLOSED: • FCV-31-3. • FCV-31-4.	Manually **CLOSE** dampers.
24.	**ENSURE** at least one CB EMER CLEANUP fan RUNNING and associated damper OPEN:	
	• CB EMERG CLEANUP FAN A-A, **OR** • Fan B-B RUNNING..	Manually **START** fan.
	• FCO-31-8, OPEN. **OR** • FCO-31-7, OPEN	**NOTIFY** TSC if at least one damper **NOT** OPEN.
25.	**ENSURE** at least one CB EMER PRESS fan RUNNING and associated damper OPEN:	
	• CB EMERG PRESS FAN A-A, **OR** FAN B-B RUNNING.	Manually **START** fan.
	• FCO-31-6, OPEN. **OR** • FCO-31-5, OPEN.	**NOTIFY** TSC if at least one damper NOT OPEN.

Appendix A
(Page 9 of 9)

Equipment Verification

Step	Action/Expected Response	Response Not Obtained
26.	**ENSURE** Control Building fans STOPPED and dampers CLOSED:	
	• SPREADING ROOM SUPPLY and EXH FANS AND dampers. • TOILET & LKR RM EXHAUST FAN AND dampers.	Manually **STOP** fans **AND** **NOTIFY** TSC if any damper **NOT** CLOSED.
27.	**INITIATE** Appendix B (E-0), Phase B Pipe Break Contingencies.	

Appendix B
(Page 1 of 1)

Phase B Pipe Break Contingencies

Step	Action/Expected Response	Response Not Obtained
1.	**CHECK** PHASE B actuated. [MISSP - 1-XX-55-6C, -6D]	**WHEN** PHASE B actuation occurs, **THEN** **GO TO** step 2.
2.	**ENSURE** 1-FCV-32-110 CLOSED. [CISP - 1-XX-55-6E] (A-train, window 13)	**DISPATCH** AUO to perform Attachment 2 (E-0).
3.	**ENSURE** 1-FCV-67-107 CLOSED. [CISP - 1-XX-55-6E] (A -train, window 43)	**DISPATCH** AUO to perform Attachment 3 (E-0).
4.	**ENSURE** 1-FCV-70-92 CLOSED. [CISP - 1-XX-55-6E] (A -train, window 73)	**DISPATCH** AUO to perform Attachment 4 (E-0).
5.	**ENSURE** 1-FCV-70-140 CLOSED. [CISP - 1-XX-55-6F] (B -train, window 74)	**DISPATCH** AUO to perform Attachment 5 (E-0).

Attachment 1
(Page 1 of 1)

Ice Condenser AHU Breaker Operation

OPEN the following to remove power from ice condenser air handling units AND **REPORT** completion to UO:

BOARD	COMPT	NOMENCLATURE
480 V Reactor Vent Board 1A-A	13D	1-BKR-232-A000/13D ICE COND 1-AHU-61-1/4/8/12/16/20/24/28
480 V Reactor Vent Board 1A-A	14D	1-BKR-232-A000/14D ICE COND 1-AHU-61-3/7/11/15/19/23/27
480 V Reactor Vent Board 1B-B	13D	1-BKR-232-B000/13D ICE COND 1-AHU-61-2/6/10/14/18/22/26/30
480 V Reactor Vent Board 1B-B	14D	1-BKR-232-B000/14D ICE COND 1-AHU-61-5/9/13/17/21/25/29

Attachment 2
(Page 1 of 1)

Control Air Isolation

A. **CLOSE** 0-ISV-32-1013 - CONTROL AIR EL 713 AB HDR ISOL [A6/S EL. 713] (chain operated - behind Fuel and Waste Handling Bd. A).

B. **IF** 0-ISV-32-1013 CANNOT BE CLOSED,
THEN

OPEN and **DISCONNECT** C&SS air compressor breakers:

1. 0-BKR-32-25 [480V SD BD 1A2-A, C/3D]
2. 0-BKR-32-26 [480V SD BD 1B1-B, C/3D]
3. 0-BKR-32-27 [480V AUX BLDG COM BD, C/6C]
4. 0-BKR-32-4900A [480V TURB BLDG COM BD, C/6C]

Attachment 3
(Page 1 of 1)

ERCW Isolation

UNLOCK AND CLOSE 1-ISV-67-523B, LOWER CNTMT VENT CLR 1B &1D ERCW SUP ISOL [A2U/692] (U-1 penetration room - North of AB Pipe Chase Cooler 1B-B in overhead)

Attachment 4
(Page 1 of 1)
CCS Return Isolation

CLOSE 1-ISV-70-700, RCP OIL COOLER CCS RETURN ISOLATION [A4/V EL. 710 U-1 Penetration Room] (approximately 10 ft. North of Penetration Room Cooler 1B-B on mezzanine above RHR Sump Valve Room)

Attachment 5
(Page 1 of 1)

CCS Supply Isolation

CLOSE 1-ISV-70-516, REACTOR BUILDING CCS SUPPLY ISOLATION [A6/T EL. 737] (Behind Elevator approximately 2 ft. west on mezzanine above “A” CCS Heat Exchanger)

Scenario 7
Attachment 2

AOI-43.01, “Loss of Unit 1 Train A Shutdown Boards.”

Section 3.1, “Initial Actions.”

Section 3.4, “Compensatory Actions for Loss of 6.9kVSD BD 1A-A.”

Watts Bar Nuclear Plant

Unit 1

Abnormal Operating Instruction

AOI-43.01

Loss of Unit 1 Train A Shutdown Boards

Revision 0009

Quality Related

Level of Use: Continuous Use

Effective Date: 01-24-2011

Responsible Organization: OPS, Operations

Prepared By: Nicholas Armour

Approved By: Brian McIlnay

Revision Log

Revision or Change Number	Effective Date	Affected Page Numbers	Description of Revision/Change
3	03/15/04	2, 7	Non-intent. Reversed steps previous steps 12 & 13 (now steps 13 & 14). No requirement to staff TSC if no protective relays actuated. Added requirement to realign BAT A on loss of board. Operator feedback.
4	02/27/07	24	Deleted reference to 0-PMP-90-212B, which was deleted by DCN 51786.
5	10/04/07	2, 7, 28	Non-intent. Changed 1-HIC-62-81A required position from 25% open to 40-50% open to be consistent with SOI-62.01. Clarified step 14 to indicated manning is for additional manpower, not do to REP classification. Operator feedback.
6	12/03/07	2, 16	Added clarification for primary water system when in bypass mode. Operator feedback.
7	02/04/10	2, 8, 12	Non-intent change. Converted procedure from word 95 to word XP using Rev 6. Corrected minor editorial errors in Section 3.0. (PER 210582, PCR 4263)
8	07/13/10	ALL	General revision to incorporate corrective actions for PER 176605. Procedure rewritten to provide clarity and logical flow. Section 3 (Operator Actions) divided into subsections for Initial Actions, Energizing 6.9kV Shutdown Board, Restoration of 6.9kV SD BD after Energization, Compensatory Actions for Loss of 6.9kV SD BD. Added section to address loss of 480V SD BDs 1A1-A or 1A2-A. Added Appendix for list of equipment affected by loss of A-Train SD BDs. Increased level of detail through-out procedure. Added steps for resetting Black-Out Relays in Section 3.3.
9	01/24/11	2, 39, 53	Added Spare Charger 8-S (DCN 53437).

1.0 PURPOSE

This Instruction provides operator actions for:

- A loss of 6.9kV Shutdown Board 1A-A OR
- A loss of either 480V Shutdown Board 1A1-A or 1A2-A, without a loss of 6.9kV SD BD 1A-A

2.0 SYMPTOMS

2.1 Alarms

A. PNL 1-M-7 BREAKER TRIP [15-E].

B. 6.9 SD BD 1A-A UV/OV/CONTROL PWR FAILURE [12-B, 201-C].

C. 480 SD BD 1A1-A/1A2-A FAILURE/ABN [10-D, 200-D].

D. RX MOV VENT BD TRAIN A UNDERVOLTAGE [141-D].

E. C & A VENT BD 1A1-A/1A2-A UNDERVOLTAGE [141-E].

F. DG AUX BD 1A1-A/1A2-A UNDERVOLTAGE [200-E].

2.2 Indications

A. Low voltage on any Unit 1 Train A 6.9KV or 480V Shutdown Board.

B. Zero amps indicated on CSST to Shutdown Board indication.

C. Open breaker indications.

D. Failure of Shutdown Board supplied loads.

2.3 Automatic Actions

A. Diesel Generator 1A-A starts upon loss of voltage to 6.9KV SD BD 1A-A.

B. Designated loads are auto stripped from 6.9kV SD BD 1A-A, 480V SD BDs 1A1-A and 1A2-A.

C. Designated loads auto sequence on when voltage is restored to 6.9kV SD BD 1A-A and the Diesel Generator feeder breaker is closed.

D. Auto start for shed loads is blocked (except for SI auto start).

3.0 OPERATOR ACTIONS

NOTES

- The loss of all onsite and offsite power is covered in ECA-0.0 and AOI-40.
- A complete or partial loss of 161kV offsite power is addressed in AOI-35.

DIAGNOSTICS	
CONDITION	**APPLICABLE PROCEDURE SECTION**
6.9kV SD BD 1A-A energized from DG 1A-A following blackout.	****GO TO** Section 3.3 Restoration After Energizing 6.9kV SD BD 1A-A
Loss of Power to 6.9kV SD BD 1A-A	** **GO TO** Section 3.1, Initial Actions
Loss of Power to 480V SD BD 1A1-A without Loss of 6.9kV SD BD 1A-A	** **GO TO** Section 3.5.1, Energize 480V SD BD 1A1-A
Loss of Power to 480V SD BD 1A2-A without Loss of 6.9kV SD BD 1A-A	** **GO TO** Section 3.5.2, Energize 480V SD BD 1A2-A

End of Section

Step	Action/Expected Response	Response Not Obtained

3.1 Initial Actions

1.	**MONITOR** B TRAIN 6.9KV SD BD 1B-B ENERGIZED.	**EMERGENCY START** DGs: • 1-HS-82-15 [1-M-1]. • 2-HS-82-15 [2-M-1]. **IF** BOTH Unit 1 6.9KV SD BDs still de-energized, AND a. **IF** Unit in MODE 1, 2, 3, or 4, **THEN:** ****GO TO** ECA-0.0, Loss of Shutdown Power. b. **IF** Unit in MODE 5, or 6,**THEN:** 1) **TRIP** RCPs 2) **PERFORM** AOI-14, Loss of RHR SD Cooling, WHILE continuing this procedure

Step	Action/Expected Response	Response Not Obtained
3.1	**Initial Actions (continued)**	
2.	**ENSURE** Diesel Generators running: • DG 1A-A • DG 1B-B • DG 2A-A • DG 2B-B	**EMERGENCY START** Diesel Generators: • 1-HS-82-15 [1-M-1]. • 2-HS-82-15 [2-M-1]. **IF** any D/G is NOT RUNNING, **THEN** **EVALUATE** RESETTING EMERGENCY STOP: **IF** RESET and START of a DG is desired, **THEN**: a. **PRESS** and **RELEASE** DG AUTO SAFETY SHUTDOWN RELAY-RESET [0-M-26]: • 1-HS-82-20 [1A-A]. • 1-HS-82-50 [1B-B]. • 2-HS-82-80 [2A-A]. • 2-HS-82-110 [2B-B]. b. **EMERGENCY START** Diesel Generator [0-M-26]: • 1-HS-82-16A [1A-A]. • 1-HS-82-46A [1B-B]. • 2-HS-82-76A [2A-A]. • 2-HS-82-106A [2B-B].

3.1 Initial Actions (continued)

NOTES
- Appendix A provides a list of affected equipment
- RCPs can be operated for up to 10 minutes after a loss of CCS flow.

Step	Action/Expected Response	Response Not Obtained
3.	**MONITOR** RCP seal cooling available: • Seal injection flow OR • CCS flow through Thermal Barrier Heat Exchangers	**MANUALLY START** • CCP 1B-B • CCS Pump 1B-B. **IF** seal cooling not restored, **THEN** **MONITOR** RCP trip criteria (reference AOI-24).
4.	**EVALUATE** ERCW supply on A Train headers: a. **ENSURE** at least one A Train ERCW Pump In-service: • ERCW Pump C-A • ERCW Pump D-A b. **START** second pump as needed.	**IF** any A Train Diesel Generator running with NO ERCW cooling, **THEN** 1) **EMERGENCY STOP** A Train DGs 2) **OPEN** 1-FCV-67-68, DG 1A-A ERCW SUP from Hdr. 2B, [DG RM 1A-A] 3) **OPEN** 2-FCV-67-68, DG 2A-A ERCW SUP from Hdr. 2B, [DG RM 2A-A] 4) **RESET** and **EMERGENCY START** A Train Diesel Generators Stopped due to lack of ERCW Cooling.

Step	Action/Expected Response	Response Not Obtained

3.1 Initial Actions (continued)

CAUTION Further damage may occur if 86 LOCKOUT relay(s) are reset before status of board is evaluated and understood.

Step	Action/Expected Response	Response Not Obtained
5.	**DISPATCH** personnel to inspect the following equipment for damage, protective relay operation, and determine reason for BO: • 6.9kV SD BD 1A-A • DG 1A-A • 480V SD BD 1A1-A • 480V SD BD 1A2-A • 480V SD Xfmrs	
6.	**NOTIFY** Work Control for support and evaluation of BD.	
7.	**ENSURE** Unit 1 INSTRUMENT POWER A RACK selected to ENERGIZED feeder (amber light ON). [1-M-7] AND **RESET** Radiation Monitor modules and alarms on 0-M-12.	
8.	**MONITOR** containment temperatures within limits: • S/R 3.6.5.1, Computer Point U9019 • S/R 3.6.5.2, Computer Point U9020	**START** containment fans as needed • CRD Mech Cooler Fans • Lower Compartment Cooler Fans • Upper Compartment Cooler Fans
9.	**ENSURE** 1B Primary Water Pump in-service.	

Step	Action/Expected Response	Response Not Obtained

3.1 Initial Actions (continued)

NOTE Operability verification of remaining AC power sources is required to be completed within one hour per LCO 3.8.1. S/R 3.8.1.1 (0-SI-82-2)

10.	**NOTIFY** Shift Manager to evaluate staffing the TSC/OSC for support.	
11.	**EVALUATE** Relay Operation and Damage reports, **THEN** **DETERMINE** if safe to energize 6.9kV SD BD 1A-A.	** **GO TO** Section 3.4 Compensatory Actions for Loss of 6.9kV SD BD 1A-A WHILE continuing to Evaluate Energizing 1A-A 6.9kV SD BD.
12.	** **GO TO** Section 3.2	

End of Section

Step	Action/Expected Response	Response Not Obtained
3.4	**Compensatory Actions for Loss of 6.9kVSD BD 1A-A**	
	NOTES Appendix A provides list of Unavailable Equipment resulting from a loss of 6.9kV SD BD 1A-A.	
1.	**MONITOR** condition of 6.9kV SD BD 1A-A and supply sources, **WHEN** ready to energize Board from available power supply, **THEN** ** **GO TO** Section 3.2.1, Step 1.	
2.	**DISPATCH** AUO to D/G Bldg to monitor D/Gs conditions USING SOI-82 series, Appendix A, for operating parameters.	
3.	**CHECK** any charging pump RUNNING.	**PERFORM** the following: a. **ISOLATE** letdown: • **CLOSE** letdown orifice(s). • **CLOSE** 1-FCV-62-69A. • **CLOSE** 1-FCV-62-70A. b. **RESTORE** charging and letdown, REFER TO APPENDIX D ALIGNMENT OF CHARGING AND LETDOWN.

Step	Action/Expected Response	Response Not Obtained
3.4	**Compensatory Actions for Loss of 6.9kVSD BD 1A-A (continued)**	
4.	**CHECK** A Train CCS flow adequate.	**START** 1B-B CCS Pump. **ENSURE** one of the following CLOSED to avoid excessive flow • RHR HTX A , 1-FCV-70-156 **OR** • SFP HTX A, 0-FCV-70-197 **IF** A Train CCS is lost, **THEN** **REFER TO** AOI-15, Loss of Component Cooling Water (CCS) FOR LOSS OF CCS FLOW.
5.	**ENSURE** Thermal Barrier Booster Pump 1B-B in-service (SOI-70.01).	**REFER TO** AOI-15, Loss of Component Cooling Water (CCS) FOR LOSS OF CCS FLOW.
6.	**ALIGN** BAT A for operation via BA Pump 1B **REFER TO** SOI-62.05.	
7.	**EVALUATE** transferring one of the following to preserve Vital Battery life: • 480V AC Vital Transfer Switch I to Alternate power supply (SOI-235.01). **OR** • 125V Vital Batt BD I to Battery Charger 6-S or 8-S on B Train feed. (SOI-236.01)	
8.	**EVALUATE** transferring 24V CAP Battery Charger 1 from Normal to Alternate (SOI-252).	

3.4 Compensatory Actions for Loss of 6.9kVSD BD 1A-A (continued)

9. **ENSURE** Aux Bldg General Supply and Exhaust Fans in-service as required to maintain ventilation and pressure (SOI-30.05).

10. **ENSURE** EBR Air Conditioning Unit B-B and MCR Air Conditioning Unit B-B in-service (SOI-31.01).

11. **ENSURE** 1B Annulus Vacuum Fan in-service (SOI-65.01).

12. **ENSURE** A Train or B Train 480V Shutdown Board Room Ventilation in-service (SOI-30.07).

NOTE LCO 3.8.1 is expected to require performance of S/R 3.8.1.1 (0-SI-82-2). Performers are NOT to take ANY actions which would interrupt power supplies in-service by this AOI.

13. **REFER TO** Tech Specs:
    - 3.5.2, ECCS-Operating.
    - 3.5.3, ECCS-Shutdown.
    - 3.8.1, AC Sources-Operating.
    - 3.8.2, AC Sources-Shutdown.
    - 3.8.4, DC Sources-Operating.
    - 3.8.5, DC Sources-Shutdown.
    - 3.8.9, Distribution Sys-Operating.
    - 3.8.10, Distribution Sys-SD.

14. **REFER TO** EPIP-1, Emergency Plan Classification Flowchart.

3.4 Compensatory Actions for Loss of 6.9kVSD BD 1A-A (continued)

15. **EVALUATE** transferring 0-DPL-13-1, Fire Protection Power Distribution Panel to Alternate. (SOI-13.01)

16. **CONTINUE MONITORING** 6.9Kv SD BD 1A-A supply sources using 1-EI-82-6A [0-M-26]

    WHEN Power supply AVAILABLE,
    THEN
    ****GO TO** Section 3.2.1 Step 1.

End of Section

Scenario 7
Attachment 3

AOI-17, "Turbine Trip."

Section 3.3, "BOP Realignment."

Step	Action/Expected Response	Response Not Obtained

3.3 BOP Realignment

CAUTION Performance of this instruction should not be allowed to delay or interfere with actions required by applicable emergency procedures or abnormal operating procedures.

NOTES

- Control room operators may initiate shutdown of pumps and equipment from the bench board immediately after a trip. Performance of this instruction will subsequently verify proper secondary equipment alignment.
- Steps in this section and items in Attachment 1 may be performed out of sequence.
- Attachment 1 may be initiated as soon as Turbine has tripped while MCR completes Section 3.2. Initiation of Attachment 1 may be part of briefing for preplanned Turbine trip with performance to begin when NAUO is notified of Turbine trip by UO.

1. **DISPATCH** turbine building NAUO to perform Attachment 1.

2. **NOTIFY** condensate demineralizer NAUO prior to Operator initiated press changes in condensate.

3. **REMOVE** generator excitation from service:

   a. **PLACE** voltage regulator to TEST.

   b. **OPEN** exciter field breaker.

   c. **PLACE** exciter regulator control to OFF.

Step	Action/Expected Response	Response Not Obtained

3.3 BOP Realignment (continued)

Step	Action/Expected Response	Response Not Obtained
4.	**MONITOR** main turbine:	
	a. **VERIFY** seal oil backup pump running.	a. **ENSURE** seal oil backup pump 1-HS-47-61D in NORMAL (T7J/729 behind MTOT)
	b. **ENSURE** turning gear oil pump RUNNING.	
	c. **WHEN** less than 600 rpm, **THEN** **ENSURE** bearing lift oil pump RUNNING.	
	d. **WHEN** turbine is at ZERO RPM, **THEN** **ENSURE** turbine on turning gear.	
	e. **MAINTAIN** MTOT lube oil temp between 95°F° and 100°F (may require RCW isolation if TCV has excessive leakage).	
	f. **MAINTAIN** GENERATOR H2 (Cold Gas) temp 95°F (may require RCW isolation if TCV has excessive leakage).	
	g. **ENSURE** Gland Steam Spillover Bypass valve is CLOSED using 1-HS-47-191A.	
5.	**ALIGN** MSRs:	
	a. **PUSH** RESET on MSR control panel.	
	b. **CLOSE** MSR HP steam and bypass isol.	
	c. **ENSURE** MSR warming valves CLOSED.	
	d. **OPEN** MSR startup vents.	
	e. **CLOSE** MSR operating vents.	

Step	Action/Expected Response	Response Not Obtained

3.3 BOP Realignment (continued)

6.	**CHECK** MSIVs OPEN.	**IF** vacuum is to be maintained, **THEN** **ENSURE** auxiliary boiler is aligned for steam seals.
7.	**ENSURE** adequate FW press:	
	a. **ENSURE** two hotwell pumps RUNNING.	
	b. **IF** FW isolation reset, **THEN** **ENSURE** one condensate booster pump RUNNING if needed for unit conditions.	
	c. **ENSURE** CNDS demin pumps OFF.	
	d. **STOP** #3 HDT pumps, and **CLOSE** the discharge valves to condensate heater strings. Notify NAUO performing Attachment 1 that #3 HDT pumps are stopped.	
	e. **STOP** #7 HDT pumps, and **CLOSE** the discharge valves to condensate heater strings.	
8.	**SHUTDOWN** any MFW pump NOT required.	
9.	**SHUTDOWN** any RCW pumps NOT required.	
10.	**SHUTDOWN** any CCW pumps NOT required.	

3.3 BOP Realignment (continued)

11. **ALIGN** extraction steam valves and drain valves:
    a. **CLOSE** #1 and #2 Heater extraction steam valves.
    b. **ENSURE** turbine drain valves OPEN.
    c. **OPEN** MFW pump turbine drain valves.

12. **PERFORM** as required:
    a. **OBTAIN** switching instructions from NEAD, and
    OPEN main generator PCB(s) MODs.
    b. **PULL-TO-LOCK** bus duct cooling fans.
    c. **VERIFY** MTOT and seal oil temps STABLE and trending to 95°F.

13. **IF** MFW isolated to steam generators,
    THEN
    REQUEST Chem Lab sample condensate and feedwater prior to re-admitting water to S/Gs from condensate-feedwater system.

14. **IF** EGTS started,
    THEN
    SHUTDOWN one train after 1 to 2 hours and place in P-AUTO:
    - **REFER TO** SOI-65.02, Emergency Gas Treatment System, section on Auto EGTS Actuation.

Step	Action/Expected Response	Response Not Obtained

3.3 BOP Realignment (continued)

15.	**IF** ABGTS started, **THEN** **SHUTDOWN** one train after 1 to 2 hours and place in P-AUTO: • **REFER TO** SOI-30.06, Auxiliary Building Gas Treatment System, section on Auto Start of ABGTS	

CAUTION Rx trip bkrs must be cycled to allow reset of MFW when isolated by SI, HI-HI S/G level, or flood level in MS valve vault room. If any SI signal is present with Auto SI blocked, cycling Rx trip bkrs will initiate SI actuation.

16.	**IF** MFW **NOT** in service, **THEN** **ESTABLISH** MFW: • **REFER TO** Attachment 2, Establishing MFW Following Reactor Trip.	
17.	**CHECK** S/G NR levels between 38% and 50%.	**IF** S/G level can NOT be maintained, **THEN** **START** M-D AFW pumps.
18.	**RETURN TO** applicable Instruction.	

End of Subsection

Scenario 7
Attachment 4

E-1, “Loss of Reactor or Secondary Coolant.”

Appendix A through D

Appendix A
(Page 1 of 1)

CLA Breaker Operation

CLOSE the following to restore power to cold leg accumulator isolation valves:

BOARD	COMPT	NOMENCLATURE
480 V Reactor MOV Board 1A1-A	3F2	1-BKR-63-118A SIS CL ACCUM 1 OUT ISOL (1-FCV-63-118)
480 V Reactor MOV Board 1A1-A	17F2	1-BKR-63-80A SIS CL ACCUM 3 OUT ISOL (1-FCV-63-80)
480 V Reactor MOV Board 1B1-B	3F2	1-BKR-63-98A SIS CL ACCUM 2 OUT ISOL (1-FCV-63-98)
480 V Reactor MOV Board 1B1-B	16F2	1-BKR-63-67A SIS CL ACCUM 4 OUT ISOL (1-FCV-63-67)

Appendix B
(Page 1 of 1)
1-FCV-63-1 Breaker Operation

CLOSE the following to restore power to 1-FCV-63-1:

BOARD	COMPT	NOMENCLATURE
480 V Reactor MOV Board 1A1-A	2E1	1-BKR-63-1A RWST TO RHR SUCT (1-FCV-63-1)

Appendix C
(Page 1 of 1)

1-FCV-63-22 Breaker Operation

CLOSE the following to restore power to 1-FCV-63-22:

BOARD	COMPT	NOMENCLATURE
480 V Reactor MOV Board 1B1-B	2F2	1-BKR-63-22A SIP COLD LEG INJECTION (1-FCV-63-22) SHUNT TRIP BREAKER

Appendix D
(Page 1 of 1)

Equipment Evaluation

A. **EVALUATE** plant equipment and systems needed to support long term cooling and recovery actions, as time and personnel availability permits:

1. Cntmt Isolation Status.
2. Emergency Gas Treatment System: One train in operation, **REFER TO** SOI-65.02.
3. Auxiliary Building Gas Treatment: One train in operation, **REFER TO** SOI-30.06.
4. Auxiliary Building Isolation alignment: **REFER TO** SOI-30.06.
5. Main Control Room Isolation alignment: **REFER TO** SOI-31.01.
6. ERCW System: Both trains in operation.
7. Component Cooling Water System: Both trains in operation.
8. Ice Condenser System: AHUs energized after cntmt hydrogen concentration verified (if applicable). **REFER TO** SOI-61.01.
9. Permanent Hydrogen Mitigation System: Igniters de-energized when no longer needed. **REFER TO** SOI-268.01.

B.1.a
Perform boration per AOI-39, "Rapid Load Reduction."

WATTS BAR NUCLEAR PLANT
JOB PERFORMANCE MEASURE
B.1.a
06-2011 NRC Exam
EVALUATION SHEET

Task: Perform boration per AOI-39. "Rapid Load Reduction."

Alternate Path: When boration is started, 1-FCV-62-128, MAKEUP TO VCT INLET and 1-FCV-62-144, MAKEUP TO VCT OUTLET will not open automatically OR manually. Per AOI-39, Step 2 RESPONSE NOT OBTAINED, the boration will be accomplished using 1-FCV-62-138, EMERG BORATE.

Facility JPM #: New

Safety Function: 1 **Title:** Reactivity Control

K/A 004 A4.18 Ability to manually operate and/or monitor in the control room: Emergency borate valve

Rating(s): 4.3/4.1 **CFR:** 41/7 / 45.5 to 45.8

Evaluation Method: Simulator __X__ In-Plant ______ **Classroom** ______

References: AOI-39, "Rapid Load Reduction," Rev. 14

Task Number: RO-113-AOI-39-001 **Title:** Perform a rapid load reduction.

Task Standard: The applicant:

1.) Determines the correct flow rate (31 gpm) and amount of boric acid required (285 gallons) for a power reduction to 80% at 2%/min using TI-7.012, Thumb Rules."

2.) Determines that the normal boration flow path is NOT available and initiates an emergency boration at approximately 31 gpm (acceptable range 25 to 35 gpm) for approximately 9 minutes (acceptable range between 8 and 11.5 minutes.).

Validation Time: 15 minutes **Time Critical:** Yes ____ No __X__

===

Applicant: ____________________ ____________ Time Start: ______
NAME Docket No. Time Finish: ______

Performance Rating: SAT ____ UNSAT ____ Performance Time ___

Examiner: ____________________ ____________________/________
NAME SIGNATURE DATE

===

COMMENTS

____

____

____

____

____

SIMULATOR OPERATOR INSTRUCTIONS:

1. ENSURE NRC Examination Security has been established.
2. RESET to Initial Condition by performing the following actions:
   a. Select ICManager on the THUNDERBAR menu (right hand side of Instructor Console Screen).
   b. Locate IC 316.
   c. Right "click" on IC 316.
   d. Select Reset on the drop down menu.
   e. Right "click" on RESET.
   f. Enter the password for IC 316.
   g. Select "Yes" on the INITIAL CONDITION RESET pop-up window.
   h. Perform SWITCH CHECK.
3. ENSURE the following information appears on the Director Summary Screen:

	Key		Type	Event	Delay	Inserted	Ramp	Initial	Final	Value
	hs-62-128	hs-62-128 boric acid blender to vct inlet sw	O	21	00:00:00	00:00:00	00:00:00		close	auto
	hs-62-144	hs-62-144 makeup injection valve control sw	O	21	00:00:00	00:00:00	00:00:00		close	auto

4. ENSURE Event 21 "1-HS-62-140A to START" is loaded. IF NOT, then edit Event 21 and add the following Event Code zlohs62140a [1] ==1.
5. Place simulator in RUN and acknowledge any alarms.
6. ENSURE a marked-up copy of AOI-39,"Rapid Load Reduction," with Step 1 circled-and-slashed is available to the Examiner.
7. ENSURE "Extra Operator" is present in the simulator.
8. ENSURE Watts Bar Nuclear Plant Unit 1 Reactivity Briefing Book (Simulator Copy) BOL (Beginning Of Life) is updated and on the desk, and that the BOL placards are on 1-M-6, below the Boric Acid and Primary Water Integrators.
9 Place simulator in FREEZE until Examiner cue is given.

READ TO APPLICANT

DIRECTION TO APPLICANT:

I will explain the initial conditions, and state the task to be performed. All control room steps shall be performed for this JPM, including any required communications. I will provide initiating cues and reports on other actions when directed by you. Ensure you indicate to me when you understand your assigned task. To indicate that you have completed your assigned task return the cue sheet I provided you.

INITIAL CONDITIONS:

1. **The plant is at 100% power, BOL conditions, with RCS boron concentration at 1031 ppm.**
2. **AOI-39, "Rapid Load Reduction," has been entered to reduce power to 80% at 2% per minute to remove the 1A Main Feedwater pump from service.**
3. **You are Control Room Operator.**

INITIATING CUES:

The Unit Supervisor directs you to borate per AOI-39, "Rapid Load Reduction," and to notify him when the boration is complete.

STEP/STANDARD	SAT/UNSAT

START TIME: _______

CAUTION

Over boration may result in excessive rod withdrawal, T-avg lower than desired, and AFD oscillations.

NOTE

- Rod Control should remain in automatic for T-avg Control
- Reactivity Briefing Sheet, "Thumb Rules" (page 3), lists boration flows and volumes for different reduction rates.
- Effect of boration will lag behind turbine load reduction and can be compensated for by temporarily increasing boric acid flow rate above recommended rate.

STEP 1: 1. **INITIATE** a manual boration:

a. **DETERMINE** recommended boration flow rate and volume from Reactivity Briefing Sheet:

CRITICAL STEP

___ SAT

___ UNSAT

STANDARD:

Applicant determines boration flow rate from the BOL Reactivity Briefing Book, Thumb Rules Section.

___The flow rate according to the table for AOI-39 is **31 gpm**.

___The amount of boric acid to reduce power to 80% is **285 gallons.**

Step is critical to ensure that control rods are properly positioned after the power reduction.

COMMENTS:

STEP/STANDARD	SAT/UNSAT
STEP 2: 1. **INITIATE** a manual boration: (continued) b. **INITIATE** normal boration: 1) **ADJUST** BA flow controller, 1-FC-62-139, to desired flow rate. STANDARD: Applicant determines from TI-7.12, "Appendix B, Reactivity Briefing Sheet, Thumb Rules Section," that the flow rate is to be set at 77.5% (acceptable range 75% to 80%) to correspond to the required flow rate of 31 gpm. The applicant locates 1-FC-62-139, BA RO BLENDER FCV-62-140 CONTROL and rotates the setpoint dial to the left to establish 77.5% (acceptable range 75% to 80%) COMMENTS:	___ SAT ___ UNSAT

STEP/STANDARD	SAT/UNSAT
STEP 3: 1. **INITIATE** a manual boration: (continued) b. **INITIATE** normal boration: 2) **ADJUST** BA batch counter 1-FQ-62-139 to required quantity. STANDARD: Applicant determines from TI-7.12, "Appendix B, Reactivity Briefing Sheet, Thumb Rules Section," that the required quantity of boron for a load drop to 80% is 285 gallons. The applicant locates 1-FQ-62-139 BA BATCH COUNTER and performs the following actions: 1. Depresses and holds the black pushbutton. 2. While holding the pushbutton, the applicant raises the red translucent cover. 3. While still holding the pushbutton, the applicant enters "000285" in the display. 4. While still holding the pushbutton, the applicant lowers the red translucent cover, and then releases the pushbutton. COMMENTS:	___ SAT ___ UNSAT

STEP/STANDARD	SAT/UNSAT
STEP 4: 1. **INITIATE** a manual boration: (continued) b. **INITIATE** normal boration: 3) **PLACE** mode selector 1-HS-62-140B to BOR. STANDARD: Applicant locates 1-HS-62-140B, VCT MAKEUP MODE, and rotates the handswitch from the "AUTO" position to the right to the "BOR" position. COMMENTS:	___ SAT ___ UNSAT
STEP 5: 1. **INITIATE** a manual boration: (continued) b. **INITIATE** normal boration: 4) **(ρ) PLACE** VCT makeup control 1-HS-62-140A, to START. STANDARD: Applicant locates 1-HS-62-140A, VCT MAKEUP CONTROL, and rotates the handswitch from the mid (neutral) position to the "START" position and releases the handswitch. The applicant observes the GREEN light DARK and the RED light LIT. COMMENTS:	___ SAT ___ UNSAT

STEP/STANDARD	SAT/UNSAT
STEP 6: 1. **INITIATE** a manual boration: (continued) b. **INITIATE** normal boration: 5) **VERIFY** desired boric acid flow indicated on 1-FI-62-139. STANDARD: Applicant determines that the boric acid flow remains at zero. The applicant may attempt to open 1-FCV-62-128 MAKEUP VCT OUTLET by rotating 1-HS-62-128 from the P AUTO position to the OPEN position. The applicant may attempt to open 1-FCV-62-144 MAKEUP VCT INLET by rotating 1-HS-62-144 from the P AUTO position to the OPEN position. The applicant determines that the normal boration flow path is not functioning properly and refers to the RESPONSE NOT OBTAINED column for contingency actions. COMMENTS:	___ SAT ___ UNSAT

STEP/STANDARD	SAT/UNSAT
STEP 7: 2. **RESPONSE NOT OBTAINED:** a. **INITIATE** emergency boration. 1) **PLACE** boric acid transfer pump aligned to blender in FAST speed STANDARD: ___Applicant locates 1-HS-62-230D BA PUMP A SPEED and rotates the switch to the right to the FAST position. The applicant locates 1-HS-62-230A BA PMP A and observes that the RED "SLOW" light is DARK, and the RED "FAST" light is LIT. ___Applicant locates 1-HS-62-232-D BA PUMP B SPEED and rotates the switch to the right to the FAST position. The applicant locates 1-HS-62-232A BA PMP A and observes that the RED "SLOW" light is DARK, and the RED "FAST" light is LIT. **Step is critical to establish the required emergency boration flow, since opening 1-FCV-62-138, EMERG BORATE fully with BA pumps in slow speed will not produce sufficient flow rate.** **Cue: If asked, inform the applicant that the "A" Boric Acid pump is aligned to the blender.** COMMENTS:	**CRITICAL STEP** ___ SAT ___ UNSAT

STEP/STANDARD	SAT/UNSAT
STEP: 2. **RESPONSE NOT OBTAINED:** a. **INITIATE** emergency boration. 2) **(ρ) ADJUST** 1-FCV-62-138 to establish desired flow rate. STANDARD: ___The applicant locates 1-HS-62-138 and rotates the handswitch to the right to open the valve and establishes boric acid flow. The applicant locates1-FI-62-137A EMER BORATE FLOW and adjusts 1-HS-62-138 to establish flow. 1-HS-62-138 will have GREEN and RED lights LIT while throttled. The flow rate according to the table for AOI-39 is **31gpm**. The amount of boric acid to reduce power to 80% is **285 gallons.** Depending on the boric acid flow rate established, the time will vary. **Step is critical because the valve must be opened to establish boron injection flow.** COMMENTS:	**CRITICAL STEP** ___ SAT ___ UNSAT

STEP/STANDARD	SAT/UNSAT
STEP: 1. **RESPONSE NOT OBTAINED:** a. **INITIATE** emergency boration. 3) **WHEN** boration is complete, **THEN CLOSE** 1-FCV-62- 138, **AND PLACE** boric acid transfer pump used in SLOW speed. STANDARD: Applicant determines the required amount of time to add the amount of boron by dividing the total amount by the flow rate established in the previous step. Applicant determines that the allotted time has elapsed and closes 1-HS-62-138. **EXAMINER CUE: After the applicant has stated the amount of time required to add the boric acid, state that "the required time has elapsed."** ___The applicant locates 1-HS-62-138 and rotates the handswitch to the left to close the valve. Handswitch must be held in the close position until the GREEN light is LIT and the RED light is DARK. Applicant locates 1-HS-62-230D BA PUMP A SPEED and rotates the switch to the left to the SLOW position. Applicant locates 1-HS-62-232-D BA PUMP B SPEED and rotates the switch to the left to the SLOW position. **Step is critical since this will terminate the boration after ensuring the proper amount of boron was injected into the RCS.** **EXAMINER CUE: After the applicant has placed the Boric Acid Pumps in "SLOW" speed, inform the applicant "that another operator will continue from here."** COMMENTS: **END OF TASK**	**CRITICAL STEP** ___ SAT ___ UNSAT

STOP TIME ________

APPLICANT CUE SHEET

(RETURN TO EXAMINER UPON COMPLETION OF TASK)

INITIAL CONDITIONS:

1. **The plant is at 100% power, BOL conditions, with RCS boron concentration at 1031 ppm.**

2. **AOI-39, "Rapid Load Reduction," has been entered to reduce power to 80% at 2% per minute to remove the 1A Main Feedwater pump from service.**

3. **You are Control Room Operator.**

INITIATING CUES:

The Unit Supervisor directs you to borate per AOI-39, "Rapid Load Reduction," and to notify him when the boration is complete.

TVA

Watts Bar Nuclear Plant

Unit 1

Abnormal Operating Instruction

AOI-39

Rapid Load Reduction

Revision 0014

Quality Related

Level of Use: Continuous Use

Effective Date: 03-02-2011

Responsible Organization: OPS, Operations

Prepared By: R. A. O'Rear

Approved By: Brian McIlnay

Revision Log

Revision or Change Number	Effective Date	Affected Page Numbers	Description of Revision/Change
9	06/20/06	2, 4, 5	Revised condenser backpressure requirements per PIC 52076-A
10	06/22/07	2, 4	Revised condenser backpressure requirements per DCN 52215 stage 1.
11	08/30/07	2, 6, 20, 21	Non-intent. Added Step 1 RNO transit to Appendix A on a failure of turbine load reduction in AUTO. Complies with changes made to GO-4 for PER125113.
12	03/07/08	4, 5-6, 12	Replaced Table 1 and cautions at beginning of step 3.1, Section 3.2 & 3.3 for DCN 52228.
13	02/24/10	All	Converted from W95 to W2003 using Rev 12. Deleted table for recommended boration rates and referenced Reactivity Briefing Sheet. Added concern for AFD to Caution for over borating. Included Reactivity Control Plan discussion into section 4.0. [PCR 3827] Added steps to shutdown a MFP [PCR 3449] Added step to place EHC in IMP-IN. [PCR 4219] Enhanced steps for borating to provide flexibility to control AFD and Rod position. [PCR 3328, 3318] Changed target band for AFD to ±3% as outlined in NOB. Added TI-7.012 as a Developmental Ref.
14	03/02/11	2, 4, 6-9,13, 14, 17, 19, 22-24	Reversed order of steps to ensure boration is started first as recommended by Reactivity Management Review Board. Minor editorial changes included: added page numbers to Diagnostic box, updated source identification, added Greek symbol (ρ) to steps directly affecting reactivity.

1.0 PURPOSE

This Instruction provides the guidance to initiate a controlled load reduction whenever plant conditions require a rapid power reduction without a reactor trip.

2.0 SYMPTOMS

A. Tech Spec Safety Limit being exceeded.

B. Tech Spec Limiting Condition for Operation (LCO) and/or ACTION not being satisfied due to circumstances in excess of those addressed in LCO 3.0.3.

C. Expiration of a Tech Spec ACTION time.

D. Serious condition requiring rapid load reduction to prevent or minimize a more serious condition, but not requiring a unit trip.

E. The SM has determined that plant conditions require a rapid load reduction at less than or equal to 5% per minute.

2.2 Indications

A. NONE

2.3 Automatic Actions

A. If a signal has occurred requiring an Auto turbine runback and the runback failed to occur, then action should be taken in accordance with AOI-16, Loss Of Normal Feedwater or AOI-37, Turbine Runback Response.

3.0 OPERATOR ACTIONS

3.1 Diagnostics

CAUTION

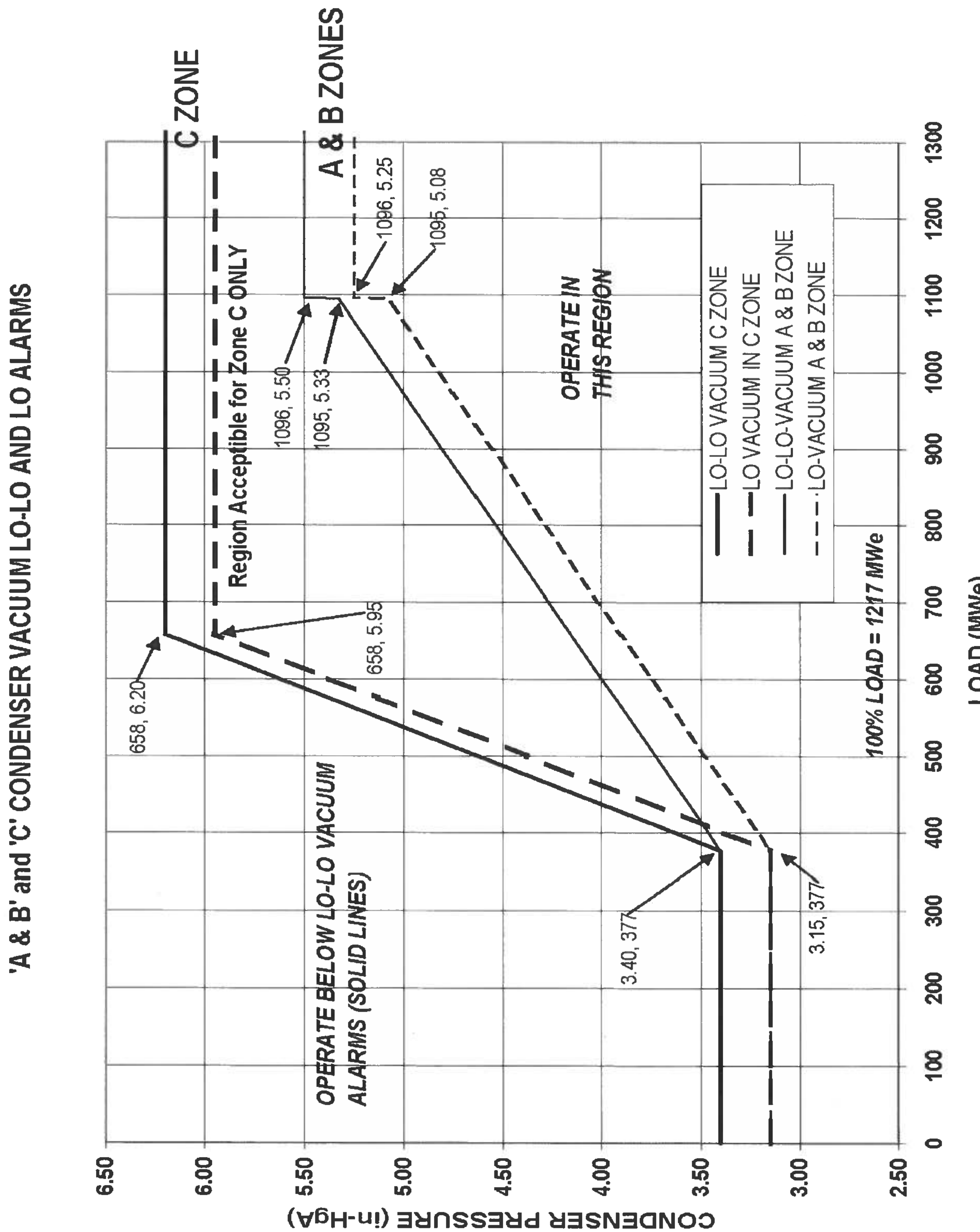
Condenser backpressure should be maintained less than the limits of Table 1 during load reduction-see next page.

NOTE

Load reduction rate shall be limited to a maximum of 5%/min. If greater than 5% is required or becomes necessary, then reactor should be tripped.

IF	GO TO Subsection	Page
Reactor power is greater than 50%	3.2	6
Reactor power is less than 50%	3.3	13

3.1 Diagnostics (continued)



Step	Action/Expected Response	Response Not Obtained

3.2 Power Reduction From Greater Than 50% Power

CAUTION **Over boration may result in excessive rod withdrawal, T-avg lower than desired, and AFD oscillations.**

NOTE

- Rod Control should remain in automatic for T-avg Control
- Reactivity Briefing Sheet, "Thumb Rules" (page 3), lists boration flows and volumes for different reduction rates.
- Effect of boration will lag behind turbine load reduction and can be compensated for by temporarily increasing boric acid flow rate above recommended rate.

Step	Action/Expected Response	Response Not Obtained
1.	**INITIATE** a manual boration:	
	a. **DETERMINE** recommended boration flow rate and volume from Reactivity Briefing Sheet:	a. **INITIATE** emergency boration. 1) **PLACE** boric acid transfer pump aligned to blender in FAST speed 2) **(p) ADJUST** 1-FCV-62-138 to establish desired flow rate. 3) **WHEN** boration is complete, **THEN** **CLOSE** 1-FCV-62-138, **AND** **PLACE** boric acid transfer pump used in SLOW speed
	b. **INITIATE** normal boration: 1) **ADJUST** BA flow controller, 1-FC-62-139, to desired flow rate. 2) **ADJUST** BA batch counter 1-FQ-62-139 to required quantity. 3) **PLACE** mode selector 1-HS-62-140B to BOR. 4) **(p) PLACE** VCT makeup control 1-HS-62-140A, to START. 5) **VERIFY** desired boric acid flow indicated on 1-FI-62-139.	

Step	Action/Expected Response	Response Not Obtained

3.2 Power Reduction From Greater Than 50% Power (continued)

CAUTION
- **Condenser Backpressure limits are on page 5.**
- **TURBINE MANUAL Operation requires continuous operator monitoring and control.**
- **LOSS OF CONDENSER VACUUM may be made worse if steam dumps are actuated. AOI-11 requires T-ave and T-ref be maintained within 3°F.**

NOTE If the initiating condition is corrected, the power reduction may be terminated

Step	Action/Expected Response	Response Not Obtained
2.	**ESTABLISH** a turbine load reduction rate less than or equal to 5%/min: a. **PLACE** turbine in IMP IN b. **SET** a desired load in the SETTER with the REFERENCE CONTROL. c. **SET** the LOAD RATE at less than or equal to 5%/min. d. **(ρ) DEPRESS** GO pushbutton.	**SELECT** TURBINE MANUAL, and **PERFORM** Appendix A. OR **CHECK** that turbine control has tripped to MANUAL as indicated by the TURBINE MANUAL pushbutton backlighted, (ρ) Momentarily **DEPRESS** the G.V. LOWER at intervals that control load reduction less than or equal to 5% /min.

Step	Action/Expected Response	Response Not Obtained
3.2	**Power Reduction From Greater Than 50% Power (continued)**	
	NOTE AFD green target band can be monitored using ICS Turn On code DOGHOUSE.	
3.	**MONITOR** rod position: • Rods above Lo-Lo insertion limit • AFD within Target Band	(ρ) **ADJUST** boric acid flow rate as needed to return rods to required position **IF** higher boric acid flow rate is needed to compensate for load reduction rate, **THEN** **INITIATE** emergency boration 1. **PLACE** boric acid transfer pump aligned to blender in FAST speed 2. (ρ) **ADJUST** 1-FCV-62-138 to establish desired flow rate. **WHEN** boration is complete, **THEN** **CLOSE** 1-FCV-62-138, **AND** **PLACE** boric acid transfer pump used in SLOW speed
4.	**REFER TO** EPIP-1, Emergency Plan Classification Flowchart	
5.	**NOTIFY** the Load Coordinator of the required load reduction and expected ramp rate	

Step	Action/Expected Response	Response Not Obtained

3.2 Power Reduction From Greater Than 50% Power (continued)

NOTE If reactor power is stabilized at a lower level a drop in T-avg will occur due to Xenon build up. Dilution may be required to maintain power level.

Step	Action/Expected Response	Response Not Obtained
6.	**MONITOR** T-avg and T-ref: • T-ave trending to T-ref. • Mismatch less than 5°F.	**(ρ) CONTROL** T-avg with Control Rods in manual. **IF** T-ave and T-ref mismatch can NOT be maintained less than 5°F, **THEN** **TRIP** reactor, and ** **GO TO** E-0, Reactor Trip or Safety Injection.
7.	**CHECK** rate of power reduction is rapid enough for existing plant conditions.	**(ρ) TRIP** reactor, and ** **GO TO** E-0, Reactor Trip or Safety Injection.
8.	**NOTIFY** Cnds Demin AUO of impending pmp shutdowns.	

Step	Action/Expected Response	Response Not Obtained

3.2 Power Reduction From Greater Than 50% Power (continued)

9. **WHEN** rated thermal power change exceeds 15% in one hour,
   THEN
   NOTIFY Chemistry to initiate 1-SI-68-28.

10. **WHEN** between 70 and 75% power,
    THEN
    REMOVE one Cnds Bstr Pmp and one Cnds Demin Pmp from service:

    - **PLACE** selected Cnds Bstr Pmp handswitch to STOP.

    - **PLACE** selected Cnds Demin Pmp handswitch to STOP, and **CLOSE** the suction valve.

3.2 Power Reduction From Greater Than 50% Power (continued)

NOTE A MFPT may be removed from service at power levels between 65% and 45%, if approved by the SM.

NOTE If holding power level at less than 60%, the Cnds Demin pumps may be left running based on header pressure and the ability of the pumps to pump forward.

11. **WHEN** between 55 and 70% power,
THEN
REMOVE both operating Cnds Demin Pumps and one of three #3 Heater Drain Pumps from service:

    a. Simultaneously **PLACE** Cnds Demin Pump handswitches to STOP.

    b. **CLOSE** Cnds Demin Pump suction valves.

    c. **STOP** and **PULL-TO-LOCK** one of three #3 Heater Drain Pumps.

12. **WHEN** 65% power is reached,
THEN
STOP and **PULL-TO-LOCK** one of two #7 Heater Drain Pumps.

13. **WHEN** 49% power is reached,
THEN
CHECK Annunciator Window 69-E, P-9 RX TRIP FROM TURB TRIP BLOCKED, is LIT.

Step	Action/Expected Response	Response Not Obtained

3.2 Power Reduction From Greater Than 50% Power (continued)

14. **IF** Power reduction below 50% is required,
THEN
** **GO TO** Subsection 3.3, Step 4.

15. **STOP** The load reduction by depressing HOLD on the Turbine Reference Setter.

16. **STABILIZE** Turbine/Reactor power with T_{avg}/T_{ref} within 3°F.

17. **WHEN** Boration is COMPLETE,
THEN
PERFORM the following to REALIGN makeup to AUTO:

    a. **ENSURE** 1-FC-62-142, PW TO BLENDER, on 35% (70gpm) and Manual-Auto toggle in AUTO.

    b. **ADJUST** 1-FC-62-139, BA TO BLENDER, to new RCS C_B.

    c. **PLACE** 1-HS-62-140B, VCT MAKEUP MODE, in AUTO.

    d. **TURN** 1-HS-62-140A, VCT MAKEUP CONTROL, to START.

    e. **CHECK** Red light is LIT.

18. ** **GO TO** GO-4, Normal Power Operation.

End of Subsection

Step	Action/Expected Response	Response Not Obtained

3.3 Power Reduction From 50% Power

CAUTION
- **Condenser Backpressure limits are on page 5.**
- **Avoid excessive rod insertion after turbine is tripped. If resulting reactor power is subcritical or less than desired, rods SHALL NOT be withdrawn in an attempt to recover reactor power.**

NOTE **If the initiating condition is corrected, power reduction may be terminated.**

Step	Action/Expected Response	Response Not Obtained
1.	**CHECK** reactor power less than or equal to 49%, annunciator window 69-E, P-9 RX TRIP FROM TURBINE TRIP BLOCKED, is LIT.	** **GO TO** Subsection 3.2
2.	**ENSURE** rod control in AUTO.	Manually **INSERT** the control bank as turbine load is reduced, maintaining T_{avg} on program.

CAUTION **TURBINE MANUAL operation requires continuous operator monitoring and control.**

Step	Action/Expected Response	Response Not Obtained
3.	**ESTABLISH** a turbine load reduction rate of less than or equal to 5%/min: a. **PLACE** turbine in IMP IN b. **SET** a desired load in the SETTER with the REFERENCE CONTROL c. **SET** the LOAD RATE less than or equal to 5%/min. d. **(ρ) DEPRESS** GO pushbutton.	**SELECT** TURBINE MANUAL, OR **CHECK** that Turbine Control has tripped to MANUAL as indicated by the TURBINE MANUAL pushbutton backlighted, (ρ) Momentarily **DEPRESS** the G.V. LOWER at intervals that control load reduction less than or equal to 5%/min.

Step	Action/Expected Response	Response Not Obtained
3.3	**Power Reduction From 50% Power (continued)**	
4.	**WHEN** 48% reactor power is reached, **THEN** **CHECK** annunciator window 70-C, P-8 LO PWR-FLOW TRIP BLOCKED, is LIT.	
5.	**CHECK** power reduction rate rapid enough for existing plant conditions.	**PERFORM** one of the following based on plant conditions: (ρ) **TRIP** reactor and ** **GO TO** E-0, Reactor Trip or Safety Injection. OR (ρ) **TRIP** turbine and ** **GO TO** AOI-17, Turbine Trip.
6.	**WHEN** 45% power is reached, **THEN** **CONTINUE** with the procedure.	

Step	Action/Expected Response	Response Not Obtained

3.3 Power Reduction From 50% Power (continued)

7. **IF** two MFWPs in service
THEN
SHUTDOWN one MFWP:

   a. **IF** 1A MFWP is to be removed from service,
   THEN

      1) **PLACE** 1-SIC-46-20A, MFPT A speed control in MANUAL and **DECREASE** speed.

      2) **ENSURE** recirc valve OPENS

      3) **WHEN** 1A MFP speed is approx 3,300 rpm,
      THEN
      PLACE 1-HS-46-9A, to TRIP

      4) **REFER TO** SOI-2 & 3.01, Condensate and Feedwater System to complete shutdown.

Step	Action/Expected Response	Response Not Obtained

3.3 Power Reduction From 50% Power (continued)

b. **IF** 1B MFWP is to be removed from service,
THEN

1) **PLACE** 1-SIC-46-20B, MFPT B speed control in MANUAL and **DECREASE** speed.

2) **ENSURE** recirc valve OPENS

3) **WHEN** 1B MFP speed is approx 3,300 rpm,
THEN
PLACE 1-HS-46-36A, to TRIP

4) **REFER TO** SOI-2 & 3.01, Condensate and Feedwater System to complete shutdown.

8. **STOP** the second #7 Heater Drain Tank pump, and **PLACE** both #7 Heater Drain Tank pumps handswitches in PULL TO LOCK.

9. **CLOSE** #7 Heater Drain Tank pumps discharge valves:

- 1-HS-6-143A
- 1-HS-6-163A
- 1-HS-6-184A

Step	Action/Expected Response	Response Not Obtained
3.3	**Power Reduction From 50% Power (continued)**	
10.	**WHEN** less than 40% power, **THEN** **CHECK** 1-HS-3-264A, AMSAC BLOCK <40% light is LIT.	Manually **PUSH** AMSAC Test/Blk/Operate, 1-HS-3-264A AMSAC TEST/BLOCK pushbutton.
11.	**WHEN** 30% power is reached, **THEN** **PERFORM** the following:	
	a. **ENSURE** turbine is operating in the IMP OUT position.	
	b. **STOP** and **PULL-TO-LOCK** one of two #3 Heater Drain Pumps.	
	c. **STOP** one of two operating CBPs by PLACING the pump handswitches to STOP.	
	d. **STOP** one of three operating Hotwell Pumps.	
12.	**STABILIZE** the unit between 20 and 30% reactor power with reliable steam/feed flow indications.	**PERFORM** either of the following: **(ρ) TRIP** reactor and ** **GO TO** E-0, Reactor Trip or Safety Injection. OR **(ρ) TRIP** turbine and ** **GO TO** AOI-17, Turbine Trip.
13.	**EVALUATE** conditions to determine if turbine AND reactor shutdown required.	

3.3 Power Reduction From 50% Power (continued)

14. **WHEN** Boration is COMPLETE,
THEN
PERFORM the following to REALIGN makeup to AUTO:

    a. **ENSURE** 1-FC-62-142, PW TO BLENDER, on 35% (70gpm) and Manual-Auto toggle in AUTO.

    b. **ADJUST** 1-FC-62-139, BA TO BLENDER, to new RCS C_B.

    c. **PLACE** 1-HS-62-140B, VCT MAKEUP MODE, in AUTO.

    d. **TURN** 1-HS-62-140A, VCT MAKEUP CONTROL, to START.

    e. **CHECK** Red light is LIT.

15. **WHEN** rated thermal power change exceeds 15% in one hour,
THEN
NOTIFY Chemistry to initiate 1-SI-68-28.

3.3 Power Reduction From 50% Power (continued)

16. **PERFORM** the following:

- **REFER TO** GO-5, Unit Shutdown From 30% Reactor Power To Hot Standby for guidance in removing equipment from service.
- **(ρ) ADJUST** reduction rate as necessary to facilitate removal of equipment and maintain controlled conditions.
- **CONTINUE** rapid load reduction.

End of Subsection

4.0 DISCUSSION

A. When removing the unit from service with conditions that require a rapid shutdown from 100% RTP, it is advisable to begin a boration in accordance with the applicable Reactivity Control Plan. The boration should assist in keeping the rods above the RIL during the power reduction while allowing the rods to insert to maintain T_{avg}/T_{ref}. The inserted rods should provide the capacity to withdraw rods and stabilize T_{avg} in the event that a momentary hold is required during the power reduction.

B. Very fast ramp rates (up to 5%/min) may result in rods inserting below the RIL briefly until the effects of the boration are realized. The Reactivity Control Plan boration volumes are calculated to maintain nominal rod position for AFD control. Boration should be started at the beginning of the power reduction. Time outside of the plus or minus 3% target band during the load reduction is allowed, but should be minimized in order to limit the resultant Xenon oscillation. Rods should remain in automatic for T_{avg} control during the load reduction until the applicable Reactivity Control Plan specifies Manual control.

C. For events requiring a partial load reduction at a rapid rate such as an automatic turbine runback or the need for manual run back the turbine in order to remove equipment from service, the load reduction should be made using rods for T_{avg} control. Boration should be initiated as soon as the unit is stabilized at the new lower power level in order to clear any RIL alarms and to return AFD to within limits. Placard values can be used to commence the initial boration, and then the rod position can be optimized by a more detailed review of the Reactivity Control Plan. The guidance for a partial load drop assumes a rapidly evolving transient occurring over a short duration. In situations requiring a partial load reduction of greater than 50% load, and it is determined during the evolution that the RIL is being exceeded, then a boration should be commenced during the load reduction as soon as time and operator span-of-control allows.

D. For power levels less than 50% power the TS limits for AFD do not apply. While it is desirable to maintain Delta Flux within the target band for all power levels greater than 15%, it should be emphasized that plant stability and maneuverability is a higher priority than Delta Flux control at low power levels.

5.0 REFERENCES

5.1 Performance

A. AOI-16, Loss of Normal Feedwater.

B. AOI-17, Turbine Trip.

C. AOI-37, Turbine Runback Response.

D. E-0, Reactor Trip Or Safety Injection.

E. GO-4, Normal Power Operation.

F. GO-5, Unit Shutdown From 30% Reactor Power To Hot Standby.

G. EPIP-1, Emergency Plan Classification Flowchart.

H. 1-SI-68-28, Primary Radiochemistry Requirements.

I. SOI-2 & 3.01, Condensate and Feedwater System.

J. SOI-62.02, Boron Concentration Control.

5.2 Developmental

A. SPP-10.4, Reactivity Management Program.

B. TI-7.012, Administration Of The Reactivity Briefing Sheets And Reactivity Control Plan

5.3 Technical Specifications

A. 3.1.1, Shutdown Margin (SDM) - T-avg > 200°F.

B. 3.1.7, Control Bank Insertion Limits

C. 3.2.3, Axial Flux Difference (AFD)

D. LCO 3.0.3

Appendix A
(Page 1 of 2)

Operating with Turbine Controls in Manual Mode

1.0 INSTRUCTIONS

NOTES
1) This section should only be used when the OPERATOR AUTO mode is malfunctioning and the turbine is online.
2) When the turbine controls are in MANUAL mode the active Turbine Manual buttons will be illuminated.
3) Turbine load changes immediately when a raise or lower button is pressed.
4) Brief momentary button presses are best for making small load changes.
5) Raising and Lowering load contained in steps 1.0B and 1.0C below may be used alternatively to achieve desired load.

A. **IF** turbine controls are **NOT** in TURBINE MANUAL mode **AND** TURBINE MANUAL mode is desired, **THEN**

PRESS TURBINE MANUAL button in TURBINE MODES group.

B. **INITIATE** load reduction by PERFORMING the following on the Turbine EHC panel:

1. **(ρ) MOMENTARILY PRESS** the lower button (GV) in the TURBINE MANUAL group.
2. **MONITOR** REFERENCE DROP.
3. **REPEAT** Substeps 1.0B.1 and 1.0B.2 as required to achieve desired load.

Appendix A
(Page 2 of 2)

Operating with Turbine Controls in Manual Mode

1.0 INSTRUCTIONS (continued)

CAUTION

Raise and Lower buttons operate Governor Valves at a rate of 33%/ minute. If Fast push button is also depressed at the same time the valve movement rate is 133.3%/ minute.

C. **INITIATE** load increase by PERFORMING the following on the Turbine EHC panel:

1. **(ρ) MOMENTARILY PRESS** the raise button (GV) in the TURBINE MANUAL group.

2. **MONITOR** REFERENCE INCREASE.

3. **REPEAT** Substeps 1.0C.1 and 1.0C.2 as required to achieve desired load.

D. **IF** OPERATOR AUTO turbine control mode is desired, **THEN**

PRESS OPER AUTO button in TURBINE MODES group.

Source Notes
(Page 1 of 1)

Requirements Statement	Source Document	Implementing Statement	Affected Steps
Rewrite GOI-6 to become a rapid load reduction procedure.	SOER 94-01 Rec. 2	C.1	All

Runback

Unit 1

Burnup = 150 MWD/MTU
Boron Concentration = 1032.8 ppm

Gal BA per ppm = 11.0
Gal PW per ppm = 62
Gal RWST per ppm = 29.6

AOI-39

TURBINE LOAD REDUCTION RATE (%/min)	BORATION FLOW RATE (gal/min)	BORIC ACID VOLUME TO REDUCE POWER FROM 100% TO 20%
2%/min	31 gpm * 40 gpm	~ 1345 gal Total
3%/min	40 gpm * 46 gpm	
≥ 4%/min	40 gpm * 61 gpm	

* When rods less than Lo-Lo Rod Insertion Limit

Power (% RTP)	Boration (gal BA)	CBD Position (steps)
100	0	220
85	200	197
80	285	193
75	369	189
65	535	182
40	982	166
20	1345	157

B.1.b
Synchronize DG 1A-A from the MCR

NOTE: This JPM may be conducted on the Simulator OR in the Main Control Room

EVALUATION SHEET

Task: Synchronize DG 1A-A from the MCR

Alternate Path: n/a

Facility JPM #: 3-OT-JPMR060A

Safety Function: 6 **Title:** Electrical Systems

K/A 064 A1.03 Ability to manually operate and/or monitor in the control room: Manual start, loading, and stopping of the ED/G

Rating(s): 3.9/3.9 **CFR:** 41.7 / 45.5 to 45.8

Evaluation Method: Simulator __X__ In-Plant __X__ **Classroom** _____

References: SOI-82.01, "Diesel Generator (DG) 1A-A," Rev. 73.

Task Number: RO-082-SOI-82-002 **Title:** Start and synchronize the emergency diesel generators.

Task Standard: The applicant synchronizes 1A-A Diesel Generator to the shutdown board from the MCR, per SOI-82.01 Section 8.1.4, and then loads the DG to 4 MW and 0.75-1.25 MVARs.

Validation Time: 18 minutes **Time Critical:** Yes _____ No __X__

==

Applicant: __________________________ ________________ Time Start: ________
NAME Docket No. Time Finish: ________

Performance Rating: SAT ____ UNSAT ____ Performance Time ___

Examiner: __________________________ ___________________________/________
NAME SIGNATURE DATE

==

COMMENTS

____

____

____

____

____

SIMULATOR OPERATOR INSTRUCTIONS:

IF CONDUCTED IN THE SIMULATOR, THEN PERFORM THE FOLLOWING:

1. **ENSURE NRC Examination Security has been established.**
2. **RESET to Initial Condition 323 by performing the following actions:**
   a. **Select ICManager on the THUNDERBAR menu (right hand side of Instructor Console Screen).**
   b. **Locate IC 323.**
   c. **Right "click" on IC 323.**
   d. **Select Reset on the drop down menu.**
   e. **Right "click" on RESET.**
   f. **Enter the password for IC 323.**
   g. **Select "Yes" on the INITIAL CONDITION RESET pop-up window.**
   h. **Perform SWITCH CHECK.**
3. **ENSURE the 1A-A Diesel Generator is running, with Window 199-A DG RUNNING annunciator LIT.**
4. **Place simulator in RUN and acknowledge any alarms.**
5. **ENSURE a marked-up copy of SOI-82.01, "Diesel Generator (DG) 1A-A," signed, circled-and-slashed through Step 3, is available to the Examiner.**
6. **ENSURE "Extra Operator" is present in the simulator.**
7. **Place simulator in FREEZE until Examiner cue is given.**

IF CONDUCTED IN THE MAIN CONTROL ROOM, THEN:

Tools/Equipment/Procedures Needed:

ENSURE a marked-up copy of SOI-82.01, "Diesel Generator (DG) 1A-A," signed, circled-and-slashed through Step 3, is available to the Examiner, marked as "EXAM MATERIAL, FOR TRAINING ONLY," for each applicant.

Begin the JPM at the Shift Manager's Desk.

READ TO APPLICANT

DIRECTION TO APPLICANT:

I will explain the initial conditions, and state the task to be performed. All control room steps shall be performed for this JPM, including any required communications. I will provide initiating cues and reports on other actions when directed by you. Ensure you indicate to me when you understand your assigned task. To indicate that you have completed your assigned task return the cue sheet I provided you.

INITIAL CONDITIONS:

1. **Testing is being conducted on 1A-A diesel generator. It is to be paralleled to the shutdown board for a Factory Representative on site.**

2. **The 1A-A DG is running at rated speed, after performance of SOI-82.01, "Diesel Generator (D/G) 1A-A," Section 8.1.3 Idle Speed to Rated Speed.**

3. **You are an extra control room operator on shift.**

INITIATING CUES:

1. **The Unit Supervisor directs you to parallel the 1A-A diesel generator to the 1A-A Shutdown Board per SOI-82.01, "Diesel Generator (D/G) 1A-A" and load it to 4 MWs.**

2. **SOI-82.01, "Diesel Generator (D/G) 1A-A," Section 8.1.4 Steps 1 through 3 have been performed.**

3. **You are to inform the Unit Supervisor when the diesel generator is loaded to 4 MWs.**

STEP/STANDARD	SAT/UNSAT

EXAMINER: USE PAGES 6 through 13 if conducting JPM on the Simulator.

SIMULATOR PERFORMANCE

START TIME: _______

STEP 1: [4] **PLACE** 1-HS-82-18, DG MODE SELECTOR Switch, in PARALLEL [0-M-26].

CRITICAL STEP

___ SAT

___ UNSAT

STANDARD:

The applicant locates 1-HS-82-18 DG MODE SELECTOR and rotates the handswitch to the right from the "UNIT" to the "PARALLEL" position.

This step is critical for task performance to allow proper operation of voltage regulator & DG speed droop circuits.

COMMENTS:

STEP 2: [5] **ENSURE** the following sync switches for 1A-A D/G in OFF:

___ SAT

___ UNSAT

NOMENCLATURE	LOCATION	POSITION	UNID	PERF INITIAL
MAINTENANCE 6.9 UNIT BD 1B SYNC SWITCH	0-M-26	OFF	1-HS-57-45	
NORMAL - CSST C SYNC SWITCH	0-M-26	OFF	1-HS-57-42	
DG SYNC SWITCH	0-M-26	OFF	1-HS-57-47	
ALTERNATE CSST D SYNC SWITCH	0-M-26	OFF	1-HS-57-114	

STANDARD:

Applicant locates each of the listed sync switches and determines that each handswitch is in the OFF position

COMMENTS:

STEP/STANDARD	SAT/UNSAT
STEP 3: [6] **PLACE** 1-HS-57-47, DG SYNC SWITCH, in SYN [0-M-26]. STANDARD: Applicant locates 11-HS-57-47, DG SYNC SWITCH and rotates the switch to the right to the"SYN" position. **This step is critical to allow synchronization of D/G to 1A-A Shutdown board.** COMMENTS:	**CRITICAL STEP** ___ SAT ___ UNSAT

CAUTION

When adjusting speed and voltage, care must be taken to prevent overshooting desired values. Voltage control response is approximately five times faster than speed control response.

STEP/STANDARD	SAT/UNSAT
STEP 4: [7] **MATCH** generator Incoming Frequency (1-XI-82-2) with Running Frequency (1-XI-82-3) using 1-HS-82-13, SPEED CONTROL [0-M-26]. STANDARD: Applicant operates 1-HS-82-13 to adjust generator frequency (incoming) on 1-XI-82-2 to match with board frequency (running) on 1-XI-82-3. **This step is critical to allow synchronization of D/G to 1A-A Shutdown board.** COMMENTS:	**CRITICAL STEP** ___ SAT ___ UNSAT

STEP/STANDARD	SAT/UNSAT
STEP 5: [8] **MATCH** generator Incoming Voltage (1-EI-82-4) with Running Voltage (1-EI-82-5) using 1-HS-82-12, VOLTAGE REGULATOR [0-M-26]. STANDARD: Applicant operates 1-HS-82-12 to adjust generator voltage on 1-EI-82-4 to board voltage on 1-EI-82-5. **This step is critical to allow synchronization of D/G to 1A-A Shutdown board.** COMMENTS:	**CRITICAL STEP** ___ SAT ___ UNSAT

NOTE

Steps 8.1.4[9], 8.1.4[10], and 8.1.4[11] should be read before performing.

EXAMINER: The applicant may use a stopwatch to time the 15 second rotation. Provide stopwatch if asked.

STEP/STANDARD	SAT/UNSAT
STEP 6: [9] **ENSURE** DG Frequency and Voltage are MATCHED with 6.9 kV SD Bd, **AND ADJUST** 1-HS-82-13, SPEED CONTROL, [0-M-26] to obtain desired clockwise rotation (15 or more seconds) on 1-XI-82-1, TRAIN 1A-A SYNCHROSCOPE. STANDARD: ___Applicant observes that running and incoming frequency and voltage are matched or takes appropriate actions to make them equal. ___The applicant adjusts 1-HS-82-13 SPEED CONTROL to make the synchroscope movie slowly in the clockwise direction at 15 seconds or more per rotation on the scope. **This step is critical to ensure proper DG synchronization that is performed in the next step.** COMMENTS:	**CRITICAL STEP** ___ SAT ___ UNSAT

NOTES

1) Steps 8.1.4[10] through 8.1.4[11.3] may be signed off after completion of Step 8.1.4[11.3].

2) Peer checking required on next step.

STEP/STANDARD	SAT/UNSAT
STEP 7: [10] **WHEN** 1-XI-82-1, TRAIN 1A-A SYNCHROSCOPE (1-XI-82-1) reaches 12 o'clock, **THEN TURN** 1-HS-57-46A, 1912 - DG TO SD BD 1A-A, to CLOSE. STANDARD: Applicant monitors 1-XI-82-1, TRAIN 1A-A SYNCHROSCOPE and when it reaches the 12 o'clock position, rotates 1-HS-57-46A, 1912 - DG TO SD BD 1A-A, to the right to the "CLOSE" position. **This step is critical to allow synchronization of D/G to 1A-A Shutdown board** COMMENTS:	**CRITICAL STEP** ___ SAT ___ UNSAT
NOTE Maintain outgoing Vars by periodically adjusting voltage regulator with 1-HS-82-12 while loading D/G. Controls should **NOT** be operated simultaneously.	
STEP 8: [11] **PERFORM** the following: [11.1] **LOAD** DG promptly using 1-HS-82-13, SPEED CONTROL to at least 1.1 Megawatts as indicated on 1-EI-82-10A, DG MEGAWATTS (0-M-26). STANDARD: Applicant periodically rotates 1-HS-82-13 to the RAISE position to increase generator load on 1-EI-82-10A, DG MEGAWATTS to ≥ 1.1 Megawatts. **This step is critical to ensure proper DG loading and avoid reverse power trip.** COMMENTS:	**CRITICAL STEP** ___ SAT ___ UNSAT

STEP/STANDARD	SAT/UNSAT

NOTE

DG Megavars may "swing" when the 6.9kV automatic tap changers engage to stabilize voltage in the system.

STEP/STANDARD	SAT/UNSAT
STEP 9: [11.2] **MAINTAIN** DG MEGAVARS 0.75 to 1.25 OUTGOING on 1-EI-82-11A, with 1-HS-82-12, VOLTAGE REGULATOR. STANDARD: Applicant periodically adjusts 1-HS-82-12, VOLTAGE REGULATOR to maintain Megavars between 0.75 and 1.25 OUTGOING on 1-EI-82-11A. **This step is critical to ensure proper DG loading and avoid reverse power trip.** COMMENTS:	**CRITICAL STEP** ___ SAT ___ UNSAT

CAUTION

Operation of the DG at load of 2.7 MW or less for extended period of time may lead to exhaust fire.

STEP/STANDARD	SAT/UNSAT
STEP 10: [11.3] **RAISE** load to at least 3.3 Megawatts. STANDARD: Applicant periodically rotates 1-HS-82-13 to the RAISE position to increase generator load on 1-EI-82-10A, DG MEGAWATTS to ≥ 3.3 Megawatts. Applicant periodically adjusts 1-HS-82-12, VOLTAGE REGULATOR to maintain Megavars between 0.75 and 1.25 OUTGOING on 1-EI-82-11A. **This step is to ensure DG is loaded per task assignment, and the information in the CAUTION is complied with.** COMMENTS:	**CRITICAL STEP** ___ SAT ___ UNSAT
STEP 11: [11.4] **PLACE** 1-HS-57-47, DG SYNC SWITCH, to OFF. STANDARD: Applicant locates 1-HS-57-47, DG SYNC SWITCH, and rotates the handswitch from the "SYN" position to the left to the "OFF" position. COMMENTS:	___ SAT ___ UNSAT

STEP/STANDARD	SAT/UNSAT
STEP 12: [11.5] **MAINTAIN** DG operation for a minimum of one hour OR until engine temperatures stabilize. STANDARD: Applicant informs the Unit Supervisor that the 1A-A DG has been synchronized and loaded to 4 MW. **EXAMINER: When this step is addressed, state "Another operator will continue from here."** COMMENTS: **END OF TASK**	___ SAT ___ UNSAT

STOP TIME ________

STEP/STANDARD	SAT/UNSAT

EXAMINER: USE PAGES 14 through 22 if conducting JPM in the Main Control Room.
MAIN CONTROL ROOM PERFORMANCE

START TIME ________

STEP 1: [4] **PLACE** 1-HS-82-18, DG MODE SELECTOR Switch, in PARALLEL [0-M-26]. STANDARD: The applicant locates 1-HS-82-18 DG MODE SELECTOR and indicates that the handswitch must be rotated to the right from the "UNIT" to the "PARALLEL" position. **CUE: After the applicant has demonstrated correct switch placement, indicate that 1-HS-82-18 DG MODE SELECTOR is in the "PARALLEL" position.** **This step is critical for task performance to allow proper operation of voltage regulator & DG speed droop circuits.** COMMENTS:	**CRITICAL STEP** ___ SAT ___ UNSAT

STEP/STANDARD	SAT/UNSAT

STEP 2: [5] **ENSURE** the following sync switches for 1A-A D/G in OFF:

___ SAT

___ UNSAT

NOMENCLATURE	LOCATION	POSITION	UNID	PERF INITIAL
MAINTENANCE 6.9 UNIT BD 1B SYNC SWITCH	0-M-26	OFF	1-HS-57-45	
NORMAL - CSST C SYNC SWITCH	0-M-26	OFF	1-HS-57-42	
DG SYNC SWITCH	0-M-26	OFF	1-HS-57-47	
ALTERNATE CSST D SYNC SWITCH	0-M-26	OFF	1-HS-57-114	

STANDARD:

Applicant locates each of the listed sync switches and determines that each handswitch is in the OFF position

COMMENTS:

STEP 3: [6] **PLACE** 1-HS-57-47, DG SYNC SWITCH, in SYN [0-M-26].

CRITICAL STEP

___ SAT

___ UNSAT

STANDARD:

Applicant locates 1-HS-57-47, DG SYNC SWITCH and indicates that the handswitch must be rotated from the "OFF" position to the right to the"SYN" position.

CUE: After applicant has demonstrated correct switch placement, indicate that 1-HS-57-47, DG SYNC SWITCH is in the "SYN" position.

This step is critical to allow synchronization of D/G to 1A-A Shutdown board.

COMMENTS:

STEP/STANDARD	SAT/UNSAT

CAUTION

When adjusting speed and voltage, care must be taken to prevent overshooting desired values. Voltage control response is approximately five times faster than speed control response.

STEP 4: [7] **MATCH** generator Incoming Frequency (1-XI-82-2) with Running Frequency (1-XI-82-3) using 1-HS-82-13, SPEED CONTROL [0-M-26].

CRITICAL STEP

___ SAT

___ UNSAT

STANDARD:

Applicant locates 1-HS-82-13 and indicates that to adjust generator frequency (incoming) on 1-XI-82-2 to match with board frequency (running) on 1-XI-82-3, handswitch 1-HS-82-13 must be rotated to the "RAISE " position until incoming and running frequency are matched.

CUE: If asked, indicate on 1-XI-82-2, INCOMING FREQUENCY, 59.4 HZ.

CUE: If asked, indicate on 1-XI-82-3, RUNNING FREQUENCY, 60.0 HZ.

CUE: After applicant has demonstrated proper switch placement, indicate that 1-XI-82-2 and 1-XI-82-3 are matched.

This step is critical to allow synchronization of D/G to 1A-A Shutdown board.

COMMENTS:

STEP/STANDARD	SAT/UNSAT
STEP 5: [8] **MATCH** generator Incoming Voltage (1-EI-82-4) with Running Voltage (1-EI-82-5) using 1-HS-82-12, VOLTAGE REGULATOR [0-M-26]. STANDARD: Applicant locates 1-HS-82-12 and indicates that the handswitch must be rotated from the neutral position to the right to the "RAISE" position to adjust generator voltage on 1-EI-82-4 to board voltage on 1-EI-82-5. **CUE: If asked, indicate on 1-XI-82-4, INCOMING VOLTAGE, kilovolts** **CUE: If asked, indicate on 1-XI-82-5, RUNNING VOLTAGE, kilovolts** **CUE: After applicant has demonstrated proper switch placement, indicate that 1-XI-82-4 and 1-XI-82-5 are matched.** **This step is critical to allow synchronization of D/G to 1A-A Shutdown board.** COMMENTS:	**CRITICAL STEP** ___ SAT ___ UNSAT

NOTE

Steps 8.1.4[9], 8.1.4[10], and 8.1.4[11] should be read before performing.

EXAMINER: The applicant may use a stopwatch to time the 15 second rotation. Provide stopwatch if asked.

STEP/STANDARD	SAT/UNSAT
STEP 6: [9] **ENSURE** DG Frequency and Voltage are MATCHED with 6.9 kV SD Bd, **AND ADJUST** 1-HS-82-13, SPEED CONTROL, [0-M-26] to obtain desired clockwise rotation (15 or more seconds) on 1-XI-82-1, TRAIN 1A-A SYNCHROSCOPE. STANDARD: ___Applicant observes that running and incoming frequency and voltage are matched or takes appropriate actions to make them equal. ___The applicant adjusts 1-HS-82-13 SPEED CONTROL to make the synchroscope movie slowly in the clockwise direction at 15 seconds or more per rotation on the scope. **CUE: If asked, indicate on 1-XI-82-2, INCOMING FREQUENCY, 60.0 HZ.** **CUE: If asked, indicate on 1-XI-82-3, RUNNING FREQUENCY, 60.0 HZ.** **CUE: After applicant has demonstrated proper switch placement, indicate that 1-XI-82-1, SYNCHROSCOPE is rotating slowly in the clockwise direction at approximately 17 seconds per rotation.** **This step is critical to ensure proper DG synchronization that is performed in the next step.** COMMENTS:	**CRITICAL STEP** ___ SAT ___ UNSAT

NOTES

1) Steps 8.1.4[10] through 8.1.4[11.3] may be signed off after completion of Step 8.1.4[11.3].

2) Peer checking required on next step.

STEP/STANDARD	SAT/UNSAT
STEP 7: [10] **WHEN** 1-XI-82-1, TRAIN 1A-A SYNCHROSCOPE (1-XI-82-1) reaches 12 o'clock, **THEN TURN** 1-HS-57-46A, 1912 - DG TO SD BD 1A-A, to CLOSE. STANDARD: Applicant locates and explains that 1-XI-82-1, TRAIN 1A-A SYNCHROSCOPE will be observed and that when the indicator reaches the 12 o'clock position, handswitch 1-HS-57-46A, 1912 - DG TO SD BD 1A-A, will be rotated to the right to the "CLOSE" position. When 1-HS-57-46A is closed, the indicator on -XI-82-1, TRAIN 1A-A SYNCHROSCOPE will stop rotating. **This step is critical to allow synchronization of D/G to 1A-A Shutdown board** COMMENTS:	**CRITICAL STEP** ___ SAT ___ UNSAT

NOTE

Maintain outgoing Vars by periodically adjusting voltage regulator with 1-HS-82-12 while loading D/G. Controls should **NOT** be operated simultaneously.

STEP/STANDARD	SAT/UNSAT
STEP 8: [11] **PERFORM** the following: [11.1] **LOAD** DG promptly using 1-HS-82-13, SPEED CONTROL to at least 1.1 Megawatts as indicated on 1-EI-82-10A, DG MEGAWATTS (0-M-26). STANDARD: Applicant indicates that 1-HS-82-13 will be rotated to the RAISE position to increase generator load on 1-EI-82-10A, DG MEGAWATTS to ≥ 1.1 Megawatts. **CUE: After applicant has demonstrated proper switch operation, indicate that 1-EI-82-10A, DG MEGAWATTS is 1.2 Megawatts.** **This step is critical to ensure proper DG loading and avoid reverse power trip.** COMMENTS:	**CRITICAL STEP** ___ SAT ___ UNSAT

NOTE
DG Megavars may "swing" when the 6.9kV automatic tap changers engage to stabilize voltage in the system.

STEP/STANDARD	SAT/UNSAT
STEP 9: [11.2] **MAINTAIN** DG MEGAVARS 0.75 to 1.25 OUTGOING on 1-EI-82-11A, with 1-HS-82-12, VOLTAGE REGULATOR. STANDARD: Applicant indicates that 1-HS-82-12, VOLTAGE REGULATOR must be periodically adjusted to maintain Megavars between 0.75 and 1.25 OUTGOING on 1-EI-82-11A. **This step is critical to ensure proper DG loading and avoid reverse power trip.** COMMENTS:	**CRITICAL STEP** ___ SAT ___ UNSAT

CAUTION

Operation of the DG at load of 2.7 MW or less for extended period of time may lead to exhaust fire.

STEP/STANDARD	SAT/UNSAT
STEP 10: [11.3] **RAISE** load to at least 3.3 Megawatts. STANDARD: Applicant indicates that 1-HS-82-13 will be rotated to the RAISE position to increase generator load on 1-EI-82-10A, DG MEGAWATTS to ≥ 3.3 Megawatts. Applicant indicates that 1-HS-82-12, VOLTAGE REGULATOR must be periodically adjusted to maintain Megavars between 0.75 and 1.25 OUTGOING on 1-EI-82-11A. **CUE: After applicant has demonstrated proper switch operation, indicate that 1-EI-82-10A, DG MEGAWATTS is 4 Megawatts.** **This step is to ensure DG is loaded per task assignment, and the information in the CAUTION is complied with.** COMMENTS:	**CRITICAL STEP** ___ SAT ___ UNSAT
STEP 11: [11.4] **PLACE** 1-HS-57-47, DG SYNC SWITCH, to OFF. STANDARD: Applicant locates 1-HS-57-47, DG SYNC SWITCH, and indicates that the handswitch must be rotated from the "SYN" position to the left to the "OFF" position. **CUE: After applicant has demonstrated proper switch placement, indicate that 1-HS-57-47, DG SYNC SWITCH is in the "OFF" position.** COMMENTS:	___ SAT ___ UNSAT

STEP/STANDARD	SAT/UNSAT
STEP 12: [11.5] **MAINTAIN** DG operation for a minimum of one hour OR until engine temperatures stabilize. STANDARD: Applicant contacts the Unit Supervisor in order to have corrective actions initiated. **EXAMINER: When this step is addressed, state "Another operator will continue from here."** COMMENTS: **END OF TASK**	___ SAT ___ UNSAT

APPLICANT CUE SHEET

(RETURN TO EXAMINER UPON COMPLETION OF TASK)

INITIAL CONDITIONS:

1. Testing is being conducted on 1A-A diesel generator. It is to be paralleled to the shutdown board for a Factory Representative on site.

2. The 1A-A DG is running at rated speed, after performance of SOI-82.01, "Diesel Generator (D/G) 1A-A," Section 8.1.3 Idle Speed to Rated Speed.

3. You are an extra control room operator on shift.

INITIATING CUES:

1. The Unit Supervisor directs you to parallel the 1A-A diesel generator to the 1A-A Shutdown Board per SOI-82.01, "Diesel Generator (D/G) 1A-A" and load it to 4 MWs.

2. SOI-82.01, "Diesel Generator (D/G) 1A-A," Section 8.1.4 Steps 1 through 3 have been performed.

3. You are to inform the Unit Supervisor when the diesel generator is loaded to 4 MWs.

TVA

Watts Bar Nuclear Plant

Unit 1

System Operating Instruction

SOI-82.01

Diesel Generator (DG) 1A-A

Revision 0073

Quality Related

Level of Use: Continuous Use

Effective Date: 01-05-2011

Responsible Organization: OPS, Operations

Prepared By: Brent Henderson

Approved By: Brian McIlnay

Revision Log

Revision or Change Number	Effective Date	Affected Page Numbers	Description of Revision/Change
68	03/15/10	51, 55	Added steps addressing XFER SELECTOR position prior and after removal of DG from an emergency start condition. [PER 219381]
69	04/05/10	2,76-78	Added section 8.9 to cross-tie start air receivers in support of maintenance.
70	06/14/10	2, 6, 9-11, 15, 18, 20, 23, 29, 31, 33, 36, 37, 44-48, 56, 62-64, 66-69, 71, 73-75, 78, 81, 83-85	Minor/Editorial type changes: Added notes and general description information on the operation of the Diesel Cylinder Test Plug. Added Appendix C and D showing the Diesel Cylinder Test Plug in the OPEN and CLOSED position.[PER 232018] Moved checklist to external attachments. Included end of section closeout steps. Changed to commitments to match procedure writers guide requirements. Updated SPP-9.17 reference.
71	07/23/10	2, 9, 31, 37, 46, 47, 82, 86, 87	Minor/Editorial type changes: Added notes and general description information on the use of the D/G Test Plug Feeler Gauge. [PER 232018] Changed commitments to match procedure writers guide requirements. Provided clarification on aux board operability with an EBR fan out of service. [PER 235807]
72	09/01/10	2, 73, 74	Enhanced Section 8.8 to address operation of LOVs (PER 238251).
73	01/05/11	2, 12, 14, 17, 19, 22, 28, 32, 35-37, 39, 40, 43, 48, 56, 62-64, 66, 68, 69, 71, 73-75, 78	Minor editorial changes. Corrective actions for PER 254638 and 255195. Added End of Section Closure

Table of Contents

Table of Contents (continued)

1.0 INTRODUCTION

1.1 Purpose

This Instruction provides the detailed steps for the operation of the Standby Diesel Generator System.

1.2 Scope

This Instruction includes operation of the following subsystems of the Standby Diesel Generator System:

A. Lube Oil Transfer System

B. DG Battery System

C. Starting Air System for 1A-A DG

D. Fuel Oil System for 1A-A DG

E. Lubricating Oil System

F. Jacket Water System

G. DG Ventilation

2.0 REFERENCES

2.1 Performance References

A. SOI-39.02, "DG CO_2 System"

B. SOI-67.01, "Essential Raw Cooling Water System"

C. 0-SI-82-9, "Diesel Generator Start History"

D. CM-6.03, "Diesel Fuel Control"

E. 0-PI-OPS-17.0, "18 Month Locked Valve Verification"

F. SPP-9.17, "Temporary Equipment Control"

G. TI-12.15, "161KV Offsite Power Requirements"

2.2 Developmental References

A. FSAR Section 8.3.1.1

B. Technical Specifications 3.8, Electrical Power Systems

C. N3-30DB-4002, "System Description for Diesel Generator Building Ventilation System"

D. N3-82-4002, "System Description for Standby Diesel Generator"

E. TVA Drawings:

1. 45N724-1
2. 45W727
3. 45W732
4. 45W760-18-1
5. 45W760-30-22, -23
6. 45W760-82 Series
7. 45W760-211-4
8. 47W839-1
9. 47W840-1
10. 47W866-9

F. Vendor Manual: WBN-VTM-P318-0010, The Power System Diesel Generator Lube Oil System, Contract No 74C63-083090.

G. Vendor Manual: WBN-VTM-P318-0030, Power System Diesel Generator Engine Cooling System, Contract No 74C63-083090.

H. Vendor Manual: WBN-VTM-P318-0070, Power Systems Diesel Generator, Contract No 083090.

I. Vendor Manual: WBN-VTM-P318-0110, Power System Diesel Generator Air Starting System, Contract No 74C63-083090.

J. Vendor Manual: WBN-VTM-P318-0120, EMD Model 645 Diesel Engines Supplied Power Systems, Contract No 083090.

K. Vendor Manual: WBN-VTM-P318-0880, Parsons Peebles 4750 DW A.C. Synchronous Generators By Power Systems, Contract No 083090.

2.2 Developmental References (continued)

L. Vendor Manual: WBN-VTM-P318-1080, Power Systems Division Electro-Motive Engine Maintenance Manual For Woodward Governor.

M. Vendor Drawings: Contract No 74C63-83090, Drawing #C379C11501.

N. Vendor Manual: WBN-VTM-L015-0010, LaMarche Model A11B Automatic Float Battery Charger

3.0 PRECAUTIONS AND LIMITATIONS

A. Operation of Diesel Generators with engine jacket water temperature above 190°F can cause engine damage.

B. Diesel Generators should **NOT** be operated above idle speed if jacket water temperature is below 100°F, except in emergencies, to prevent possible engine damage.

C. Circulating oil pressure should be maintained above 10 psig when in standby alignment and above 40 psig when Diesel is running to ensure adequate engine lubrication.

D. Fire protection for the DG Bldg should be maintained in service.

E. The engine airbox drain should remain OPEN to remove accumulation of fuel oil.

F. Prematurely resetting 86 Lockout Relay (LOR) (resetting with red light illuminated) may cause the solenoid to burn out.

G. When a DG is operating in parallel with another feed to the SD Bd, operations that could cause the DG to become isolated to the SD Bd (even momentarily) should be avoided. Example: Transferring or testing the power supply feeding the SD Bd will cause the DG to be momentarily isolated. This may cause the DG to tie back into the system while "out of phase". [C.5]

H. When the DGs are required to be operable, only one DG should be tested at a time to ensure adequate availability of backup power.

I. Whenever the diesel aux board Electric Board Room fans are inoperable and outside air temperature is above 80°F but **NOT** above 95°F, an adjacent exhaust fan (from a like train) needs to be running and the door between the two rooms blocked open to keep the diesel Aux Board operable. See Appendix A.

J. Extended operation at speeds below 850 rpm with the exciter regulator in service can damage the exciter regulator.

K. If DG has operated for four or more cumulative hours below 1.32 megawatts load, it should be operated above 2.2 megawatts load for at least 30 minutes to purge exhaust stack.

L. If, during the startup of a DG for testing purposes, a thick black combustion product emits for more than five minutes, load should be raised to full load to burn excess fuel oil. If smoke will **NOT** clear, the DG should be **SHUT DOWN**.

M. Manual control of the voltage regulator is permissible only during emergencies and then only when the DG is the ONLY electrical supply to the SD Bd.

3.0 PRECAUTIONS AND LIMITATIONS (continued)

N. Following a DG shutdown from high crankcase pressure, handhold or top deck covers must **NOT** be opened for inspection until the engine has cooled for at least two hours. The engine must **NOT** be restarted or a restart attempted until it is determined that the cause of the trip was **NOT** a crankcase explosion. High crankcase pressure trip may indicate an explosive condition on the engine; for example, an overheated bearing may ignite the hot oil vapors if air is allowed to enter. If the shutdown was the result of a crankcase explosion, the engine shall **NOT** be operated until the pressure detector has been reset and the cause of the explosion can be determined and corrected.

O. At normal pressure, the Starting Air Receivers are designed to provide five normal starts without compressors operating. However, for subsequent starts, the compressors must be operating.

P. All four Diesel Generator Start Air Receivers must be aligned for service and maintained greater than or equal to 200 psig in order for the Diesel Generator to be considered OPERABLE for Technical Specification 3.8.3. However, the Diesel Generator may be functional and capable of starting with as little as one partially charged Start Air Receiver per engine.

Q. Air receiver pressure will drop below the minimum Tech Spec value (LCO 3.8.3 Action E) if the air receiver pressure is **NOT** initially high in the band maintained by the Air Compressor. If this occurs, this is an expected LCO entry.

R. The Day Tanks of each DG must be checked for condensate after each operation of the DG that exceeds one hour.

S. The installed 7-day tank local level meter has an accuracy of ±3.6 inches. The sticking method of determining tank level is for reference only. This method is subject to variation depending on the operator. The measurement stick is **NOT** a calibrated instrument. The tank elevation at the port where the DG 7-day tanks are "sticked" is located 1/2 inch lower that the tank's elevation where the level gage instrument taps is located. Therefore when comparing these readings, this 1/2 inch should be subtracted from the stick measurement.

T. DG should be operated with 1-HS-82-18, DG MODE SELECTOR, in UNIT position when DG is the only feed to SD Bd or in PARALLEL when DG is paralleled with another source to ensure proper load control.

U. If DG fails to start automatically upon a blackout (BO) signal, three manual starts may be attempted. One DG start will be attempted when the Loss of Offsite Power (LOOP) or BO occurs and the affected DG fails to start. Another start will be attempted when the first attempt fails, and then recognition of the BO event will result. The final start attempt will be reserved for the end of the BO event. [C.2]

3.0 PRECAUTIONS AND LIMITATIONS (continued)

V. To prevent Woodward Governor cycling, 1-RLY-82-LRX1A, DG 1A-A LOCAL/REMOTE CONTROL LOCKOUT, should be in LOCAL and 1-HS-82-23, MAINT-AUTO **SWITCH** GEN 1A-A, should be in MAINT when the Air Start Motor Valves are isolated.

W. Diesel Generators should **NOT** be loaded if jacket water temperature is below 120°F, except during fast-start testing from standby conditions as specifically required by periodic test instructions.

X. The Governor Position (Governor Differential) alarms may be disregarded while the engine is **SHUT DOWN**. During periods when the governor actuators are inactive, the engine fuel racks are free to independently "float" to achieve an equilibrium position. This design characteristic does **NOT** adversely affect DG operability.

Y. Except in an emergency, DG fast restart within 15 minutes to 3 hours should be avoided unless the camshaft lube oil level is in or above the bottom sightglass, and below the top sightglass.

Z. An extended period of time for a DG run is 8 hours of DG operation. [C.3]

AA. Ensure ERCW is isolated to an INPO DG when the other DGs have started.[C.4]

BB. If both Aux. AC and associated DC lube oil pumps fail to run or fail to supply ≥10 psig oil pressure when the DG is shutdown, then the DG should **NOT** be unnecessarily restarted until Aux AC and DC lube oil pump operation has been restored or the DG has been allowed to cool for 3 hours. The DG is **NOT** inoperable during this period and may be placed in standby.

CC. If severe weather is expected whenever the DG is to be synchronized to the grid, consideration should be given to reschedule this activity. This will minimize the risk for damaging the Diesel Generator being tested should a fault occur on the line at the time the Diesel Generator is operating in parallel.

DD. If a DG is emergency started and synchronized to the grid, notify the load dispatcher as soon as the plant is stabilized.

Date________ INITIALS

4.0 PREREQUISITE ACTIONS

4.1 Preliminary Actions

NOTES

1) Throughout this instruction where an **IF/THEN** statement exists, the step may be **N/A** if condition does **NOT** exist.
2) Signoffs/information in unused Sections may be left blank.
3) Throughout this instruction, Concurrent Verification (CV) may be marked **N/A** for breaker or fuse steps where no manipulation is performed.

[1] **INDICATE** Section to be performed, and reason for use.

5.0	Standby Alignment ________	7.0	Shutdown ________
6.0	Normal Operation ___N/A___	8.0	Infrequent Operations ________

Section/ Reason/ Remarks: ____________________________

____

____

____

4.2 Field Preparations

[1] **ENSURE** ERCW available to Heat Exchangers per SOI-67.01. ________

[2] **ENSURE** CO_2 Fire Protection System in service per SOI-39.02. ________

4.3 Approvals and Notifications

[1] **COORDINATE** performance with US and U-1 UO. ________

Date________ INITIALS

8.1.4 Manual-Remote Synchronizing DG

~~[1]~~ **PLACE** 1-RLY-82-LRX1A, DG 1A-A LOCAL/REMOTE CONTROL LOCKOUT, in REMOTE [1-ARB-82-A/1, Diesel Generator 1A-A Relay Board]. ________

~~[2]~~ **ENSURE** 1-RLY-82-86LOR1, DG 1A-A EMERGENCY START LOCKOUT, RESET [1-ARB-82-A/1, Diesel Generator 1A-A Relay Board]. ________

~~[3]~~ **NOTIFY** the load coordinator that a DG will be synchronized to the grid and that the WBN control room should be notified to remove the DG from service if the offsite power supply line protection is lost as detailed in TI-12.15. ________

[4] **PLACE** 1-HS-82-18, DG MODE SELECTOR Switch, in PARALLEL [0-M-26]. ________

[5] **ENSURE** the following sync switches for 1A-A D/G in OFF:

NOMENCLATURE	LOCATION	POSITION	UNID	PERF INITIAL
MAINTENANCE 6.9 UNIT BD 1B SYNC SWITCH	0-M-26	OFF	1-HS-57-45	
NORMAL - CSST C SYNC SWITCH	0-M-26	OFF	1-HS-57-42	
DG SYNC SWITCH	0-M-26	OFF	1-HS-57-47	
ALTERNATE CSST D SYNC SWITCH	0-M-26	OFF	1-HS-57-114	

[6] **PLACE** 1-HS-57-47, DG SYNC SWITCH, in SYN [0-M-26]. ________

CAUTION

When adjusting speed and voltage, care must be taken to prevent overshooting desired values. Voltage control response is approximately five times faster than speed control response.

[7] **MATCH** generator Incoming Frequency (1-XI-82-2) with Running Frequency (1-XI-82-3) using 1-HS-82-13, SPEED CONTROL [0-M-26]. ________

[8] **MATCH** generator Incoming Voltage (1-EI-82-4) with Running Voltage (1-EI-82-5) using 1-HS-82-12, VOLTAGE REGULATOR [0-M-26]. ________

Date________ INITIALS

8.1.4 Manual-Remote Synchronizing DG (continued)

NOTE

Steps 8.1.4[9], 8.1.4[10], and 8.1.4[11] should be read before performing.

[9] **ENSURE** DG Frequency and Voltage are MATCHED with 6.9 kV SD Bd, **AND**

ADJUST 1-HS-82-13, SPEED CONTROL, [0-M-26] to obtain desired clockwise rotation (15 or more seconds) on 1-XI-82-1, TRAIN 1A-A SYNCHROSCOPE. ________

________ CV

NOTES

1) Steps 8.1.4[10] through 8.1.4[11.3] may be signed off after completion of Step 8.1.4[11.3].
2) Peer checking required on next step.

Start of Critical Step(s)

[10] **WHEN** 1-XI-82-1, TRAIN 1A-A SYNCHROSCOPE (1-XI-82-1) reaches 12 o'clock, **THEN**

TURN 1-HS-57-46A, 1912 - DG TO SD BD 1A-A, to CLOSE. ________

End of Critical Step(s)

[11] **PERFORM** the following:

NOTE

Maintain outgoing Vars by periodically adjusting voltage regulator with 1-HS-82-12 while loading D/G. Controls should **NOT** be operated simultaneously.

[11.1] **LOAD** DG promptly using 1-HS-82-13, SPEED CONTROL to at least 1.1 Megawatts as indicated on 1-EI-82-10A, DG MEGAWATTS (0-M-26). ________

Date________ INITIALS

8.1.4 Manual-Remote Synchronizing DG (continued)

NOTE

DG Megavars may "swing" when the 6.9kV automatic tap changers engage to stabilize voltage in the system.

[11.2] **MAINTAIN** DG MEGAVARS 0.75 to 1.25 OUTGOING on 1-EI-82-11A, with 1-HS-82-12, VOLTAGE REGULATOR. ________

CAUTION

Operation of the DG at load of 2.7 MW or less for extended period of time may lead to exhaust fire.

[11.3] **RAISE** load to at least 3.3 Megawatts. ________

[11.4] **PLACE** 1-HS-57-47, DG SYNC SWITCH, to OFF. ________

[11.5] **MAINTAIN** DG operation for a minimum of one hour OR until engine temperatures stabilize. ________

[12] **IF** DG accumulates at least four hours operation below 1.32 megawatts load, **THEN**

OPERATE DG at a minimum of 2.2 megawatts load for at least 30 minutes to purge exhaust stacks. ________

[13] Section 8.1, Local Operation and Manual Remote Synchronizing of DG 1A-A complete. ________

[14] **IF** DG is to be shutdown from Main Control Room, **THEN**

GO TO Section 7.1. ________

[15] **IF** DG is to be shutdown locally [DGB], **THEN**

GO TO Section 7.2. ________

End of Section

B.1.c
Return NIS Power Range N41 to Service.

WATTS BAR NUCLEAR PLANT
JOB PERFORMANCE MEASURE
B.1.c
06-2011 NRC Exam

EVALUATION SHEET

Task: Return NIS Power Range N41 to Service.

Alternate Path: When 1-LIC-3-234 NUC PWR - SG 4 LEVEL CONTROL is placed in AUTO, 1-FCV-3-103 fails open. The applicant will manually trip the reactor based on the inability to control the increase in SG 4 level

Facility JPM #: 3-OT-JPMR108A (Modified)

Safety Function: 7 **Title:** Instrumentation

K/A 015 A4.02 Ability to manually operate and/or monitor in the control room: NIS indicators

Rating(s): 3.9/3.9 **CFR:** 41.7 / 45.5 to 45.8

Evaluation Method: Simulator __X__ In-Plant ______ **Classroom** ______

References: AOI-4, "Nuclear Instrumentation Malfunctions," Rev. 29

Task Number: RO-092-AOI-4-002 **Title:** Respond to a failure of the power range nuclear instrumentation.

Task Standard: The applicant :

1.) Returns the following switches to the NORMAL POSITION:
   a. DETECTOR CURRENT COMPARATOR switch for UPPER SECTION
   b. DETECTOR CURRENT COMPARATOR switch for LOWER SECTION.
   c. COMPARATOR CHANNEL DEFEAT
2.) Returns the following switches to the OPERATE position:
   a. ROD STOP BYPASS,
   b. POWER MISMATCH BYPASS.
3.) Places Rod control "AUTO."
4.) Places SG LEVEL - NIS BIAS controller for SG 4 is in "AUTO," and determines that a failure of 1-FCV-3-103, SG 4 MFRV has occurred. The applicant responds to the uncontrolled rise in SG 4 level by tripping the reactor.

Validation Time: 15 minutes **Time Critical:** Yes ____ No __X__

==

Applicant: ____________________ _____________ Time Start: ______
NAME Docket No. Time Finish: ______

Performance Rating: SAT ____ UNSAT ____ Performance Time ___

Examiner: ____________________ ____________________/________
NAME SIGNATURE DATE

==

COMMENTS

-+

SIMULATOR OPERATOR INSTRUCTIONS:

1. ENSURE NRC Examination Security has been established.
2. RESET to Initial Condition 326 by performing the following actions:
   a. Select ICManager on the THUNDERBAR menu (right hand side of Instructor Console Screen).
   b. Locate IC 326.
   c. Right "click" on IC 326.
   d. Select Reset on the drop down menu.
   e. Right "click" on RESET.
   f. Enter the password for IC 326.
   g. Select "Yes" on the INITIAL CONDITION RESET pop-up window.
   h. Perform SWITCH CHECK.
3. ENSURE the following information appears on the Director Summary Screen:

	Key		Type	Event	Delay	Inserted	Ramp	Initial	Final	Value
	fw29d	main fw reg vlv lcv-3-103 fail position	M	25	00:00:000		00:00:000		100	0

4. ENSURE Event 25 is loaded. IF NOT then EDIT Event 25 and enter the following in the Event Code - zdilic3234(3)==1
5. ENSURE that Power Range N41 is removed from service per AOI-4, Attachment 1. Place simulator in RUN and acknowledge any alarms.
6. ENSURE a marked-up copy of AOI-4, "Nuclear Instrumentation Malfunctions" signed and circled-and-slashed through Step 20 is available to the Examiner for each applicant.
7. ENSURE "Extra Operator" is present in the simulator.
8. Place simulator in FREEZE until Examiner cue is given.

DIRECTION TO APPLICANT:

I will explain the initial conditions, and state the task to be performed. All control room steps shall be performed for this JPM, including any required communications. I will provide initiating cues and reports on other actions when directed by you. Ensure you indicate to me when you understand your assigned task. To indicate that you have completed your assigned task return the cue sheet I provided you.

INITIAL CONDITIONS:

1. **Unit 1 is at 100% power.**
2. **PRM N41 failed during last shift.**
3. **AOI-4 Section 3.4 has been completed through Step 20.a.**
4. **Work Control has notified the MCR that repairs to PRM N41 are complete and the instrument is ready to be returned to service.**
5. **You are the Operator at the Controls.**

INITIATING CUES:

The Unit Supervisor has directed you to complete the return of PRM N41 to service. Inform the Unit Supervisor when AOI-4,"Nuclear Instrumentation Malfunctions" is complete.

STEP/STANDARD	SAT/UNSAT

START TIME: _______

STEP 1: 20. **WHEN** PRM is to be restored, **THEN**: b. **REFER TO** Attachment 1, PRM Function At NIS Rack, step 2. STANDARD: Applicant refers to Attachment 1, PRM Function At NIS Rack, step B. COMMENTS:	___ SAT ___ UNSAT
EXAMINER: The following actions are taken from AOI-4,"Nuclear Instrumentation Malfunctions," Attachment 1, "PRM Function At NIS Rack," Step 2.	
STEP 2: B. **WHEN** PRM is ready for return to service, **THEN PERFORM** the following Steps: 1. **PLACE** DETECTOR CURRENT COMPARATOR switch for UPPER SECTION in NORMAL. STANDARD: Detector Current Comparator Upper Section switch placed to "NORMAL" from the "N41" position (Miscellaneous Control & Indication Panel,1-IDWR-92-N50-G IV) **Step is critical for proper restoration of N41 upper power detector input to the current comparator.** COMMENTS:	**CRITICAL STEP** ___ SAT ___ UNSAT

STEP/STANDARD	SAT/UNSAT
STEP 3: 2. **PLACE** DETECTOR CURRENT COMPARATOR switch for LOWER SECTION in NORMAL. STANDARD: Detector Current Comparator Lower Section switch placed to "NORMAL" from the "N41" position (Miscellaneous Control & Indication Panel, 1-IDWR-92-N50-G IV). **Step is critical for proper restoration of the N41 lower power detector input to current comparator.** COMMENTS:	**CRITICAL STEP** ___ SAT ___ UNSAT

NOTE

On the following step, annunciator window 66-C, 67-C, 68-C OR 69-C, N-(#) OVERPOWER ROD STOP BYPASSED, will clear depending on which channel is bypassed.

STEP/STANDARD	SAT/UNSAT
STEP 4: 3. **PLACE** ROD STOP BYPASS switch in OPERATE. STANDARD: Rod Stop Bypass switch is positioned from "N41" to "OPERATE" (Miscellaneous Control & Indication Panel,1-IDWR-92-N50-G IV) **Step is critical for proper restoration of to enable rod stop interlock protection from channel N41.** COMMENTS:	**CRITICAL STEP** ___ SAT ___ UNSAT

STEP/STANDARD	SAT/UNSAT
STEP 5: 4. **PLACE** POWER MISMATCH BYPASS switch in OPERATE. STANDARD: Power Mismatch Bypass switch is positioned from "N41" to "OPERATE" (Miscellaneous Control & Indication Panel, 1-IDWR-92-N50-G IV) **Step is critical to restore channel N41 input to high auctioneering circuit and power mismatch circuits.** COMMENTS:	**CRITICAL STEP** ___ SAT ___ UNSAT
NOTE On the following step, annunciator window 82-E, NIS CHANNEL IN TEST, will clear.	
STEP 6: 5. **PLACE** COMPARATOR CHANNEL DEFEAT switch in NORMAL. STANDARD: Comparator Channel Defeat Switch is positioned to "NORMAL" from the "N41" position (Comparator & Rate Panel, Comparator N37, 1-IDWR-92-N37 IV). **Step is critical to restore channel input to channel comparator alarm circuits.** COMMENTS:	**CRITICAL STEP** ___ SAT ___ UNSAT
NOTE On the following step, annunciator window 115-E, POWER RANGE FLUX RATE HI, will clear if the positive rate trip light is LIT.	

Attachment 1
(Page 3 of 3)

PRM Function At NIS Rack

1.0 INSTRUCTIONS (continued)

NOTE
On the following step, annunciator window 82-E, NIS CHANNEL IN TEST, will clear.

5. **PLACE** COMPARATOR CHANNEL DEFEAT switch in NORMAL.

NOTE
On the following step, annunciator window 115-E, POWER RANGE FLUX RATE HI, will clear if the positive rate trip light is LIT.

6. **IF** POSITIVE RATE TRIP is LIT,
   THEN
   RESET RATE MODE switch.

STEP/STANDARD	SAT/UNSAT
STEP 7: 6. **IF** POSITIVE RATE TRIP is LIT, **THEN RESET** RATE MODE switch. STANDARD: Positive Rate Trip light on Power Range Upper N41A, 1-IDWR-92-42A II, is checked and determines light is NOT LIT and continues to next step. COMMENTS:	___ SAT ___ UNSAT
EXAMINER: The following actions are taken from AOI-4, "Nuclear Instrumentation Malfunctions," Section 3.4 at Step 20.c.	
STEP 8: c. **ENSURE** T-avg and T-ref within 1°. STANDARD: Applicant verifies T-avg and T-ref within 1° by recorder 1-TR-68-2B on 1-M-5 or other T-avg - T-ref indications. COMMENTS:	___ SAT ___ UNSAT

STEP/STANDARD	SAT/UNSAT
STEP 9: d. **ENSURE** zero demand on control rod position indication [1-M-4]. STANDARD: Applicant determines zero demand on control rod position indication CERPI display or ICS computer display for CERPI • CERPI Display • Plant computer COMMENTS:	___ SAT ___ UNSAT
STEP 10: e. **IF** auto rod control desired, **PLACE** control rods in auto. STANDARD: The rod control hand switch has been placed in AUTO position. **CUE: If asked, respond as US that auto rod control is desired** COMMENTS:	**CRITICAL STEP** ___ SAT ___ UNSAT

EXAMINER: When the applicant places 1-LIC-3-234 NUC PWR - SG 4 LEVEL CONTROL in AUTO, 1-FCV-3-103A SG-4 MFW REG VLV will fail open.

STEP/STANDARD	SAT/UNSAT
STEP 11: 21. **ENSURE** S/G level controllers and SG LEVEL - NIS BIAS controllers in AUTO. STANDARD: The applicant locates 1-LIC-2-231 NUC PWR - SG 1 LEVEL CONTROL and shifts the controller from the MANUAL position down to the AUTO position. The applicant locates 1-LIC-2-234 NUC PWR - SG 4 LEVEL CONTROL and shifts the controller from the MANUAL position down to the AUTO position. **Step is critical to restore channel N41 program level input to SG 1 and SG 4 level control circuits.** COMMENTS:	**CRITICAL STEP** ___ SAT ___ UNSAT

EXAMINER: Based on TI-12.04, "User's Guide for Abnormal and Emergency Operating Instructions," Section 2.1.1.C, the applicant may decide that SG 4 level rise cannot be stopped and initiate a reactor trip prior to entering the following instruction. If the reactor is tripped, GO TO JPM step 21.

EXAMINER: If the operator does not decide to initiate a reactor trip initially, the following actions are taken from ARI 63-F, SG LEVEL DEVIATION.

STEP 12: **[1] DETERMINE** which S/G has abnormal level. STANDARD: Applicant determines that SG 4 level is abnormal and rising. COMMENTS:	___ SAT ___ UNSAT

STEP/STANDARD	SAT/UNSAT
STEP 13: **[2] CHECK** steam flow/feed flow instrumentation to **VERIFY** level controls are restoring S/G levels to **NORMAL**. STANDARD: Applicant determines that the level control circuit is NOT restoring level to normal in SG 4. COMMENTS:	___ SAT ___ UNSAT
STEP 14: **[3] IF** level controls have malfunctioned, **THEN** **[a] PLACE** FW controls in manual. **[b] RESTORE** S/G level to normal and **GO TO** AOI-16, *LOSS OF NORMAL FEEDWATER.* STANDARD: Applicant locates and places 1-FIC-3-103A SG - 4 MFW REG VLV in manual by raising the toggle switch from the "AUTO" position to the "MANUAL " position, then holding the toggle switch to the left to CLOSE the valve. The applicant determines that 1-FIC-3-103A SG - 4 MFW REG VLV will NOT close. COMMENTS:	___ SAT ___ UNSAT

EXAMINER: Based on TI-12.04, "User's Guide for Abnormal and Emergency Operating Instructions," Section 2.1.1.C, the applicant may decide that SG 4 level rise cannot be stopped and initiate a reactor trip prior to entering the following instruction. If the reactor is tripped, GO TO JPM step 21.

EXAMINER: The following actions are taken from AOI-16, "Loss of Normal Feedwater," Section 3.6,"MFW reg or bypass valve control failure."

STEP/STANDARD	SAT/UNSAT
STEP 15: **1. CONTROL** failed MFW reg or bypass reg valve in MANUAL. STANDARD: Applicant determines that the SG 4 main feedwater reg valve is open and attempts to close the valve using 1-FIC-3-103A SG - 4 MFW REG VLV. COMMENTS:	___ SAT ___ UNSAT
STEP 16: **2. EVALUATE** placing control rods in MANUAL. STANDARD: Applicant determines that rods should be in MANUAL and places 1-RBSS in the MANUAL POSITION. COMMENTS:	___ SAT ___ UNSAT
STEP 17: **3. CHECK** MFW pumps recirc valves **CLOSED.** STANDARD: Applicant locates 1-FIC-3-70, MFWP A RECIRC CONTROL and determines that the valve is closed based on the controller display. Applicant locates 1-FIC-3-84, MFWP B RECIRC CONTROL and determines that the valve is closed based on the controller display. COMMENTS:	___ SAT ___ UNSAT

STEP/STANDARD	SAT/UNSAT
NOTES 1) Bypass reg. valve may be manually positioned up to 0.85 x 106 lb/hr flow to dampen oscillations in feedwater flow in loop of affected main reg valve. 2) A power tilt in the affected core quadrant may occur due to a rise in bypass flow. Flows above 84,500 lbm/hr in the bypass line will invalidate the value of computer point U1118	
STEP 18: 4. **CHECK** SG levels on bypass reg valve control. STANDARD: Applicant determines that bypass reg valves are NOT controlling SG level, and enters the RNO for actions. COMMENTS:	___ SAT ___ UNSAT
STEP 19: 4. **RESPONSE NOT OBTAINED** ** **GO TO** Step 6. STANDARD: Applicant determines that the correct procedure path is to Step 6. COMMENTS:	___ SAT ___ UNSAT
STEP 20: 6. **CHECK** S/G levels returning to PROGRAM. STANDARD: Applicant determines that SG 4 level is continuing to rise, and enters the **RESPONSE NOT OBTAINED** column for actions. COMMENTS:	___ SAT ___ UNSAT

STEP/STANDARD	SAT/UNSAT
STEP 21: 6. **RESPONSE NOT OBTAINED:** (ρ) **IF** S/G level RISING **OR DROPPING** uncontrolled, **THEN TRIP** reactor, and ****GO TO** E-0, Reactor Trip or Safety Injection. STANDARD: If not already accomplished, the applicant determines that SG 4 level is rising in an uncontrolled manner and trips the reactor. **Cue: After the applicant initiates the reactor trip state, "another operator will continue from this point."** COMMENTS:	**CRITICAL STEP** ___ SAT ___ UNSAT

STOP TIME ________

APPLICANT CUE SHEET

(RETURN TO EXAMINER UPON COMPLETION OF TASK)

INITIAL CONDITIONS:

1. Unit 1 is at 100% power.
2. PRM N41 failed during last shift.
3. AOI-4 Section 3.4 has been completed through Step 20.a.
4. Work Control has notified the MCR that repairs to PRM N41 are complete and the instrument is ready to be returned to service.
5. You are the Operator at the Controls.

INITIATING CUES:

The Unit Supervisor has directed you to complete the return of PRM N41 to service. Inform the Unit Supervisor when AOI-4,"Nuclear Instrumentation Malfunctions" is complete.

TVA

Watts Bar Nuclear Plant

Unit 1

Abnormal Operating Instruction

AOI-4

Nuclear Instrumentation Malfunctions

Revision 0029

Quality Related

Level of Use: Continuous Use

Effective Date: 02-01-2010

Responsible Organization: OPS, Operations

Prepared By: Ralph Goode

Approved By: Greg Evans

Revision Log

Revision or Change Number	Effective Date	Affected Page Numbers	Description of Revision/Change
27	09/15/05	2, 16	Added note to clarify control rod availability.
28	12/05/07	2, 16	Section 3.4 step 6, added note and reworded step to clarify inputs and operable channel selection on failed power range monitor. Operator feedback.
29	02/01/10	All	Procedure converted from W95 to W2007 using Rev 28. This change does not have rev-bars.
		8	Added step 3.2[8] for Mode 2 Tech Specs references
		14, 15, 17	Deleted caution and note prior to step 3.4[3], note contents incorporated into action steps and also added to Section 4, Discussion. Changed method of placing Main and Bypass FW reg valves in manual on PRM malfunction, also change method for returning Main and Bypass FW reg valves to Auto.
		20, 21	Added discussion of auto/manual rod withdrawal block to section 4.3
		22	Added TS 3.3.3 and 3.3.4 to references

1.0 PURPOSE

This Instruction provides instructions to respond to a loss of Source Range, Intermediate Range or Power Range NIS monitors.

2.0 SYMPTOMS

2.1 Alarms

A. CHANNEL I SOURCE/INTERMEDIATE RANGE TROUBLE [81-A].

B. SOURCE RANGE HI FLUX AT SHUTDOWN [81-B].

C. CHANNEL II SOURCE/INTERMEDIATE RANGE TROUBLE [82-A].

D. INTERM RANGE HI FLUX ROD WD STOP [82-B].

E. POWER RANGE OVERPOWER ROD WD STOP [83-A].

F. POWER RANGE UPR DETECTOR FLUX DEVN [83-B].

G. POWER RANGE LWR DETECTOR FLUX DEVN [83-C].

H. PLANT COMPUTER GENERATED ALARM (SEE ICS) [83-D].

I. POWER RANGE CHANNEL DEVIATION [83-E].

2.2 Indications

A. Source Range Monitor (SRM) malfunction:

1. Audio count rate not operating.
2. Erratic or loss of indication.
3. INSTRUMENT POWER ON and/or CONTROL POWER ON lights at NIS racks DARK [1-M-13].
4. Both startup rate channels NOT indicating same startup rate.
5. NON-OPERATE light LIT [1-M-13].

B. Intermediate Range Monitor (IRM) malfunction:

1. Erratic or loss of indication.
2. INSTRUMENT POWER ON and/or CONTROL POWER ON lights at NIS racks DARK [1-M-13].

2.2 Indications (continued)

3. Both startup rate channels NOT indicating same startup rate.

4. SRM does not energize during shutdown.

5. NON-OPERATE light LIT [1-M-13].

C. Power Range Monitor (PRM) malfunction:

1. Erratic or loss of indication.

2. Delta flux meter failed high, low, or giving erratic indications.

3. CONTROL POWER ON and/or INSTRUMENT POWER ON lights at NIS racks DARK [1-M-13].

2.3 Automatic Actions

A. Source Range Monitor failure:

1. Possible source range monitor high flux Rx trip at 10^5 cps if SRM NOT blocked.

2. Possible Cntmt evacuation alarm at 0.5 decade above background.

B. Intermediate Range Monitor failure:

1. Intermediate range monitor 20% high flux rod stop (if NOT blocked above P-10).

2. Intermediate range monitor 25% high flux Rx trip (if NOT blocked above P-10).

3. Possible loss of P-6 block if intermediate range monitor greater than 1.66 X 10^{-4}% power and intermediate range monitor fails low.

C. Power Range Monitor failure:

1. Possible 103% power rod stop.

2. Possible actuation or loss of P-8, P-9, or P-10.

3. Temporary rod insertion if channel fails high with rods in auto.

4. If N41 or N42 fails low, associated S/G levels will drop, possibly resulting in low S/G level Rx trip.

3.0 OPERATOR ACTIONS

3.1 Diagnostics

IF	**GO TO** Subsection
Source Range Monitor malfunction	3.2
Intermediate Range Monitor malfunction	3.3
Power Range Monitor malfunction	3.4

Step	Action/Expected Response	Response Not Obtained
3.2	**Source Range Monitor (SRM) Failure**	
1.	**STOP** positive reactivity changes or core alterations.	
2.	**IF** both SRMs required and failed, **THEN** **OPEN** Rx trip breakers.	
3.	**INITIATE** performance of 1-SI-0-10, Shutdown Margin.	
4.	**IF** SOURCE RANGE HI FLUX AT SHUTDOWN alarm occurs [81-B], **THEN**:	
	a. **CHECK** alarm valid.	a. **IF** a spurious alarm occurs, **THEN**: 1) **CHECK** by other SRM that alarm was false. 2) **ENSURE** shutdown monitors reset [1-M-13]. 3) **ANNOUNCE** false alarm over PA. 4) ** **GO TO** Step 5.
	b. **ENSURE** Cntmt is evacuated.	
	c. **CHECK** Rx power STABLE.	c. **IF** uncontrolled positive reactivity insertion, **THEN** ** **GO TO** AOI-34, Immediate Boration.

Step	Action/Expected Response	Response Not Obtained

3.2 Source Range Monitor (SRM) Failure (continued)

NOTE Placing the affected channel in bypass will cause either window 64A or 65A to alarm.

5. **PLACE** failed channel LEVEL TRIP switch to BYPASS [1-M-13].

6. **PLACE** failed channel HIGH FLUX AT SHUTDOWN switch to BLOCK [1-M-13].

7. **ENSURE** 1-NR-92-145 recording an operable source range channel [1-M-4].

Step	Action/Expected Response	Response Not Obtained

3.2 Source Range Monitor (SRM) Failure (continued)

8.	**IF** in MODE 2, **THEN** **REFER** To the following TECH Specs. • 3.3.1, Reactor Trip System Instrumentation, • 3.3.3, PAM Instruments, • 3.3.4, Remote Shutdown System	
9.	**IF** in MODE 3, 4, or 5, **THEN**:	
	• **CHECK** audio count rate audible in control room.	• **PLACE** audio count rate channel CHANNEL SELECTOR switch to operable channel [1-M-13].

	• **REFER TO** the following Tech Specs:
	  • 3.3.1,Reactor Trip System Instrumentation,
	  • 3.3.3, PAM Instruments,
	  • 3.3.4, Remote Shutdown System.	

Step	Action/Expected Response	Response Not Obtained

3.2 Source Range Monitor (SRM) Failure (continued)

Step	Action/Expected Response	Response Not Obtained
10.	**IF** in MODE 6, **THEN**:	
	• **CHECK** audio count rate audible in control room.	• **IF** audible audio count rate is NOT being received in the control room, **THEN** **PLACE** audio count rate channel CHANNEL SELECTOR switch to an operable channel [1-M-13].
	• **CHECK** audio count rate audible in Cntmt.	**IF** audible audio count rate is **NOT** being received in Cntmt, **THEN**: a. **TURN** AMPLIFIER SELECT switch to A1 [1-M-13 switch on rear of amplifier]. b. **CHECK** an audible count rate in Cntmt.
	• **REFER TO** Tech Spec 3.9.3, Nuclear Instrumentation.	
11.	**NOTIFY** Operations Duty Manager and Rx Engineering of failed channel.	
12.	**INITIATE** repair of SRM.	
13.	**DO NOT CONTINUE** UNTIL SRM repair complete.	

Step	Action/Expected Response	Response Not Obtained

3.2 Source Range Monitor (SRM) Failure (continued)

14. **CHECK** SRM operable:

- **CHECK** INSTRUMENT POWER ON and CONTROL POWER ON lights LIT at NIS racks [1-M-13].
- **CHECK** NON-OPERATE light DARK [1-M-13].
- **CHECK** audio count rate operating in control room for MODES 2 through 6.
- **CHECK** audio count rate operating in Cntmt for MODE 6.
- **COMPARE** channel output.

15. **IF** shutdown monitor required, **THEN**:

a. **RESET** shutdown monitor:

1) **ENSURE** power switch on Shutdown Monitor is ON.

2) **RESET** the Alarm Setpoint with the black pushbutton to the right of the display.

3) **RESET** the Alarm with the black pushbutton to the right of the "alarm" light.

b. **PLACE** HIGH FLUX AT SHUTDOWN switch in NORMAL.

Step	Action/Expected Response	Response Not Obtained

3.2 Source Range Monitor (SRM) Failure (continued)

16. **PLACE** LEVEL TRIP switch in NORMAL [1-M-13].

17. **IF** refueling activities were stopped due to source range monitor problems,
THEN
OBTAIN Plant Manager approval prior to resuming refueling activities.

18. **RETURN TO** Instruction in effect.

End of Section

3.3 Intermediate Range Monitor (IRM) Failure

1. **IF** greater than P-6 and less then P-10 with BOTH IRM channels failed,
   THEN
   STOP positive reactivity changes.

NOTE Placing the affected channel in bypass will cause either window 64B or 65B to alarm.

2. **PLACE** failed channel LEVEL TRIP switch to BYPASS [1-M-13].

3. **ENSURE** 1-NR-92-145 recording an operable IRM.

4. **REFER TO** Tech Spec 3.3.1, Rx Trip System Instrumentation and 3.3.3, PAM Instruments.

5. **NOTIFY** Operations Duty Manager and Rx Engineering of any failed channel.

6. **INITIATE** repair of IRM.

7. **DO NOT CONTINUE** UNTIL repairs are complete.

3.3 Intermediate Range Monitor (IRM) Failure (continued)

8. **CHECK** intermediate range monitor operable:

   - **CHECK** INSTRUMENT POWER ON and CONTROL POWER ON lights LIT at NIS racks [1-M-13].
   - **CHECK** NON-OPERATE light DARK [1-M-13].
   - **COMPARE** channel output.

9. **PLACE** failed channel LEVEL TRIP switch in NORMAL [1-M-13].

10. **RETURN TO** Instruction in effect.

End of Section

Step	Action/Expected Response	Response Not Obtained
3.4	**Power Range Monitor (PRM) Failure**	
1.	**PLACE** control rods in MANUAL.	
2.	**CHECK** rod motion STOPPED.	**TRIP** Rx. ** **GO TO** E-0, Reactor Trip or Safety Injection.
3.	**CHECK** N41 Normal	**PLACE** S/G 1 and S/G 4 Main FW reg valves in MANUAL. **PLACE** all Bypass FW reg valves in MANUAL. **ADJUST** FW as required to maintain S/G levels on program. **PLACE** S/G 1 and S/G 4 LEVEL - NIS BIAS controllers in MANUAL. **MATCH** bias controllers to demand output on S/Gs 2 and 3.

Step	Action/Expected Response	Response Not Obtained
3.4	**Power Range Monitor (PRM) Failure (continued)**	
4.	**CHECK** N42 Normal	**PLACE** S/G 2 and S/G 3 Main FW reg valves in MANUAL. **PLACE** all Bypass FW reg valves in MANUAL. **ADJUST** FW as required to maintain S/G levels on program. **PLACE** S/G 2 and S/G 3 LEVEL - NIS BIAS controllers in MANUAL. **MATCH** bias controllers to demand output on S/Gs 1 and 4.
5.	**CHECK** N43 and N44 NORMAL	**IF** N43 or N44 failed HIGH **AND** Bypass FW reg valves controlling S/G level, **THEN:** **PLACE** all Bypass FW reg. valves in MANUAL. **ADJUST** FW as required to maintain S/G levels on program.
6.	**IF** Main FW reg valves controlling S/G level, **THEN:** a. **ENSURE** S/G Main FW reg valve level demand and level are matched. b. **PLACE** affected S/G Main FW reg valves in AUTO.	

Step	Action/Expected Response	Response Not Obtained

3.4 Power Range Monitor (PRM) Failure (continued)

NOTE Control rod withdrawal may not be possible if a PRM has failed high due to the 103% Rod Withdrawl Stop (C-2) (Annunciator window 83-A).

7. **MAINTAIN** T-avg and T-ref within 3°.

8. **ENSURE** 1-NR-92-145 recording an operable power range channel.

NOTE Inputs to 1-TR-68-2A include power range monitor, pressurizer pressure, ΔT and Tavg. Selection of an operable channel should consider other failures in addition to the failed power range monitor channel.

9. **ENSURE** 1-TR-68-2A placed to operable ΔT/OTΔT/OPΔT channel using 1-XS-68-2B, ΔT RCDR TR-68-2A LOOP SELECT [1-M-5].

10. **DEFEAT** affected PRM functions:

    - **REFER TO** Attachment 1, PRM Function At NIS Rack.

3.4 Power Range Monitor (PRM) Failure (continued)

11. **IF** Bypass FW reg. valves are in MANUAL
    AND
    controlling S/G level, **THEN:**

    a. **ENSURE** Bypass FW reg valves level demand and level are matched.

    b. **PLACE** Bypass FW reg. valves in AUTO.

CAUTION Allowing at least 5 minutes between any rod control input (i.e., T-avg, T-ref, or NIS) change and placing rods in AUTO, will help prevent undesired control rod movement.

12. **WHEN** failed PRM defeated
    AND
    AUTO rod control desired,
    THEN:

    a. **ENSURE** T-avg and T-ref within 1°.

    b. **ENSURE** zero demand on control rod position indication [1-M-4].

    c. **PLACE** control rods in AUTO.

13. **INITIATE** repairs on failed channel.

14. **NOTIFY** Work Control to have IM trip failed channel bistables.

Step	Action/Expected Response	Response Not Obtained
3.4	**Power Range Monitor (PRM) Failure (continued)**	
	CAUTION Power fuses should not be removed during the performance of IMI-160 until affected S/G level controls are in manual at either the SG LEVEL - NIS BIAS controller(s) or the Main FW reg valve controllers.	
15.	**WHEN** notified bistables are tripped, **THEN** **CHECK** lights and alarms referenced in Appendix A are LIT.	**CONTACT** Work Control to have IMs immediately troubleshoot the problem.
16.	**REFER TO** Tech Specs: • 3.3.1, Rx Trip System (RTS) Instrumentation, table for minimum channels. • 3.2.4, Quadrant Power Tilt Ratio (QPTR). • SR 3.2.4.2 for loss of one channel may require performance of 1-SI-0-22, Incore QPTR.	
17.	**NOTIFY** Operations Duty Manager and Rx Engineering of failed channel.	
18.	**DO NOT CONTINUE** with this Instruction UNTIL failed PRM repair is completed.	
19.	**CHECK** failed channel trip status lights and associated alarms in Appendix A are CLEAR.	**NOTIFY** Work Control to have IM troubleshoot problem. **ENSURE** trip status lights DARK before continuing this Instruction.

Step	Action/Expected Response	Response Not Obtained

3.4 Power Range Monitor (PRM) Failure (continued)

CAUTION Allowing at least 5 minutes between any rod control input (i.e., T-avg, T-ref, or NIS) change and placing rods in AUTO, will help prevent undesired control rod movement.

20. **WHEN** PRM is to be restored,
THEN:

a. **PLACE** control rods in manual.

b. **REFER TO** Attachment 1, PRM Function At NIS Rack, step 2.

c. **ENSURE** T-avg and T-ref within 1°.

d. **ENSURE** zero demand on control rod position indication [1-M-4].

e. **IF** auto rod control desired,
PLACE control rods in auto.

21. **ENSURE** S/G level controllers and SG LEVEL - NIS BIAS controllers in AUTO.

22. **RETURN TO** Instruction in effect.

End of Section

4.0 DISCUSSION

4.1 Source Range Failure

SRM channels N131 & N132 are blocked manually above P-6. SRM channel indications are automatically removed above P-10. SRM channel failure may be evidenced by various alarms caused by loss of supply voltage, or the channel indicating high, low, and/or erratic. If one SRM channel fails high, Rx will trip at 10^5 cps unless the SRM trip is blocked. Audio count rate is required in cntmt and in the Control Room when refueling operations are being conducted, and should be operating in the Control Room at all times when the source range channels are in service.

4.2 Intermediate Range Failure

Malfunction of an IRM channel N135 or N136 may be evidenced by erratic or loss of indication, various alarms caused by loss of supply voltage, or by the channel indicating high, low, or erratic. One of two IRMs indicating greater than 25% power (and not blocked) will cause a Rx trip.

4.3 Power Range Failure

PRM channel malfunction may be evidenced by erratic or loss of indication, various alarms caused by loss of supply voltage, or the channel indicating high, low, or erratic. Greater than one PRM must fail high before Rx will trip on high flux.

N41 inputs to the S/G level program for S/G 1 and S/G 4 Main FW reg valve. N42 inputs to the S/G level program for S/G 2 and S/G 3 Main FW reg valves. Either N41 or N42 PRM failing low could result in a Rx trip, as the affected S/G levels will drop to the NO LOAD level. This drop in level should not cause a Rx Trip but the resultant level swing caused by the Main FW reg valve going closed could cause the S/G level to drop below the LO-LO level trip setpoint.

The auctioneered high PRM channel inputs an anticipatory signal to the S/G level program of all four Bypass FW reg valves. This signal is input into the control circuit after the bais control. The failure of one PRM to a value greater than 103% will result in an Auto/Manual Rod withdrawal block.

4.3 Power Range Failure (continued)

The rod control circuitry contains multiple lead/lag modules. Even with T-avg/T-ref matched within 1 °F, rod movement could occur when the rods are returned to AUTO if rod control inputs change while rods were in MANUAL.

- Decay time for T-avg lead/lag modules is approximately 3 minutes.
- Decay time for T-ref lead/lag modules and NIS lead/lag modules is approximately 5 minutes.

Allow at least 5 minutes between any change to rod control inputs (i.e., T-avg, T-ref, or NIS) and placing rods in AUTO, this will help prevent undesired control rod movement.

Ensuring zero demand on the CERPI monitors in the main control room will also help prevent undesired control rod movement.

5.0 REFERENCES

5.1 Performance

A. E-0, Reactor Trip or Safety Injection.

B. AOI-34, Immediate Boration.

C. 1-SI-0-10, Shutdown Margin.

D. 1-SI-0-22, Incore QPTR.

5.2 Developmental

A. IMI-160.001, Removal of Reactor Protection System Channel I From Service.

B. IMI-160.002, Removal of Reactor Protection System Channel II From Service.

C. IMI-160.003, Removal of Reactor Protection System Channel III From Service.

D. IMI-160.004, Removal of Reactor Protection System Channel IV From Service.

5.3 Technical Specifications (Tech Specs)

A. 3.3.1, Reactor Trip System (RTS) Instrumentation.

B. 3.3.3 Post Accident Monitoring (PAM) Monitoring

C. 3.3.4 Remote Shutdown System

D. 3.2.4, Quadrant Power Tilt Ratio (QPTR), SR 3.2.4.2 for loss of one channel.

E. 3.9.3, Nuclear Instrumentation.

Appendix A
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Power Range Failure

N41 Power Range Failure

COMPARATOR	R PANEL	STATUS LIGHT	ANNUNCIATOR
TB-411C (overtemp delta t trip)	R-2	[1-XX-55-5, window 10] LOOP 1 OTΔT TRIP TS-68-2D	[123-C] OVERTEMP ΔT TRIP ALERT
TB-411D (overtemp turb rbk & blk rod withdrawal)	R-2	[1-XX-55-5, window 15] LOOP 1 OTΔT RUN BACK TS-68-2E	[123-D] OVERTEMP ΔT TURB RUNBACK & C-3 ROD BLOCK
N/A	1-M-13 when fuses pulled	[1-XX-55-5, window 7] PR FLUX HI NC41R	[115-C] POWER RANGE FLUX HI
N/A	1-M-13 when fuses pulled	[1-XX-55-5, window 8] PR HI RATE NC41U/K	[115-E] POWER RANGE FLUX RATE HI

Appendix A
(Page 2 of 4)

Power Range Failure

N42 Power Range Failure

COMPARATOR	R PANEL	STATUS LIGHT	ANNUNCIATOR
TB-421C (overtemp delta t trip)	R-6	[1-XX-55-5, window 30] LOOP 2 OTΔT TRIP TS-68-25D	[123-C] OVERTEMP ΔT TRIP ALERT
TB-421D (overtemp turb rbk & blk rod withdrawal)	R-6	[1-XX-55-5, window 35] LOOP 2 OTΔT RUN BACK TS-68-25E	[123-D] OVERTEMP ΔT TURB RUNBACK & C-3 ROD BLOCK
N/A	1-M-13 when fuses pulled	[1-XX-55-5, window 27] PR FLUX HI NC42R	[115-C] POWER RANGE FLUX HI
N/A	1-M-13 when fuses pulled	[1-XX-55-5, window 28] PR HI RATE NC42U/K	[115-E] POWER RANGE FLUX RATE HI

Appendix A
(Page 3 of 4)

Power Range Failure

N43 Power Range Failure

COMPARATOR	R PANEL	STATUS LIGHT	ANNUNCIATOR
TB-431C (overtemp delta t trip)	R-10	[1-XX-55-5, window 50] LOOP 3 OTΔT TRIP TS-68-44D	[123-C] OVERTEMP ΔT TRIP ALERT
TB-431D (overtemp turb rbk & blk rod withdrawal)	R-10	[1-XX-55-5, window 55] LOOP 3 OTΔT RUN BACK TS-68-44E	[123-D] OVERTEMP ΔT TURB RUNBACK & C-3 ROD BLOCK
N/A	1-M-13 when fuses pulled	[1-XX-55-5, window 47] PR FLUX HI NC43R	[115-C] POWER RANGE FLUX HI
N/A	1-M-13 when fuses pulled	[1-XX-55-5, window 48] PR HI RATE NC43U/K	[115-E] POWER RANGE FLUX RATE HI

Appendix A
(Page 4 of 4)

Power Range Failure

N44 Power Range Failure

COMPARATOR	R PANEL	STATUS LIGHT	ANNUNCIATOR
TB-441C (overtemp delta t trip)	R-13	[1-XX-55-5, window 70] LOOP 4 OTΔT TRIP TS-68-67D	[123-C] OVERTEMP ΔT TRIP ALERT
TB-441D (overtemp turb rbk & blk rod withdrawal)	R-13	[1-XX-55-5, window 75] LOOP 4 OTΔT RUN BACK TS-68-67E	[123-D] OVERTEMP ΔT TURB RUNBACK & C-3 ROD BLOCK
N/A	1-M-13 when fuses pulled	[1-XX-55-5, window 67] PR FLUX HI NC44R	[115-C] POWER RANGE FLUX HI
N/A	1-M-13 when fuses pulled	[1-XX-55-5, window 68] PR HI RATE NC44U/K	[115-E] POWER RANGE FLUX RATE HI

Attachment 1
(Page 1 of 3)

PRM Function At NIS Rack

1.0 INSTRUCTIONS

NOTE

The following annunciators may be affected by defeating a PRM channel:

- [66-C, 67-C, 68-C, 69-C] N-(#) OVERPOWER ROD STOP BYPASSED.
- [82-E] NIS CHANNEL IN TEST.
- [83-A] POWER RANGE OVERPOWER ROD WD STOP.
- [83-E] POWER RANGE CHANNEL DEVIATION.
- [115-C] POWER RANGE FLUX HI.
- [115-E] POWER RANGE FLUX RATE HI.

A. **PERFORM** the following steps for the affected PRM:

1. **PLACE** DETECTOR CURRENT COMPARATOR switch for UPPER SECTION to failed channel.

2. **PLACE** DETECTOR CURRENT COMPARATOR switch for LOWER SECTION to failed channel.

NOTE

On the following step, annunciator window 83-A, POWER RANGE OVERPOWER ROD WD STOP will clear (if channel failure was high) and window 66-C, 67-C, 68-C OR 69-C, N-(#) OVERPOWER ROD STOP BYPASSED, will come into alarm depending on which channel is bypassed.

3. **PLACE** ROD STOP BYPASS switch to failed channel.

4. **PLACE** POWER MISMATCH BYPASS switch to failed channel.

Attachment 1
(Page 2 of 3)

PRM Function At NIS Rack

1.0 INSTRUCTIONS (continued)

> **NOTE**
> On the following step, annunciator window 83-E, POWER RANGE CHANNEL DEVIATION, will clear and annunciator window 82-E, NIS CHANNEL IN TEST, will come into alarm.

5. **PLACE** COMPARATOR CHANNEL DEFEAT switch to failed channel.

> **NOTE**
> On the following step, annunciator window 115-E, POWER RANGE FLUX RATE HI, will clear if the positive rate trip light is LIT.

6. **IF** POSITIVE RATE TRIP is LIT,
   THEN
   RESET RATE MODE switch.

B. **WHEN** PRM is ready for return to service,
   THEN
   PERFORM the following Steps:

1. **PLACE** DETECTOR CURRENT COMPARATOR switch for UPPER SECTION in NORMAL.

2. **PLACE** DETECTOR CURRENT COMPARATOR switch for LOWER SECTION in NORMAL.

> **NOTE**
> On the following step, annunciator window 66-C, 67-C, 68-C OR 69-C, N-(#) OVERPOWER ROD STOP BYPASSED, will clear depending on which channel is bypassed.

3. **PLACE** ROD STOP BYPASS switch in OPERATE.

4. **PLACE** POWER MISMATCH BYPASS switch in OPERATE.

TVA

Watts Bar Nuclear Plant

Unit 1

Abnormal Operating Instruction

AOI-16

Loss of Normal Feedwater

Revision 0032

Quality Related

Level of Use: Continuous Use

Effective Date: 05-11-2010

Responsible Organization: OPS, Operations

Prepared By: R. A. O'Rear

Approved By: Gregory A. Evans

Revision Log

Revision or Change Number	Effective Date	Affected Page Numbers	Description of Revision/Change
30	11/01/07	2, 17 19 20 21 22 23 24 25	Added Caution for AFD and reworded Step 8. Corrected reference in Step 14 RNO. Added Step 2 to evaluate placing rods in MAN. Added Step 6 to monitor TDMFP speed. Allowed for speed adjustment in MANUAL. Added to Step 12 to return switches to AUTO and provided direction for placing rods in AUTO in Step 13. Added Step 3 to check MFP recirc valves. Added Step 10 to return MFP speed control to AUTO.
31	02/22/10	All	Document converted from W95 to W2007 using Rev. 30. Corrected step references in note in section 3.6, [PCR 3526] Added step to ensure FW and STM channels are same channel as noted in section 3.6 [PCR 4191]. Added step to section 3.6 to address a failure of FWP recirc valve [PCR 4259]. Added RNO to address placing steam dumps in pressure mode if demand is not zero in AER. [4264]. Added steps to clear the Valve Pos Limit light in RNO at step 3.5.6 [4271]
32	05/11/10	2,6-8, 9-14, 17-21, 23-25, 27-29	Added directions to control RCW flow cooling Standby feed pump [PCR4370] Revised sequence of steps on clearing valve position lights to be consistent with same type step in AOI-37. [PCR 4329] Added (ρ) mark to steps that directly affects reactivity. Added RNO to address AFD if VPL is used in section 3.3 [PCR 4391]

1.0 PURPOSE

This Instruction provides actions to respond to a loss of normal FW due to MFW pump trip, a malfunctioning MFW reg valve or a loss of pump automatic speed control.

2.0 SYMPTOMS

2.1 Alarms

A. MFPT 1A ABNORMAL [50-A]

B. MFPT 1B ABNORMAL [50-B]

C. TRIPPED [51-A]

D. MFP 1A FLOW LO [57-A]

E. MFP 1B FLOW LO [58-A]

F. SG FEEDWATER FLOW HI [58-B]

G. SG 1 LEVEL HI [60-B]

H. SG 2 LEVEL HI [61-B]

I. SG 3 LEVEL HI [62-B]

J. SG 4 LEVEL HI [63-B]

K. SG LEVEL DEVIATION [63-F]

2.2 Automatic Actions

NOTE
Pressure equivalent load is indicated on ICS point P0300A. Runback circuitry may be verified at 1-PIS-47-13, HP TURBINE IMPULSE STEAM PRESSURE [1-L-262, 729, T3J]. Standby Main Feedwater Pump Auto Start at 67% load is armed when relay number 1 is illuminated on the PIS. Turbine runback at 85% load is armed when relay number 3 is illuminated on the PIS.

A. MFW pump trip, with runback armed:

1. Turbine runback to less than 85%.
2. Standby feedwater pump starts.
3. Affected MFW pump turbine condenser isolates.

B. Loss of one MFW pump, with runback NOT armed:

1. Standby FW pump starts (if turbine load greater than 67%).
2. MFW pump turbine condenser isolates if FW flow greater than 40%.

C. If MFW reg vlv fails OPEN, turbine trip will occur at 82.4% steam generator level.

3.0 OPERATOR ACTIONS

3.1 Diagnostics

IF	GO TO Subsection
Standby MFWP TRIP without Main Turbine in service	3.2
Standby MFWP TRIP with Main Turbine in service	3.3
MFWP TRIP less than 800 MWe (67% Turbine Load)	3.4
MFWP TRIP greater than or equal to 800 MWe (67% Turbine Load)	3.5
MFW reg or bypass reg valve control failure	3.6
MFW pump speed control circuit failure	3.7

Step	Action/Expected Response	Response Not Obtained
3.2	**Loss of Standby MFWP Without Main Turbine In Service**	
1.	(ρ) **IF** loss of S/G level is imminent, **THEN** **TRIP** reactor, and ** **GO TO** E-0, Reactor Trip or Safety Injection.	
2.	**CHECK** at least one MFW pump in service	** **GO TO** Step 5.
3.	**ENSURE** adequate feed flow for existing conditions: • Feed flow greater than or equal to steam flow. • S/G levels returning to program.	Manually **CONTROL** MFWPT speed.
4.	** **GO TO** Step 10.	
5.	**START** AFW pumps: a. Both MD AFW pumps. b. TD AFW pump.	

CAUTION Care should be taken to avoid excessive rod insertion. If resulting Reactor power is less than desired, rods SHALL NOT be withdrawn in an attempt to recover Reactor power.

Step	Action/Expected Response	Response Not Obtained
6.	(ρ) **INSERT** control rods to reduce reactor power to within AFW capabilities (less than 4%).	
7.	(ρ) **MAINTAIN** zero startup rate.	

Step	Action/Expected Response	Response Not Obtained
3.2	**Loss of Standby MFWP Without Main Turbine In Service (continued)**	
8.	**CHECK** AFW pumps LCVs controlling S/G levels to 38%.	Manually **CONTROL** AFW LCVs to maintain S/G levels at 38%.
9.	(ρ) **STABILIZE** RCS T-ave greater than or equal to 557°F.	**ENSURE** steam dumps and S/G PORVs CLOSED. **IF** cooldown continues, **THEN** **CONTROL** AFW flow to minimize cooldown.
10.	**WHEN** S/G levels controlled, **THEN** **CONSULT** plant staff for recovery actions	
11.	**REFER TO** appropriate instruction: a. SPP-3.5, Regulatory Reporting Requirements. b. GO-3, Unit Startup From Less Than 4% Reactor Power To Less Than 30% Reactor Power. c. GO-5, Unit Shutdown From Less Than 30% Reactor Power To Hot Standby.	

End of Section

Step	Action/Expected Response	Response Not Obtained
3.3	**Loss of Standby MFWP With Main Turbine In Service**	
1.	(ρ) **IF** loss of S/G level is imminent, **THEN** **TRIP** reactor, and ** **GO TO** E-0, Reactor Trip or Safety Injection.	
2.	**IF** both MFWPs in service, **THEN:**	
	a. **INITIATE** repairs on Standby MFWP.	
	b. **RETURN TO** Instruction in effect.	
3.	**CHECK** one MFWP in service.	(ρ) **TRIP** turbine, and ** **GO TO** AOI-17, Turbine Trip

CAUTION Runback may result in exceeding Tech Spec 3.2.3 limits on Axial Flux Difference (AFD).

Step	Action/Expected Response	Response Not Obtained
4.	**CHECK** turbine load less than 800 MWe (67%).	(ρ) **REDUCE** turbine load to within MFWP capability with valve position limiter. (ρ) **IF** AFD is ouside limits, **THEN** **INITIATE** boration to return AFD within limits.
5.	**MONITOR** reactor power controlled to match turbine power.	(ρ) **INSERT** control rods to match reactor power with turbine load.

Step	Action/Expected Response	Response Not Obtained

3.3 Loss of Standby MFWP With Main Turbine In Service (continued)

6.	**ENSURE** adequate feed flow for existing conditions: • Feed flow greater than or equal to steam flow. • S/G levels returning to program.	Manually **CONTROL** MFWPT speed. (p) **REDUCE** turbine load, if necessary: a. **SET** LOAD RATE at 5%/min. b. **SET** target (10% drop) in SETTER with REFERENCE CONTROL ∇ (lower). c. **PUSH** GO button. d. **WHEN** desired load reached, **THEN** **PUSH** HOLD button, and **REPEAT** Step 6.
7.	**IF** reactor power dropped by greater than or equal to 15% in one hour, **THEN** **NOTIFY** Chemistry to initiate power change sampling requirements.	

Step	Action/Expected Response	Response Not Obtained

3.3 Loss of Standby MFWP With Main Turbine In Service (continued)

8. **IF** C-7 LOSS OF LOAD STM DUMP INTERLOCK annunciator LIT [66E], **THEN**

   a. **ENSURE** steam dump valves have zero demand.

   b. **RESET** loss-of-load interlock with steam dump mode switch.

Response Not Obtained:

a. **PLACE** steam dump valves in pressure mode as follows:

   1) **PLACE** steam dumps to OFF

      - 1-HS-1-103A,STEAM DUMP FSV "A"
      - 1-HS-1-103B, STEAM DUMP FSV "B"

   2) **PLACE** steam dump mode switch in STEAM PESSURE.

   3) **ENSURE** steam dump demand indicator 1-XI-1-33 reading zero.

   4) **PLACE** steam dumps to ON.

      - 1-HS-1-103A,STEAM DUMP FSV "A"
      - 1-HS-1-103B, STEAM DUMP FSV "B"

   5) **ADJUST** steam dump demand controller to 84% (1092 psig).

WHEN conditions allow,
THEN
REFER to SOI-1.02 and
PLACE steam dumps in TAVG Mode.

Step	Action/Expected Response	Response Not Obtained
3.3	**Loss of Standby MFWP With Main Turbine In Service (continued)**	
9.	**CHECK** VALVE POS LIMIT LIGHT LIT.	** **GO TO** Step 11.
10.	**(p) REDUCE** turbine load setpoint using REFERENCE CONTROL ∇ (lower) AND GO button until VALVE POS LIMIT LIGHT not LIT, **THEN** **SET** valve position limiter to 95%.	
11.	**RETURN TO** Instruction in effect.	

End of Section

Step	Action/Expected Response	Response Not Obtained
3.4	**Loss of MFWP Less Than 800 MWe (67% Turbine Load)**	
1.	(ρ) **IF** loss of S/G level is imminent, **THEN** **TRIP** reactor, and ** **GO TO** E-0, Reactor Trip or Safety Injection.	
2.	**CHECK** at least one MFWP in service.	(ρ) **IF** reactor power greater than 50% (P-9), **THEN** **TRIP** reactor, and ** **GO TO** E-0, Reactor Trip or Safety Injection. (ρ) **IF** 1-HS-3-45 in NORMAL, **THEN** **TRIP** turbine, and ** **GO TO** AOI-17, Turbine Trip. ** **GO TO** Step 9.
3.	**PLACE** tripped MFP recirc valve controller in MANUAL, and **CLOSE** recirc valve.	
4.	**ENSURE** MFWP speed rising to control S/G Δ-P and levels on program.	Manually **CONTROL** MFWPT speed.

Step	Action/Expected Response	Response Not Obtained

3.4 Loss of MFWP Less Than 800 MWe (67% Turbine Load) (continued)

5.	**ENSURE** adequate feed flow for existing conditions: • Feed flow greater than or equal to steam flow. • S/G levels returning to program.	**START** Standby MFWP AND **LOCALLY MAINTAIN** oil temp between 110 to 130°F using 1-THV-24-948 **REDUCE** turbine load, if necessary: a. **SET** LOAD RATE at 5%/min. b. **SET** target (10% drop) in SETTER with REFERENCE CONTROL∇ (lower). c. **PUSH** GO button. d. **IF** adequate feed flow established, **THEN** **PUSH** HOLD button and ** **GO TO** Step 6. e. **IF** continued load reduction may establish adequate feed flow, **THEN** **REPEAT** Step 5 RNO. (p) **IF** reactor power greater than 50% (P-9) **AND** adequate feed flow can **NOT** be established, **THEN** **TRIP** reactor, and ** **GO TO** E-0, Reactor Trip or Safety Injection. (p) **IF** adequate feed flow can **NOT** be established (less than P-9), **THEN** **TRIP** turbine, and ** **GO TO** AOI-17, Turbine Trip.

Step	Action/Expected Response	Response Not Obtained
3.4	**Loss of MFWP Less Than 800 MWe (67% Turbine Load) (continued)**	
6.	**MONITOR** reactor power controlled to match turbine load.	(p) **INSERT** control rods to match reactor power with turbine load.
7.	**INITIATE** repairs on failed pump.	
8.	**RETURN TO** Instruction in effect.	
9.	**START** Standby MFWP, and **ESTABLISH** feed flow.	(p) **IF** Standby MFWP flow can **NOT** be established, **THEN** **TRIP** turbine, and ** **GO TO** AOI-17, Turbine Trip.
10.	(p) **REDUCE** turbine load to between 150 and 200 MWe (12 and 16%): a. **SET** LOAD RATE at 5%/min. b. **SET** 10% in SETTER with REFERENCE CONTROL∇ (lower). c. **PUSH** GO button. d. **WHEN** Unit between 150 and 200 MWe, **THEN** **PUSH** HOLD button.	

Step	Action/Expected Response	Response Not Obtained

3.4 Loss of MFWP Less Than 800 MWe (67% Turbine Load) (continued)

NOTE AUTO rod withdrawal will be blocked below 15% reactor power (C-5).

11.	(ρ) **INSERT** control rods to match reactor power with turbine load (between 12 and 16%), then **MAINTAIN** zero startup rate.	
12.	(ρ) **MAINTAIN** Tave-Tref on program: a. **ADJUST** turbine load. b. **CONTROL** feed flow. c. **MONITOR** steam dumps and S/G PORV operation.	
13.	**MONITOR** #1 FW heater inlet pressure less than 1363 psig.	**STOP** Condensate Booster Pumps, as necessary.

NOTE Manual level control may be required due to the slow response characteristics of the bypass reg valves.

14.	**MONITOR** bypass reg valves controlling S/G levels on program.	**CONTROL** bypass reg valves in MANUAL. (ρ) **IF** S/G levels can **NOT** be maintained, **THEN** **TRIP** Reactor, and ** **GO TO** E-0, Reactor Trip or Safety Injection.

Step	Action/Expected Response	Response Not Obtained
3.4	**Loss of MFWP Less Than 800 MWe (67% Turbine Load) (continued)**	
15.	**IF** C-7 LOSS OF LOAD STM DUMP INTERLOCK annunciator LIT [66E], **THEN**	
	a. **ENSURE** steam dump valves have zero demand.	a. **PLACE** steam dump valves in pressure mode as follows: 1) **PLACE** steam dumps to OFF • 1-HS-1-103A,STEAM DUMP FSV "A" • 1-HS-1-103B, STEAM DUMP FSV "B" 2) **PLACE** steam dump mode switch in STEAM PESSURE. 3) **ENSURE** steam dump demand indicator 1-XI-1-33 reading zero. 4) **PLACE** steam dumps to ON. • 1-HS-1-103A,STEAM DUMP FSV "A" • 1-HS-1-103B, STEAM DUMP FSV "B" 5) **ADJUST** steam dump demand controller to 84% (1092 psig). 6) **WHEN** conditions allow, **THEN** **REFER** to SOI-1.02 and **PLACE** steam dumps in TAVG Mode.
	b. **RESET** loss-of-load interlock with steam dump mode switch.	

Step	Action/Expected Response	Response Not Obtained

3.4 Loss of MFWP Less Than 800 MWe (67% Turbine Load) (continued)

16. **IF** reactor power dropped by greater than or equal to 15% in one hour, **THEN** **NOTIFY** Chemistry to initiate power change sampling requirements.

17. **EVALUATE** MFWP status to determine recovery action plan.

18. **REFER TO** GO-5, Unit Shutdown From 30% Reactor Power to Hot Standby, to complete alignments for 15% power level.

End of Section

Step	Action/Expected Response	Response Not Obtained
3.5	**Loss of MFWP Greater Than or Equal To 800 MWe (67% Turbine Load)**	
1.	(ρ) **IF** loss of S/G level is imminent, **THEN** **TRIP** reactor, and ** **GO TO** E-0, Reactor Trip or Safety Injection.	
2.	**CHECK** turbine load less than or equal to 1000 MWe (85%).	**ENSURE** Standby MFWP running. (ρ) **REDUCE** turbine load to less than 1000 MWe with valve position limiter.
3.	**PLACE** tripped MFP recirc valve controller in MANUAL, and **CLOSE** recirc valve.	
4.	**CHECK** turbine load less than 800 MWe (67%).	**ENSURE** Standby MFWP running. (ρ) **IF** Standby MFWP **NOT** available, **THEN** **REDUCE** turbine load to less than 800 MWe with valve position limiter.
5.	**ENSURE** MFWP speed rising to control S/G Δ-P and levels on program.	Manually **CONTROL** MFWPT speed.

3.5 Loss of MFWP Greater Than or Equal To 800 MWe (67% Turbine Load) (continued)

CAUTION Continued load reductions below 800 MWe should be done using normal turbine controls at less than or equal to 5% min.

Step	Action/Expected Response	Response Not Obtained
6.	**ENSURE** adequate feed flow for existing conditions: • Feed flow greater than or equal to steam flow. • S/G levels returning to program.	**ENSURE** Standby MFWP running. **IF** VALVE POS LIMIT LIT, **THEN** **REDUCE** turbine load setpoint using REFERENCE CONTROL ∇ (lower) AND GO button until VALVE POS LIMIT LIGHT not LIT, **THEN** **SET** valve position limiter to 95%. (ρ) **REDUCE** turbine load, if necessary: a. **SET** LOAD RATE at 5%/min. b. **SET** target (10% drop) in SETTER with REFERENCE CONTROL∇ (lower). c. **PUSH** GO button. **WHEN** desired load reached, **THEN** **PUSH** HOLD button, and **REPEAT** Step 6.
7.	**ENSURE** T-avg and T-ref within 3°.	(ρ) **INSERT** control rods to match reactor power with turbine load.

Step	Action/Expected Response	Response Not Obtained
3.5	**Loss of MFWP Greater Than or Equal To 800 MWe (67% Turbine Load) (continued)**	
	CAUTION Runback may result in exceeding Tech Spec 3.2.3 limits on Axial Flux Difference (AFD).	
8.	**MONITOR** AFD within limits of LCO 3.2.3.	(ρ) **INITIATE** boration to return AFD within limits.
9.	**IF** feed flow greater than 40%, **THEN** **ENSURE** tripped MFWP turbine condenser valves CLOSED: • Pump A, 1-FCV-2-205 and -210, OR • Pump B, 1-FCV-2-211 and -216.	
10.	**MONITOR** reg valves controlling S/G levels on program.	**CONTROL** reg valves in MANUAL. (ρ) **IF** S/G levels can **NOT** be maintained, **THEN** **TRIP** Reactor, and ** **GO TO** E-0, Reactor Trip or Safety Injection.

Step	Action/Expected Response	Response Not Obtained

3.5 Loss of MFWP Greater Than or Equal To 800 MWe (67% Turbine Load) (continued)

11. **LOCALLY MAINTAIN** oil temp between 110 to 130°F on running Standby MFP using 1-THV-24-948

12. **IF** C-7 LOSS OF LOAD STM DUMP INTERLOCK annunciator LIT [66E], **THEN**

a. **ENSURE** steam dump valves have zero demand.

   RNO: a. **PLACE** steam dump valves in pressure mode as follows:

   1) **PLACE** steam dumps to OFF
      - 1-HS-1-103A,STEAM DUMP FSV "A"
      - 1-HS-1-103B, STEAM DUMP FSV "B"

   2) **PLACE** steam dump mode switch in STEAM PESSURE.

   3) **ENSURE** steam dump demand indicator 1-XI-1-33 reading zero.

   4) **PLACE** steam dumps to ON.
      - 1-HS-1-103A,STEAM DUMP FSV "A"
      - 1-HS-1-103B, STEAM DUMP FSV "B"

   5) **ADJUST** steam dump demand controller to 84% (1092 psig).

   6) **WHEN** conditions allow, **THEN** **REFER** to SOI-1.02 and **PLACE** steam dumps in TAVG Mode.

b. **RESET** loss-of-load interlock with steam dump mode switch.

Step	Action/Expected Response	Response Not Obtained

3.5 Loss of MFWP Greater Than or Equal To 800 MWe (67% Turbine Load) (continued)

13.	**ENSURE** Condensate System Pumps in service as necessary: • **REFER TO** GO-4, Normal Power Operation.	
14.	**IF** reactor power dropped by greater than or equal to 15% in one hour, **THEN** **NOTIFY** Chemistry to initiate power change sampling requirements.	
15.	**CHECK** VALVE POS LIMIT LIT.	** **GO TO** Step 16.
16.	**RETURN** valve position limiter to normal: a. **ENSURE** turbine in IMP OUT b. (ρ) **REDUCE** turbine load setpoint using REFERENCE CONTROL ∇ (lower) AND GO button until VALVE POS LIMIT LIGHT not LIT, c. **SET** valve position limiter to 95%.	
17.	**INITIATE** repairs on failed pump.	
18.	**RETURN TO** Instruction in effect.	

End of Section

Step	Action/Expected Response	Response Not Obtained
3.6	**Main FW Reg or Bypass Reg Valve Control Failure**	
1.	**CONTROL** failed MFW reg or bypass reg valve in MANUAL.	
2.	**EVALUATE** placing control rods in MANUAL.	
3.	**CHECK** MFW pumps recirc valves CLOSED.	**PLACE** affected valve in MANUAL and **CONTROL** as necessary.

3.6 Main FW Reg or Bypass Reg Valve Control Failure (continued)

NOTES

1) Bypass reg. valve may be manually positioned up to 0.85×10^6 lb/hr flow to dampen oscillations in feedwater flow in loop of affected main reg valve.

2) A power tilt in the affected core quadrant may occur due to a rise in bypass flow. Flows above 84,500 lbm/hr in the bypass line will invalidate the value of computer point U1118

Step	Action/Expected Response	Response Not Obtained
4.	**CHECK** SG levels on bypass reg valve control.	** **GO TO** Step 6.
5.	**IF** any bypass reg valve failed, **THEN**	
	a. (ρ)**ENSURE** turbine tripped.	
	b. **ENSURE** AFW pumps running.	
	c. (ρ) **INSERT** control rods to reduce reactor power to within AFW capabilities (less than 4%), then **MAINTAIN** zero startup rate.	
	d. **CHECK** AFW LCVs controlling S/G levels to 38%.	d. Manually **CONTROL** AFW LCVs to maintain S/G levels at 38%.
	e. **CHECK** bypass reg valves closed.	e. **ISOLATE** bypass reg valves as required.
	f. **CHECK** S/G levels returning to PROGRAM.	f. (ρ) **IF** S/G level RISING **OR** DROPPING uncontrolled, **THEN** **TRIP** reactor, and ****GO TO** E-0, Reactor Trip or Safety Injection.

Step	Action/Expected Response	Response Not Obtained

3.6 Main FW Reg or Bypass Reg Valve Control Failure (continued)

Step	Action/Expected Response	Response Not Obtained
	g. ** **GO TO** Step 9.	
6.	**CHECK** S/G levels returning to PROGRAM.	(p) **IF** S/G level RISING **OR DROPPING** uncontrolled, **THEN** **TRIP** reactor, and ****GO TO** E-0, Reactor Trip or Safety Injection.
7.	**MONITOR** TDMFW Pump speed normal for current power level	**PLACE** TDMFW Pump Master Speed Control to MANUAL, **THEN** **ADJUST** speed as necessary.

Step	Action/Expected Response	Response Not Obtained
3.6	**Main FW Reg or Bypass Reg Valve Control Failure (continued)**	
	NOTE A LO FW FLOW WTR HAMMER annunciation [59-C] will be received when any main feedwater flow drops to less than 0.75×10^6 lb/hr.	
8.	**WHEN** any S/G MFW flow drops to less than 0.55×10^6 lb/hr, **THEN** **INITIATE** manual anti-water hammer actions:	
	a. **CLOSE** affected loop(s) MFW reg valve and FW isolation valve.	
	b. **MAINTAIN** affected S/G levels on program with bypass reg valves.	
	c. (ρ) **REDUCE** turbine load to within capability of bypass reg valves.	c. (ρ) **IF** S/G level loss IMMINENT, **THEN** **TRIP** reactor, and ** **GO TO** E-0, Reactor Trip or Safety Injection.
	d. **TRANSFER** S/G level control to bypass reg valves: • **REFER TO** SOI-2 & 3.01, Condensate and Feedwater System.	

Step	Action/Expected Response	Response Not Obtained

3.6 Main FW Reg or Bypass Reg Valve Control Failure (continued)

CAUTION Power range N41 controls S/G 1 and S/G 4 MFW reg valves. N42 controls S/G 2 and S/G 3 MFW reg valves.

NOTE All power range monitors input to auctioneered high anticipatory circuit for bypass FW reg valves.

Step	Action/Expected Response	Response Not Obtained
9.	**CHECK** power range N41 through N44 NORMAL.	** **GO TO** AOI-4, Nuclear Instrumentation Malfunctions.

NOTE Steps 10 & 11 should end up having the same channel (A or B) selected for steam flow and feed flow on each S/G to ensure a loss of voltage to any one channel will have minimal effect on the affected S/G level.

Step	Action/Expected Response	Response Not Obtained
10.	**CHECK** controlling steam flow Channels NORMAL.	a. **SELECT** operable channel. b. **EVALUATE** effect of the failed channel on the MFPs Speed Control and **ADJUST** in MANUAL as necessary while continuing this section.
11.	**CHECK** controlling FW flow channels NORMAL.	**SELECT** operable channel.

Step	Action/Expected Response	Response Not Obtained

3.6 Main FW Reg or Bypass Reg Valve Control Failure (continued)

12.	**CHECK** press compensation channel(s) NORMAL.	**REFER TO** Tech Specs: • 3.3.2, Engineered Safety Feature Actuation System (ESFAS) Instrumentation. • 3.3.3, Post Accident Monitoring (PAM) Instrumentation. • 3.3.4, Remote Shutdown System.
13.	**ENSURE** same channel (A or B) selected for steam flow and feed flow on each S/G	
14.	**IF** affected S/G controlling channel and level NORMAL, **THEN** a. **RETURN** MFW reg valve to AUTO. b. **RETURN** TDMFWP Speed Control to AUTO (if in MANUAL).	
15.	**WHEN** conditions allow auto rod control, **THEN** a. (ρ) **ENSURE** T-avg and T-ref within 1°F. b. **ENSURE** zero demand on control rod position indication [1-M-4]. c. **PLACE** rods in AUTO.	
16.	**INITIATE** repairs to failed equipment.	
17.	**RETURN TO** Instruction in effect.	

End of Section

Step	Action/Expected Response	Response Not Obtained

3.7 Failure Of MFW Pump Control

Step	Action/Expected Response	Response Not Obtained
1.	**CHECK** MFWPT speed controller(s) NORMAL.	**CONTROL** MFP speed using MANUAL control of master controller or individual controller(s) as required. (ρ) **IF** MANUAL control of individual MFWPT controller is ineffective, **THEN** **TRIP** affected MFWPT, and ** **GO TO** Section 3.4 or 3.5 as applicable.
2.	**PLACE** control rods in MANUAL.	
3.	**CHECK** MFW pumps recirc valves CLOSED.	**PLACE** affected valve in MANUAL and **CONTROL** as necessary.
4.	(ρ) **ENSURE** T-avg and T-ref within 3°.	
5.	**MAINTAIN** MFWP discharge press on PROGRAM.	
6.	**ENSURE** S/G levels return to PROGRAM.	**IF** S/G levels RISING **OR** DROPPING uncontrolled, **THEN** **TRIP** reactor, and ** **GO TO** E-0, Reactor Trip or Safety Injection.
7.	**CHECK** steam dump mode in T-AVG position.	**IF** 1-PT-1-33 failed **AND** steam dumps in PRESS mode, **THEN:** a. **TURN** steam dumps OFF. b. **PLACE** steam dump press controller to MANUAL, and **ZERO** output. c. **TURN** steam dumps ON. d. **STABILIZE** S/G press.

3.7 Failure Of MFW Pump Control (continued)

8. **INITIATE** repairs to failed equipment.

9. (ρ) **IF** desired to place control rods in AUTO,
THEN
ENSURE T-avg and T-ref within 1°
and
PLACE control rods in auto.

10. **WHEN** MFP pump control repairs completed,
THEN
PLACE MFP speed control in AUTO.

11. **RETURN TO** Instruction in effect.

End of Section

4.0 DISCUSSION

This AOI addresses loss of normal feedwater to any or all S/Gs as a result of pump failures or valve malfunctions.

A. Loss of reg valve control can result in the valve failing open or closed. This failure requires the operator to place the valve control in manual and return the S/G level to program. A low FW flow water hammer annunciation will be received when any main feedwater flow drops to less than 0.75 x 10^6 lb/hr (20%) [window 59-C]. Actions must be taken to restore flow. If any S/G MFW flow drops to less than 0.55 x 10^6 lb/hr then manual closure of the affected MFW reg valve, FW isol valve and level control by the bypass reg valve is required to prevent water hammer conditions in the affected S/G.

B. The unit can maintain 85% load with one MFWP and start of the standby MFWP. The standby MFWP auto starts on loss of one MFWP with turbine load greater than or equal to 67% (1-PIS-47-13, HP TURBINE IMPULSE STEAM PRESSURE). Without the standby MFWP, the turbine must be manually run-back to less than 67%.

C. If PT-1-33 fails high, the feed pump speed program circuit will see a small ΔP signal, causing the MFWPs to raise speed. If PT-1-33 fails low, the feed pump speed program circuit will see a large ΔP signal, causing the FW pumps to drop speed.

D. If PT-1-33 fails high and the steam dumps are selected to the pressure mode, the steam dump valves should open proportionally to the error signal generated by the difference in the PIC-1-33 setpoint and the failed high signal.

E. If PT-3-1 fails high, the feed pump speed control circuit will see a large ΔP signal. This will cause the MFWPs to drop speed. If PT-3-1 fails low, this causes the feed pump speed control circuit to see a small ΔP and raise speed.

F. If SG controlling channel inputs fail, the affected reg valve can be returned to auto by selecting a operable flow channel.

5.0 REFERENCES

5.1 Performance

A. AOI-4, Nuclear Instrumentation Malfunction.

B. AOI-17, Turbine Trip.

C. E-0, Reactor Trip or Safety Injection.

D. GO-3, Unit Startup from less than 4% Reactor Power to less than 30% Reactor Power.

E. GO-4, Normal Power Operation.

F. GO-5, Unit Shutdown from less than 30% Reactor Power to Hot Standby

G. SOI-2 & 3.01, Condensate and Feedwater System.

H. SPP-3.5, Regulatory Reporting Requirements.

5.2 Technical Specification

A. 3.3.2, Engineered Safety Feature Actuation System (ESFAS) Instrumentation.

B. 3.3.3, Post Accident Monitoring (PAM) Instrumentation.

C. 3.3.4, Remote Shutdown System.

5.3 Plant Drawings

A. 1-47W803-1

B. 1-47W611-3-1, -2, & -6

B.1.d
Establish Manual Makeup to the VCT

WATTS BAR NUCLEAR PLANT
JOB PERFORMANCE MEASURE
B.1.d
06-2011 NRC Exam
EVALUATION SHEET

Task: Establish Manual Makeup to the VCT.

Alternate Path: n/a

Facility JPM #: 3-OT-JPMR050A (Modified.)

Safety Function: 2 **Title:** Inventory Control

K/A 004 K1.19 Knowledge of the physical connections and/or cause-effect relationships between the CVCS and the following systems: Primary grade water supply

Rating(s): 2.7/2.9 **CFR:** 41.2 to 41.9 / 45.7 to 45.8

Evaluation Method: Simulator __X__ In-Plant ______ **Classroom** ______

References: SOI-62.02, "Boron Concentration Control," Rev. 51.

Task Number: RO-062-SOI-62-017 **Title:** Perform manual makeup to the Volume Control Tank.

Task Standard: The applicant aligns the makeup control system to perform a MANUAL makeup of 97 gallons, and raises VCT level from 22% to approximately 27%.

Validation Time: 10 minutes **Time Critical:** Yes ____ No __X__

===

Applicant: ____________________ _______________ Time Start: ______

NAME Docket No. Time Finish: ______

Performance Rating: SAT ____ UNSAT ____ Performance Time ___

Examiner: ____________________ ____________________/________

NAME SIGNATURE DATE

===

COMMENTS

____

____

____

____

____

____

SIMULATOR OPERATOR INSTRUCTIONS:

1. ENSURE NRC Examination Security has been established.
2. RESET to Initial Condition 317 by performing the following actions:
    a. Select ICManager on the THUNDERBAR menu (right hand side of Instructor Console Screen).
    b. Locate IC 317.
    c. Right “click” on IC 317.
    d. Select Reset on the drop down menu.
    e. Right “click” on RESET.
    f. Enter the password for IC 317.
    g. Select “Yes” on the INITIAL CONDITION RESET pop-up window.
    h. Perform SWITCH CHECK.
4. Place simulator in RUN and acknowledge any alarms. ENSURE VCT level is 22% on 1-LI-62-129A, VCT LEVEL.
5. ENSURE copies of SOI-62.02, “Boron Concentration Control,” Section 6.5, “Manual Makeup” and REACTW data sheets for the VCT level change are available to the Examiner.
6. ENSURE “Extra Operator” is present in the simulator.
7. Place simulator in FREEZE until Examiner cue is given.

READ TO APPLICANT

DIRECTION TO APPLICANT:

I will explain the initial conditions, and state the task to be performed. All control room steps shall be performed for this JPM, including any required communications. I will provide initiating cues and reports on other actions when directed by you. Ensure you indicate to me when you understand your assigned task. To indicate that you have completed your assigned task return the cue sheet I provided you.

INITIAL CONDITIONS:

1. **The Unit is at 100% RTP.**
2. **Auto Make-up from the Blender is out-of-service.**
3. **VCT level is being raised to 40% in batches.**
4. **The STA has just completed a REACTW calculation to raise level from 22% to 27%.**

INITIATING CUES:

The Unit Supervisor directs you to perform manual makeup batch to the VCT to increase level, using the REACTW data provided.

STEP/STANDARD	SAT/UNSAT

START TIME: _______

CAUTION

When maintaining VCT level using Manual, level must be monitored closely to avoid charging pump suction auto swap over to RWST.

NOTES

1) Manual is used when auto makeup is unavailable or if desired due to special operating conditions. As RCS CB is changed during load follow, the Manual blended solution setpoints must be adjusted. Controls are on 1-M-6.
2) RCS CB may be slightly changed during blended makeup because of the inaccuracy in flow controller settings. When this occurs, small RCS temperature changes will be seen and control rod adjustments may be required to compensate for the temperature change.
3) If batching to the VCT, use several small batches, (rather than one large batch) to allow time to evaluate possible reactivity effects between batches. A maximum batch of 100 gallons at a time is allowed

EXAMINER: Ensure that the applicant has been provided the REACTW sheet for the level increase to 27%.

STEP 1: [1] **PERFORM** Appendix C, Calculation Of Boric Acid And Primary Water Integrator Setting For Manual Makeup OR USE Appendix B for Blending at greater than 2500 ppm. STANDARD: Applicant utilizes the REACTW printout provided as Attachment C. COMMENTS:	___ SAT ___ UNSAT

STEP/STANDARD	SAT/UNSAT
STEP 2: [2] **PLACE** controllers in MANUAL, **AND CLOSE** the following: [2.1] 1-FC-62-139, BA TO BLENDER. [2.2] 1-FC-62-142, PW TO BLENDER. STANDARD: Applicant locates 1-FC-62-139, BA TO BLENDER and moves the toggle switch from the AUTO (down, mid-position) to the MANUAL (up, in the slot) position. Applicant locates 1-FC-62-142, PW TO BLENDER and moves the toggle switch from the AUTO (down, mid-position) to the MANUAL (up, in the slot) position. COMMENTS:	___ SAT ___ UNSAT

STEP/STANDARD	SAT/UNSAT
STEP 3: [3] **ADJUST** Batch Counters for the desired quantity of boric acid and primary water using values from Appendix B or C: [3.1] 1-FQ-62-139, BA BATCH COUNTER. [3.2] 1-FQ-62-142, PW BATCH COUNTER. STANDARD: The applicant locates 1-FQ-62-139 BA BATCH COUNTER, and performs the following actions: 1. Depresses and holds the black pushbutton. 2. While holding the pushbutton, the applicant raises the red translucent cover. 3. While still holding the pushbutton, the applicant enters **"000015"** in the display. 4. While still holding the pushbutton, the applicant lowers the red translucent cover, and then releases the pushbutton. 5. Observes the value displayed after the red translucent cover is lowered remained at "000015." The applicant locates 1-FQ-62-142, PW BATCH COUNTER. and performs the following actions: 1. Depresses and holds the black pushbutton. 2. While holding the pushbutton, the applicant raises the red translucent cover. 3. While still holding the pushbutton, the applicant enters **"000082"** in the display. 4. While still holding the pushbutton, the applicant lowers the red translucent cover, and then releases the pushbutton. 5. Observes the value displayed after the red translucent cover is lowered remained at "000082." COMMENTS:	___ SAT ___ UNSAT

STEP/STANDARD	SAT/UNSAT
STEP 4: [4] **PLACE** 1-HS-62-140B, VCT MAKEUP MODE, in MAN. STANDARD: Applicant locates 1-HS-62-140B, VCT MAKEUP MODE, and determines that the handswitch is in the OFF position. Applicant rotates the handswitch to the right to the "MAN" position. **Step is critical since this action is required to initiate manual makeup.** COMMENTS:	**CRITICAL STEP** ___ SAT ___ UNSAT
STEP 5: [5] **TURN** 1-HS-62-140A, VCT MAKEUP CONTROL, to START, [5.1] **CHECK** Red light is LIT. STANDARD: Applicant locates 1-HS-62-140A, VCT MAKEUP CONTROL and rotates the handswitch to the right to the START position. The applicant observes the GREEN light is DARK and the RED light is LIT. **Step is critical since this action is required to initiate manual makeup.** COMMENTS:	**CRITICAL STEP** ___ SAT ___ UNSAT

NOTE

When blending to VCT through 1-FCV-62-128, Chemistry cannot get a representative sample of the blender outlet.

STEP/STANDARD	SAT/UNSAT
STEP 6: [6] **IF** Borating OR Blending, **THEN PERFORM** the following: [6.1] **OPEN** 1-FCV-62-128, MAKEUP TO VCT INLET, **OR** 1-FCV-62-144, MAKEUP TO VCT OUTLET. STANDARD: The applicant locates 1-FCV-62-128, MAKEUP TO VCT INLET, and rotates the handswitch from the "P AUTO" position to the "OPEN" position **OR** The applicant locates 1-FCV-62-144, MAKEUP TO VCT OUTLET., and rotates the handswitch from the "P AUTO" position to the "OPEN" position **Step is critical since this establishes a flow path to fill the VCT.** COMMENTS:	**CRITICAL STEP** ___ SAT ___ UNSAT

CAUTIONS

1) 1-FC-62-142 should be maintained above 10% due to potential for controller oscillations.

2) If 1-FCV-62-128, MAKEUP TO VCT INLET and FCV-62-144, MAKEUP TO VCT OUTLET are NOT closed, boric acid will feed to the VCT through 1-FCV-62-140, BA TO BLENDER.

NOTE

When blending to VCT through 1-FCV-62-128, Chemistry cannot get a representative sample of the blender outlet.

STEP/STANDARD	SAT/UNSAT
STEP 7: [7] **IF** Diluting, **THEN PERFORM** the following: STANDARD: Applicant determines that a dilution is not in progress and enters "N/A" for this step. COMMENTS:	___ SAT ___ UNSAT
STEP 8: [8] **IF** Alternate Diluting, **THEN PERFORM** the following: STANDARD: Applicant determines that an alternate dilution is not in progress and enters "N/A" for this step. COMMENTS:	___ SAT ___ UNSAT
STEP 9: [9] **IF** RCS CB is being changed, **THEN ENSURE** 1-HS-68-341H, BACKUP HEATER C [1-M-4], is ON to equalize RCS-Pzr CB. STANDARD: Applicant determines that an RCS boron concentration is not being changed and enters "N/A" for this step. COMMENTS:	___ SAT ___ UNSAT

STEP/STANDARD	SAT/UNSAT
STEP 10: [10] **MONITOR** parameters listed below:	___ SAT ___ UNSAT

Instrument	Location	Parameters
1-PI-62-122	1-M-6	VCT PRESS
1-LI-62-129A	1-M-6	VCT LEVEL
1-FI-62-139	1-M-6	BA TO BLENDER FLOW
1-FQ-62-139	1-M-6	BA BATCH COUNTER
1-FI-62-142	1-M-6	PW TO BLENDER FLOW
1-FQ-62-142	1-M-6	PW BATCH COUNTER
1-LI-62-238	1-M-6	BAT A LEVEL
1-LI-62-242	1-M-6	BAT C LEVEL

STANDARD:

Applicant monitors the listed parameters during the manual makeup.

COMMENTS:

STEP 11: [11] **IF** 1-LI-62-129A, VCT LEVEL, rises to 63% **THEN ENSURE** 1-FCV-62-118A, LETDOWN DIVERT TO HUT, diverts to the HUT.

___ SAT

___ UNSAT

STANDARD:

Applicant observes VCT level has not exceeded 63% and continues to the next step.

COMMENTS:

STEP/STANDARD	SAT/UNSAT
STEP 12: [12] **WHEN** 1-LI-62-129A, VCT LEVEL, is at desired level, **THEN PERFORM** the following: [12.1] **PLACE** 1-HS-62-140A, VCT MAKEUP CONTROL, to STOP. [12.2] **CLOSE** 1-FCV-62-128, MAKEUP TO VCT INLET. [12.3] **CLOSE** 1-FCV-62-144, MAKEUP TO VCT OUTLET. STANDARD: When VCT level reaches approximately 27%, the applicant : ___1.) Locates 1-HS-62-140A, VCT MAKEUP CONTROL and rotates the handswitch to the left to the "STOP" position. Observes the GREEN light LIT and the RED light DARK on 1-HS-62-140A. ___2.) Locates 1-HS-62-128A, MAKEUP TO VCT INLET and rotates the handswitch to the left to the "STOP" position, then allows the switch to return to the "P-AUTO" position. Observes the GREEN light LIT and the RED light DARK on 1-HS-62-128. ___3.) Locates 1-HS-62-144, MAKEUP TO VCT OUTLET and rotates the handswitch to the left to the "STOP" position, then allows the switch to return to the "P-AUTO" position. Observes the GREEN light LIT and the RED light DARK on 1-HS-62-144. **Step is critical to terminate flow to the VCT.** COMMENTS:	**CRITICAL STEP** ___ SAT ___ UNSAT

STEP/STANDARD	SAT/UNSAT
STEP 13: [13] **IF** used for Boration **AND** flushing is required, **THEN FLUSH** per Section 6.3. STANDARD: Applicant determines that a boration was not performed and enters "N/A" for this step. COMMENTS:	___ SAT ___ UNSAT
STEP 14: [14] **IF** batch is greater than or equal to 500 gal, **THEN NOTIFY** Chemistry to sample RCS CB. STANDARD: Applicant determines that the batch was less than 500 gallons and enters "N/A" for this step. COMMENTS:	___ SAT ___ UNSAT
STEP 15: [15] **IF** maintaining VCT level with Manual Makeup, **THEN REPEAT** Steps 6.5[1] thru 6.5[14] as needed. STANDARD: Applicant informs the Unit Supervisor that the VCT level has been raised to 27%. The applicant may ask if another batch is to be accomplished. **Cue: If the applicant asks if another batch is required, inform the applicant that another operator will continue filling the VCT.** COMMENTS: **END OF TASK**	___ SAT ___ UNSAT

STOP TIME ________

APPLICANT CUE SHEET

(RETURN TO EXAMINER UPON COMPLETION OF TASK)

INITIAL CONDITIONS:

1. The Unit is at 100% RTP.
2. Auto Make-up from the Blender is out-of-service.
3. VCT level is being raised to 40% in batches of less than 100 gallons.
4. The STA has just completed a REACTW calculation to raise level from 22% to 27%.

INITIATING CUES:

The Unit Supervisor directs you to perform manual makeup batch to the VCT to increase level, using the REACTW data provided.

[REACTW - VERS WB3.3]

VCT MAKEUP INTEGRATOR SETTINGS CALCULATION
WATTS BAR UNIT 1 CYCLE 10

INPUT DATA

[1] CURRENT RCS BORIC ACID CONCENTRATION	1031.	PPM
[2] CURRENT BAT BORIC ACID CONCENTRATION	6820.	PPM
[3] B-10 DEPLETION VALUE	0.	PPM
[4] CURRENT VCT LEVEL	22.0	%
[5] DESIRED VCT LEVEL	27.0	%

CALCULATION OUTPUTS

[1] B-10 CORRECTED BORON CONCENTRATION	1031.	PPM
[2] VCT ADDITION VOLUME	97.	GALS
[3] TOTAL FLOW RATE	82.5	GPM

CALCULATION CHECK

QUANTITIES [1] AND [2] BELOW SHOULD BE APPROXIMATELY THE SAME

[1] VCT ADDITION VOLUME	97.	GALS
[2] (15. + 82.) (BA INTG SETTING + PW INTG SETTING) TOTAL INTEGRATOR SETTING	97.	GALS

MAKEUP CONTROL / INDICATION

[1] BA BATCH COUNTER (1-FQ-62-139) [1-M-6]	15.	GALS
[2] BA TO BLENDER (1-FC-62-139) [1-M-6]	31.2	%
[3] BA TO BLENDER FLOW (1-FI-62-139) [1-M-6]	12.5	GPM
[4] PW BATCH COUNTER (1-FQ-62-142) [1-M-6]	82.	GALS
[5] PW TO BLENDER (1-FC-62-142) [1-M-6]	35.0	%
[6] PW TO BLENDER FLOW (1-FI-62-142) [1-M-6]	70.0	GPM

____________________ PERFORMER ________ DATE

____________________ IV/SRO ________ DATE

[REACTW - VERS WB3.3]

VCT MAKEUP INTEGRATOR SETTINGS CALCULATION
WATTS BAR UNIT 1 CYCLE 10

INPUT DATA

[1] CURRENT RCS BORIC ACID CONCENTRATION	1031.	PPM
[2] CURRENT BAT BORIC ACID CONCENTRATION	6820.	PPM
[3] B-10 DEPLETION VALUE	0.	PPM
[4] CURRENT VCT LEVEL	22.0	%
[5] DESIRED VCT LEVEL	27.0	%

CALCULATION OUTPUTS

[1] B-10 CORRECTED BORON CONCENTRATION	1031.	PPM
[2] VCT ADDITION VOLUME	97.	GALS
[3] TOTAL FLOW RATE	82.5	GPM

CALCULATION CHECK
QUANTITIES [1] AND [2] BELOW SHOULD BE APPROXIMATELY THE SAME

[1] VCT ADDITION VOLUME	97.	GALS
[2] (15. + 82.) (BA INTG SETTING + PW INTG SETTING) TOTAL INTEGRATOR SETTING	97.	GALS

MAKEUP CONTROL / INDICATION

[1] BA BATCH COUNTER (1-FQ-62-139) [1-M-6]	15.	GALS
[2] BA TO BLENDER (1-FC-62-139) [1-M-6]	31.2	%
[3] BA TO BLENDER FLOW (1-FI-62-139) [1-M-6]	12.5	GPM
[4] PW BATCH COUNTER (1-FQ-62-142) [1-M-6]	82.	GALS
[5] PW TO BLENDER (1-FC-62-142) [1-M-6]	35.0	%
[6] PW TO BLENDER FLOW (1-FI-62-142) [1-M-6]	70.0	GPM

PERFORMER ______________ DATE ______

IV/SRO ______________ DATE ______

Watts Bar Nuclear Plant

Unit 1

System Operating Instruction

SOI-62.02

Boron Concentration Control

Revision 0051

Quality Related

Level of Use: Continuous Use

Effective Date: 10-01-2010

Responsible Organization: OPS, Operations

Prepared By: Nicholas Armour

Approved By: Henry Champagne

Revision Log

Rev or Change Number	Effective Date	Affected Page Numbers	Description of Revision/Change
46	11/27/06	2, 14, 17, 21, 52, 53	Deleted reference to NOB for reactivity control plan. This has been replaced by TI-7.012.
47	03/11/08	2, 28-29, 56 32,34	Minor editorial changes: Reformatted sections 6.6 & 6.7 to fit on a single page. Added references to table 7.17, 7.18, 7.19, 7.30 to App E Reactivity balance data sheet. For DCN 52277, added 8.1[11] & [21] to prevent invalid data being sent to the BEACON core monitoring software.
48	09/11/08	2,60	Revised to incorporate EDC 52884-A (implemented by WO 08-817141-000) which changed 1-FIT-62-142 to 1-FT-62-142. Revised the valve check list to change the UNID for the root valves.
49	10/16/09	2,8,14,21,25,29, 30,41,51,54-58	Adjusted sections 6.6 and 6.7 to reduce them to one page for ease of use [PCR 3028] Added step to Sec 6.7 to return FCI-62-139 to desired setting. [PCR 4066] Made minor non-intent changes to structure of appendixes and clarified SRO approvals and IVs results Revised notes to refer to IFBA burnout shutdown margin, and control rod positioning for AFD control. Revised threshold level of a Reactivity Event to 0.5%. Revised App. E to simplify calculation and correct sign convention IAW Reactor Eng comments. Clarified note on SRO IV on App. E and D to state it is for validation of Rx Eng provided data. [PCR 4207]
50	11/16/09	15	Incorporate UC-1 to allow for positioning 1-FC-62-142 as directed by US/SM.
51	10/01/10	2, 4, 7, 9-12, 14-17, 19, 21, 23-29, 31-33, 35, 38, 40-44, 57	Minor/editorial revision: Added signoffs to Steps 8.1[22] through 8.1[25] (PCR 4637). Added (ρ) notation for direct reactivity steps. Reformatted source notes, added section end identification and created external attachments for all checklists.

Table of Contents

Table of Contents (continued)

ATTACHMENTS

1.0 INTRODUCTION

1.1 Purpose

To provide instructions for operation of the CVCS Boron Concentration Control System.

1.2 Scope

This Instruction includes the following operations:

A. Startup (Standby Readiness)

B. Automatic Makeup

C. Dilution

D. Alternate Dilution

E. Boration

F. Manual Makeup

G. Minor Dilution

H. Minor Boration

I. RWST Makeup Using Blender

J. Batching to Holdup Tank A Prior to Pumping Transfer Canal

K. Major and Minor Boration with Boric Acid Integrator out of service

L. VCT Level Reduction

2.0 REFERENCES

2.1 Performance References

A. 1-TRI-62-3, Boric Acid Flow Paths: Valve Position Verification

B. NUPOP, Nuclear Parameters and Operations Package

C. SOI-62.01, CVCS-Charging and Letdown

D. SOI-62.05, Boric Acid Batching, Transfer and Storage

E. SOI-62.06, Boron Disposal System

F. SOI-78.01, Spent Fuel Pit Cooling and Cleaning System

G. SOI-81.01, Primary Makeup Water Systems

H. SOI-236.01, 125V DC Vital Battery Board I

I. TI-4 PART II, Pant Curve Book, Tank Curves, Turbine Curves

J. Tech Requirements Fig 3.1.6, Boric Acid Tank Limits

K. Computer Program REACTW and REACTW Computer Program User's Guide.

L. Computer Program REACTINW and REACTINW Computer Program User's Guide

M. TI-59, Boration Tables

2.2 Developmental References

A. Tech Spec Section 3.1, Reactivity Control Systems

B. System Description N3 62 4001, Chemical and Volume Control System

C. TVA Drawings:

1. 47W610-62-3
2. 47W611-62-2
3. 47W809-2
4. 47W812-1
5. 47W855-1

3.0 PRECAUTIONS AND LIMITATIONS

A. At least one Reactor Coolant Pump (RCP) or one Residual Heat Removal (RHR) Pump will be in operation during boron concentration (C_B) changes. [C.1][C.2][C.3]

B. Pressurizer (Pzr) C_B should **NOT** be less than 50 ppm from RCS C_B.

C. Axial Offset should be maintained in Target Band during C_B changes.

D. Normally the reactor will **NOT** be made critical by boron dilution.

E. Boric Acid Tank (BAT) level should be monitored during makeup or boration to avoid violating Tech Requirement (TR) 3.1.6 level limits, and consideration of the other requirements of TR 3.1.5 and 3.1.6 should be evaluated, particularly in sections which use the in-service BAT.

F. TI-59 Boration Tables were calculated using 70 gpm Primary Water flow up to 2500 ppm. For blending at concentrations greater than 2500 ppm, primary water flow will need to be adjusted downward per Appendix B while Boric Acid flow is maintained at 40 gpm (e.g. 100% on 1-FC-62-142)

G. Expect a delay between time boration/dilution is started until effect is seen in RCS.

H. When subcritical, Boration/Dilution effects are monitored by Source Range counts. Unexplained change in count rate requires the operation to be stopped.

I. At power, Boration/Dilution effects are monitored by Rod movement and T_{avg}. Operation must be stopped if Rods move in the wrong direction or T_{avg} change is unexplained.

J. The following should be evaluated as potential Reactivity Management issues: unanticipated

1. power change >0.5%,
2. rod motion > 5 steps,
3. T_{avg} change >1°F.

K. During refueling operations, boron concentration changes can affect Mansell readings. If Mansell is in service for RCS level indication, and RCS boron concentration is changed, the Boron Concentration Input value to Mansell should be adjusted.

Date________ **Initials**

4.0 PREREQUISITE ACTIONS

4.1 Preliminary Actions

NOTES

1) Throughout the Instruction where an **IF/THEN** statement occurs, the step should be **N/A** if stated condition does **NOT** exist.
2) Signoffs/information in unused Sections may be left blank.

[1] **INDICATE** Section to be performed, and reason for use:

5.0	Startup ________	7.0	Shutdown ________
6.0	Normal Operation ________	8.0	Infrequent Operations ________

Section/ Reason/ Remarks: ____________________

____

____

____

4.2 Field Preparations

[1] **ENSURE** Section 3.0, Precautions, and Limitations, REVIEWED. ________

[2] **CHECK** Primary Water System IN SERVICE (ref SOI-81.01). ________

[3] **ENSURE** Refuel Water Storage Tank (RWST) and Boric Acid Tank(s) AVAILABLE. ________

[4] **CHECK** Boric Acid Pump(s) IN OPERATION (ref SOI-62.05). ________

4.3 Approvals and Notifications

[1] **COORDINATE** performance with US and UO. ________

Date________ **Initials**

5.0 STARTUP (OR STANDBY READINESS)

[1] **PERFORM** the following:

NOMENCLATURE	LOCATION	POSITION	UNID	PERF INITIALS
MAKEUP TO VCT INLET	1-M-6	P AUTO	1-HS-62-128	
MAKEUP TO VCT OUTLET	1-M-6	P AUTO	1-HS-62-144	
BA TO BLENDER	1-M-6	P AUTO	1-HS-62-140D	
PW TO BLENDER	1-M-6	P AUTO	1-HS-62-143	

NOTE

Appendix B has guidance for Blending at greater than 2500 ppm.

[2] **ADJUST** 1-FC-62-142, PW TO BLENDER [1-M-6], to 35% (equivalent to 70 gpm, normal makeup flow), **AND**

PLACE Manual-Auto toggle in AUTO. ________

[3] **ADJUST** dial on 1-FC-62-139, BA TO BLENDER [1-M-6], to present C_B, **AND**

PLACE Manual-Auto toggle in AUTO. ________

[4] **PLACE** 1-HS-62-140B, VCT MAKEUP MODE [1-M-6], in AUTO. ________

[5] **TURN** 1-HS-62-140A, VCT MAKEUP CONTROL [1-M-6], in START, **AND**

CHECK Red light is LIT. ________

End of Section

Date________ **Initials**

6.0 NORMAL OPERATION

Normal makeup control is Automatic (AUTO), with Volume Control Tank (VCT) level maintained by periodic addition to or diversion from CVCS.

Applicable Checklists will be performed at discretion of Operations Superintendent or designee. Checklists are normally performed for System Alignment Verification in Mode 5 or whenever alignment verification is needed.

6.1 Auto Makeup

NOTE

RCS CB may be slightly changed during blended makeup because of the inaccuracy in flow controller settings. When this occurs small RCS temperature, changes will be seen and control rod adjustments may be required to compensate for the temperature change.

[1] **WHEN** Auto Makeup is in progress, **THEN**

MONITOR the following:

- 1-FI-62-139, BA TO BLENDER FLOW [1-M-6].
- 1-FI-62-142, PW TO BLENDER FLOW [1-M-6].
- 1-LI-62-129A, VCT LEVEL [1-M-6], to ensure level within Appendix A, VCT Level Setpoints.

End of Section

Date________ **Initials**

6.2 Dilution

CAUTIONS

1) RCS flow should be at least 3000 gpm during dilution. If all coolant flow is lost during dilution, one RCS loop could fill with unborated water. Reinitiating of flow in that loop could flush the unborated water into the core and cause a rapid reduction in shutdown margin. [C.3]
2) Dilution is performed only when Rx is substantially subcritical or Control Rods are above their insertion limit.

NOTES

1) Section 6.6 should be used for minor dilution.
2) Dilution is for long-term reactivity addition, and may be used to: [C.3]
   - overcome Xenon buildup.
   - maintain control rods positioned as necessary to control AFD during reactivity maneuvers.
   - compensate for fuel burnup.
3) TI-4 Part II may be used to approximate the number of gallons required to adjust VCT to desired level.

[1] **IF** reactor is subcritical **AND** a dilution is required, **THEN**

PERFORM Appendix D. ________

Date________ Initials

6.2 Dilution (continued)

NOTE

Appendix D and E may be used by an SRO to approve and independently verify data provided by Reactor Engineering. In this case, an additional IV by another SRO is **NOT** required.

[2] **IF** reactor is critical **AND** Reactor power is to be changed by greater than 5%, **THEN**

USE an approved Reactivity Control Plan ________

OR

PERFORM the following if Reactivity Control Plan **NOT** available:

- Appendix D, Calculation For Amount Of Boric Acid Or Primary Water (TI-59). ________
- Appendix E, Reactivity Balance Calculation. ________

[3] **ENSURE** 1-FC-62-142, PW TO BLENDER dial [1-M-6], set to 35% (70 gpm) or as directed by SM/US, and Manual-Auto toggle in AUTO. ________

[4] **ADJUST** 1-FQ-62-142, PW BATCH COUNTER [1-M-6], for required quantity. ________

[5] **PLACE** 1-HS-62-140B, VCT MAKEUP MODE [1-M-6], in DIL. ________

[6] **(p) TURN** 1-HS-62-140A, VCT MAKEUP CONTROL [1-M-6], to START. ________

[6.1] **CHECK** Red light is LIT. ________

Date________ Initials

6.2 Dilution (continued)

[7] **ENSURE** 1-HS-68-341H, BACKUP HEATER C [1-M-4], is ON, to equalize Pzr-RCS C_B. ________

[8] **MONITOR** the following parameters:

Instrument	Location	Parameters
1-PI-62-122	1-M-6	VCT PRESS
1-LI-62-129A	1-M-6	VCT LEVEL
1-FI-62-142	1-M-6	PW TO BLENDER FLOW
1-FQ-62-142	1-M-6	PW BATCH COUNTER
1-FQ-62-139	1-M-6	BA BATCH COUNTER

NOTE

Rods may step IN if in AUTO.

[9] **MONITOR** NIS and Rod Movement to verify expected response. ________

[10] **IF** 1-LI-62-129A, VCT LEVEL [1-M-6] rises to 63%, **THEN**

ENSURE 1-FCV-62-118A, LETDOWN DIVERT TO HUT, diverts to the HUT. ________

[11] **WHEN** dilution is COMPLETE, AND 1-FCV-62-128 is closed, **THEN**

PERFORM the following to ALIGN makeup to AUTO:

[11.1] **ENSURE** 1-FC-62-142, PW TO BLENDER, on 35% (70gpm), and Manual-Auto toggle in AUTO. ________

[11.2] **ADJUST** 1-FC-62-139, BA TO BLENDER, for new RCS C_B. ________

[11.3] **PLACE** 1-HS-62-140B, VCT MAKEUP MODE, in AUTO. ________

[11.4] **TURN** 1-HS-62-140A, VCT MAKEUP CONTROL, to START. ________

A. **CHECK** Red light is LIT. ________

Date________ Initials

6.2 Dilution (continued)

[12] **IF** batch dilution is ≥500 gal, **THEN**

NOTIFY Chemistry to sample RCS C_B. ________

[13] **IF** desired to reduce VCT level, **THEN**

GO TO Section 8.5, VCT Level Reduction. ________

End of Section

Date________ Initials

6.3 Alternate Dilution or Flush

CAUTION

RCS flow should be at least 3000 gpm during dilution. If all coolant flow is lost during dilution, one RCS loop could fill with unborated water. Reinitiating of flow in that loop could flush the unborated water into the core and cause a rapid reduction in shutdown margin. [C.3]

NOTES

1) Section 6.6 should be used for minor dilution.
2) Alternate Dilution is used for faster dilution, e.g., during Xenon transients, load changes, or to facilitate anticipated reactivity insertions (e.g., physics testing). When conditions stabilize, the operator should return to normal dilution, if necessary to continue dilution, since alternate dilution reduces RCS H2 conc.
3) TI-4 Part II may be used to approximate the number of gallons required to adjust VCT to desired level.

[1] **IF** reactor is subcritical **AND** a dilution is required, **THEN**

PERFORM Appendix D. _________

NOTE

Appendix D and E may be used by an SRO to approve and independently verify data provided by Reactor Engineering. In this case, an additional IV by another SRO is **NOT** required.

[2] **IF** reactor is critical **AND** Reactor power is to be changed by greater than 5%, **THEN**

USE an approved Reactivity Control Plan _________

OR

PERFORM the following if Reactivity Control Plan **NOT** available:

- Appendix D, Calculation For Amount Of Boric Acid Or Primary Water (TI-59). _________
- Appendix E, Reactivity Balance Calculation. _________

Date________ Initials

6.3 Alternate Dilution or Flush (continued)

[3] **ENSURE** 1-FC-62-142, PW TO BLENDER dial [1-M-6], set to 35% (70 gpm), or other setting as specified in approved instruction, and Manual-Auto toggle in AUTO. ________

[4] **ADJUST** 1-FQ-62-142, PW BATCH COUNTER [1-M-6], for required quantity. ________

[5] **PLACE** 1-HS-62-140B, VCT MAKEUP MODE [1-M-6], in ALT DIL. ________

[6] **PLACE** 1-FCV-62-128, MAKEUP TO VCT INLET, in CLOSE. ________

[7] **(p) TURN** 1-HS-62-140A, VCT MAKEUP CONTROL [1-M-6], to START. ________

[7.1] **CHECK** Red light is LIT. ________

[8] **ENSURE** 1-HS-68-341H, BACKUP HEATER C [1-M-4], is ON, to equalize RCS-Pzr C_B. ________

[9] **MONITOR** the following parameters:

Instrument	Location	Parameters
1-PI-62-122	1-M-6	VCT PRESS
1-LI-62-129A	1-M-6	VCT LEVEL
1-FI-62-142	1-M-6	PW TO BLENDER FLOW
1-FQ-62-142	1-M-6	PW BATCH COUNTER
1-FQ-62-139	1-M-6	BA BATCH COUNTER

NOTE

Rods may step IN if in AUTO.

[10] **MONITOR** NIS and Rod movement to verify expected response. ________

[11] **IF** 1-LI-62-129A, VCT LEVEL [1-M-6], rises to 63%, **THEN**

ENSURE 1-FCV-62-118A, LETDOWN DIVERT TO HUT [1-M-6], diverts to HUT. ________

Date________ **Initials**

6.3 Alternate Dilution or Flush (continued)

[12] **WHEN** alternate dilution is COMPLETE, **THEN**

PERFORM the following to REALIGN makeup to AUTO:

[12.1] **ENSURE** 1-FC-62-142, PW TO BLENDER, on 35% (70gpm) and Manual-Auto toggle in AUTO. _________

[12.2] **ADJUST** 1-FC-62-139, BA TO BLENDER, to new RCS C_B. _________

[12.3] **PLACE** 1-HS-62-140B, VCT MAKEUP MODE, in AUTO. _________

[12.4] **TURN** 1-HS-62-140A, VCT MAKEUP CONTROL, to START. _________

A. **CHECK** Red light is LIT. _________

[12.5] **ENSURE** 1-HS-62-128, MAKEUP to VCT INLET, in P-AUTO. _________

[13] **IF** batch is greater than or equal to 500 gal, **THEN**

NOTIFY Chemistry to sample RCS C_B. _________

End of Section

Date________ **Initials**

6.4 Boration

NOTES

1) Section 6.7 should be used for minor boration.
2) Boration is for long-term reactivity reduction, and may be used to:
   - compensate for Xenon burnout.
   - maintain control rods positioned as necessary to control AFD during reactivity maneuvers.
   - Compensate for IFBA burnout.
   - Increase shutdown margin.
3) Appendix B has guidance for Blending at greater than 2500 ppm.
4) TI-4 Part II may be used to approximate the number of gallons required to adjust VCT to desired level.

[1] **IF** transition from AOI-39, RAPID LOAD REDUCTION, **THEN**

[1.1] **USE** AOI-39 boration table to determine required boric acid addition and flow rate **AND** ________

[1.2] **GO TO** Step 6.4[4]. ________

[2] **IF** reactor is subcritical **AND** a boration is required, **THEN**

PERFORM Appendix D. ________

Date________ Initials

6.4 Boration (continued)

NOTE
Appendix D and E may be used by an SRO to approve and independently verify data provided by Reactor Engineering. In this case, an additional IV by another SRO is **NOT** required.

[3] **IF** reactor is critical AND Reactor power is to be changed by greater than 5%, **THEN**

USE an approved Reactivity Control Plan ________

OR

PERFORM the following if Reactivity Control Plan **NOT** available:

- Appendix D, Calculation For Amount Of Boric Acid Or Primary Water (TI-59). ________
- Appendix E, Reactivity Balance Calculation. ________

[4] **ADJUST** 1-FC-62-139, BA TO BLENDER [1-M-6], for desired flow rate. ________

[5] **ADJUST** 1-FQ-62-139, BA BATCH COUNTER [1-M-6], for required quantity. ________

[6] **PLACE** 1-HS-62-140B, VCT MAKEUP MODE [1-M-6], in BOR. ________

[7] **(p) TURN** 1-HS-62-140A, VCT MAKEUP CONTROL [1-M-6], to START. ________

[7.1] **CHECK** Red light is LIT. ________

[8] **ENSURE** 1-HS-68-341H, BACKUP HEATER C [1-M-4], is ON, to equalize RCS-Pzr C_B. ________

Date________ Initials

6.4 Boration (continued)

[9] **MONITOR** the following parameters:

Instrument	Location	Parameters
1-PI-62-122	1-M-6	VCT PRESS
1-LI-62-129A	1-M-6	VCT LEVEL
1-FI-62-139	1-M-6	BA TO BLENDER FLOW
1-FQ-62-139	1-M-6	BA BATCH COUNTER
1-FI-62-142	1-M-6	PW TO BLENDER FLOW
1-FQ-62-142	1-M-6	PW BATCH COUNTER
1-LI-62-238	1-M-6	BAT A LEVEL
1-LI-62-242	1-M-6	BAT C LEVEL

NOTE

Rods should step OUT if in AUTO.

[10] **MONITOR** NIS and Rod movement to verify expected response. ________

[11] **IF** 1-LI-62-129A, VCT LEVEL, rises to 63% **THEN**

ENSURE 1-FCV-62-118A, LETDOWN DIVERT TO HUT, diverts to the HUT. ________

Date________ Initials

6.4 Boration (continued)

[12] **WHEN** Boration is COMPLETE, **THEN**

PERFORM the following to REALIGN makeup to AUTO:

[12.1] **ENSURE** 1-FC-62-142, PW TO BLENDER, on 35% (70gpm) and Manual-Auto toggle in AUTO. ________

[12.2] **ADJUST** 1-FC-62-139, BA TO BLENDER, to new RCS C_B. ________

[12.3] **PLACE** 1-HS-62-140B, VCT MAKEUP MODE, in AUTO. ________

[12.4] **TURN** 1-HS-62-140A, VCT MAKEUP CONTROL, to START. ________

A. **CHECK** Red light is LIT. ________

[13] **IF** required to flush affected piping, **THEN**

GO TO Section 6.3. ________

End of Section

Date________ **Initials**

6.5 Manual Makeup

CAUTION

When maintaining VCT level using Manual, level must be monitored closely to avoid charging pump suction auto swap over to RWST.

NOTES

1) Manual is used when auto makeup is unavailable or if desired due to special operating conditions. As RCS CB is changed during load follow, the Manual blended solution setpoints must be adjusted. Controls are on 1-M-6.
2) RCS C_B may be slightly changed during blended makeup because of the inaccuracy in flow controller settings. When this occurs small RCS temperature changes will be seen and control rod adjustments may be required to compensate for the temperature change.
3) If batching to the VCT, use several small batches, (rather than one large batch) to allow time to evaluate possible reactivity effects between batches. A maximum batch of 100 gallons at a time is allowed.

[1] **PERFORM** Appendix C, Calculation Of Boric Acid And Primary Water Integrator Setting For Manual Makeup OR USE Appendix B for Blending at greater than 2500 ppm. ☐

[2] **PLACE** controllers in MANUAL, **AND**

CLOSE the following: ☐

[2.1] 1-FC-62-139, BA TO BLENDER. ☐

[2.2] 1-FC-62-142, PW TO BLENDER. ☐

[3] **ADJUST** Batch Counters for the desired quantity of boric acid and primary water using values from Appendix B or C:

[3.1] 1-FQ-62-139, BA BATCH COUNTER. ☐

[3.2] 1-FQ-62-142, PW BATCH COUNTER. ☐

[4] **PLACE** 1-HS-62-140B, VCT MAKEUP MODE, in MAN. ☐

[5] **TURN** 1-HS-62-140A, VCT MAKEUP CONTROL, to START. ☐

[5.1] **CHECK** Red light is LIT. ☐

Date________ **Initials**

6.5 Manual Makeup (continued)

NOTE

When blending to VCT through 1-FCV-62-128, Chemistry cannot get a representative sample of the blender outlet.

[6] **IF** Borating OR Blending, **THEN**

PERFORM the following:

[6.1] (ρ) **OPEN** 1-FCV-62-128, MAKEUP TO VCT INLET, **OR** 1-FCV-62-144, MAKEUP TO VCT OUTLET. ☐

[6.2] **MANUALLY ADJUST** 1-FC-62-139, BA TO BLENDER, and 1-FC-62-142, PW TO BLENDER, to desired flow(s) using blending flowrates from Appendix C, OR Appendix B for Blending at greater than 2500 ppm. ☐

CAUTIONS

1) 1-FC-62-142 should be maintained above 10% due to potential for controller oscillations.

2) If 1-FCV-62-128, MAKEUP TO VCT INLET and FCV-62-144, MAKEUP TO VCT OUTLET are **NOT** closed, boric acid will feed to the VCT through 1-FCV-62-140, BA TO BLENDER. [C.5]

NOTE

When blending to VCT through 1-FCV-62-128, Chemistry cannot get a representative sample of the blender outlet.

[7] **IF** Diluting, **THEN**

PERFORM the following:

[7.1] (ρ) **OPEN** 1-FCV-62-128, MAKEUP TO VCT INLET. ☐

[7.2] **ADJUST** 1-FC-62-142, PW TO BLENDER, to desired flow. ☐

Date________ Initials

6.5 Manual Makeup (continued)

[8] **IF** Alternate Diluting, **THEN**

PERFORM the following:

[8.1] (p) **OPEN** 1-FCV-62-144, MAKEUP TO VCT OUTLET and 1-FCV-62-128, MAKEUP TO VCT INLET. ☐

[8.2] **ADJUST** 1-FC-62-142, PW TO BLENDER, to desired flow. ☐

[9] **IF** RCS C_B is being changed, **THEN**

ENSURE 1-HS-68-341H, BACKUP HEATER C [1-M-4], is ON to equalize RCS-Pzr C_B. ☐

[10] **MONITOR** parameters listed below:

Instrument	Location	Parameters
1-PI-62-122	1-M-6	VCT PRESS
1-LI-62-129A	1-M-6	VCT LEVEL
1-FI-62-139	1-M-6	BA TO BLENDER FLOW
1-FQ-62-139	1-M-6	BA BATCH COUNTER
1-FI-62-142	1-M-6	PW TO BLENDER FLOW
1-FQ-62-142	1-M-6	PW BATCH COUNTER
1-LI-62-238	1-M-6	BAT A LEVEL
1-LI-62-242	1-M-6	BAT C LEVEL

[11] **IF** 1-LI-62-129A, VCT LEVEL, rises to 63% **THEN**

ENSURE 1-FCV-62-118A, LETDOWN DIVERT TO HUT, diverts to the HUT. ☐

[12] **WHEN** 1-LI-62-129A, VCT LEVEL, is at desired level, **THEN**

PERFORM the following:

[12.1] **PLACE** 1-HS-62-140A, VCT MAKEUP CONTROL, to STOP. ☐

[12.2] **CLOSE** 1-FCV-62-128, MAKEUP TO VCT INLET. ☐

[12.3] **CLOSE** 1-FCV-62-144, MAKEUP TO VCT OUTLET. ☐

Date________ Initials

6.5 Manual Makeup (continued)

[13] **IF** used for Boration **AND** flushing is required, **THEN**

FLUSH per Section 6.3. ☐

[14] **IF** batch is greater than or equal to 500 gal, **THEN**

NOTIFY Chemistry to sample RCS C_B. ☐

[15] **IF** maintaining VCT level with Manual Makeup, **THEN**

REPEAT Steps 6.5[1] thru 6.5[14] as needed. ☐

[16] **ENSURE** Steps 6.5[1] thru 6.5[14] COMPLETE. ________

[17] **WHEN** Auto Makeup can be RESTORED, **THEN**

PERFORM the following to REALIGN makeup to AUTO:

[17.1] **ENSURE** 1-FC-62-142, PW TO BLENDER, dial set to 35% (70 gpm), **THEN**

PLACE Manual-Auto toggle switch in AUTO. ________

[17.2] **ADJUST** 1-FC-62-139, BA TO BLENDER dial to new RCS C_B, **THEN**
PLACE Manual-Auto toggle switch in Auto. ________

[17.3] **PLACE** 1-HS-62-140B, VCT MAKEUP MODE, in AUTO. ________

[17.4] **PLACE** 1-HS-62-140A, VCT MAKEUP CONTROL, to START. ________

A. **CHECK** Red light is LIT. ________

[17.5] **ENSURE** 1-HS-62-128, MAKEUP TO VCT INLET, is in P-AUTO. [1-M-6] ________

[17.6] **ENSURE** 1-HS-62-144, MAKEUP TO VCT OUTLET, is in P-AUTO. [1-M-6] ________

End of Section

Date________ Initials

6.6 Minor Dilution

NOTES

1) Section 6.6, Minor Dilution, may be reproduced, laminated, displayed, reused, etc. as desired.
2) Minor Dilution is defined as the addition of Primary Water done several times each shift to compensate for fuel burn-up, and maintain T_{avg} on program.

[1] **ENSURE** 1-HS-68-341H, BACKUP HEATER C, is ON, to equalize Pzr-RCS C_B. ☐

[2] **ADJUST** 1-FQ-62-142, PW BATCH COUNTER, for required quantity. ☐

[3] **PLACE** 1-HS-62-140B, VCT MAKEUP MODE in DIL. ☐

[4] **(ρ) TURN** 1-HS-62-140A, VCT MAKEUP CONTROL, to START. ☐

[4.1] **CHECK** Red light is LIT. ☐

[5] **MONITOR** the following parameters:

Instrument	Location	Parameters
1-PI-62-122	1-M-6	VCT PRESS
1-LI-62-129A	1-M-6	VCT LEVEL
1-FI-62-142	1-M-6	PW TO BLENDER FLOW
1-FQ-62-142	1-M-6	PW BATCH COUNTER
1-FQ-62-139	1-M-6	BA BATCH COUNTER

[6] **WHEN** dilution is COMPLETE, AND 1-FCV-62-128 is closed, **THEN**

PLACE 1-HS-62-140B, VCT MAKEUP MODE, in AUTO. ☐

[7] **TURN** 1-HS-62-140A, VCT MAKEUP CONTROL, to START. ☐

[7.1] **CHECK** Red light is LIT. ☐

[8] **IF** desired to reduce VCT level, **THEN**

GO TO Section 8.5, VCT Level Reduction. ☐

End of Section

Date________ Initials

6.7 Minor Boration

NOTES

1) Section 6.7, may be reproduced, laminated, displayed, reused, etc. as desired.
2) Minor Boration is defined as the addition of Boric Acid done several times each shift early in core life, to compensate for burnable poison burn-up, and maintain T_{avg} on program.

[1] **ENSURE** 1-HS-68-341H, BACKUP HEATER C [1-M-4], is ON, to equalize RCS-Pzr C_B. ☐

[2] **ADJUST** 1-FC-62-139, BA TO BLENDER [1-M-6], for desired flow rate. ☐

[3] **ADJUST** 1-FQ-62-139, BA BATCH COUNTER [1-M-6], for required quantity. ☐

[4] **PLACE** 1-HS-62-140B, VCT MAKEUP MODE [1-M-6], in BOR. ☐

[5] **(ρ) TURN** 1-HS-62-140A, VCT MAKEUP CONTROL [1-M-6], to START. ☐

[5.1] **CHECK** Red light is LIT. ☐

[6] **MONITOR** the following parameters:

Instrument	Location	Parameters
1-PI-62-122	1-M-6	VCT PRESS
1-LI-62-129A	1-M-6	VCT LEVEL
1-FI-62-139	1-M-6	BA TO BLENDER FLOW
1-FQ-62-139	1-M-6	BA BATCH COUNTER
1-FI-62-142	1-M-6	PW TO BLENDER FLOW
1-FQ-62-142	1-M-6	PW BATCH COUNTER
1-LI-62-238	1-M-6	BAT A LEVEL
1-LI-62-242	1-M-6	BAT C LEVEL

Date________ **Initials**

6.7 Minor Boration (continued)

[7] **WHEN** Boration is COMPLETE, **THEN**

PLACE 1-HS-62-140B, VCT MAKEUP MODE, in AUTO. ☐

[8] **TURN** 1-HS-62-140A, VCT MAKEUP CONTROL, to START. ☐

[8.1] **CHECK** Red light is LIT. ☐

[9] **RETURN** 1-FC-62-139, BA TO BLENDER [1-M-6], to desired flow rate. ☐

End of Section

Date________ Initials

7.0 SHUTDOWN

[1] **ENSURE** the following handswitches to STOP:

[1.1] 1-HS-62-140B, VCT MAKEUP MODE [1-M-6]. ________

[1.2] 1-HS- 62-140A, VCT MAKEUP CONTROL [1-M-6]. ________

End of Section

Date________ Initials

8.0 INFREQUENT OPERATIONS

8.1 RWST Makeup Using Blender

NOTE

Performance of this Section should be coordinated with performance of 1-TRI-62-3, Boric Acid Flow Paths: Valve Position Verification.

[1] **REFER TO** one of the following methods to determine amount of Primary Water (PW) & Boric Acid (BA) needed: (**N/A** method **NOT** used)

[1.1] **IF** blending at less than 2500 ppm, **THEN**

USE TI-59. ________

[1.2] **IF** blending at 2500 ppm or greater, **THEN**

USE Appendix B. ________

[2] **ENSURE** VCT level adequate for operation without makeup for expected duration of RWST makeup. ________

[3] **ENSURE** no Containment Spray recirc to RWST evolutions in progress. ________

NOTE

If operating, a Refueling Water Purification Pump may be left in operation during make-up to the RWST; however, adjustments may be required to maintain desired RWPP differential pressure ≥82 psid.

[4] **CHECK** if Refueling Water Purification Pump is being used to recirc the RWST.

YES ☐
NO ☐

[5] **PLACE** 1-HS-62-140B, VCT MAKEUP MODE (1-M-6) in MANUAL. ________

Date________ Initials

8.1 RWST Makeup Using Blender (continued)

[6] **PLACE** the following HSs in CLOSE: [C.3]

NOMENCLATURE	LOCATION	UNID	PERF INITIALS
MAKEUP TO VCT INLET	1-M-6	1-HS-62-128	
MAKEUP TO VCT OUTLET	1-M-6	1-HS-62-144	

[7] **PERFORM** the following:

NOMENCLATURE	LOCATION	POSITION	UNID	PERF INITIALS
CVCS BA BLENDER OUTLET ISOLATION	A4U/713	OPEN	1-ISV-62-936	
RWST BORIC ACID MAKEUP	A4U/713	OPEN	1-ISV-62-938	

[8] **PLACE** flow controllers in MANUAL, **AND**

PERFORM the following:

NOMENCLATURE	LOCATION	POSITION	UNID	PERF INITIALS
BA TO BLENDER	1-M-6	CLOSED	1-FC-62-139	
PW TO BLENDER	1-M-6	CLOSED	1-FC-62-142	

[9] **ADJUST** the following batch counters for the required amount:

[9.1] 1-FQ-62-139, BA BATCH COUNTER [1-M-6]. ________

[9.2] 1-FQ-62-142, PW BATCH COUNTER [1-M-6]. ________

[10] **NOTIFY** Chemistry of RWST makeup operation for determination of sampling requirements. ________

NOTE

Step 8.1[11] may be performed from the ICS system menu or by using the "DFP" turn-on code or by using other ICS screens. It is performed to prevent inaccurate data from being sent to the BEACON core monitoring program.

[11] **DELETE** the following ICS points from processing:

[11.1] U0102 "BORIC ACID FLOW RATE" ________

[11.2] U0103 "PRIMARY MAKEUP WTR FLOW RATE" ________

Date________ **Initials**

8.1 RWST Makeup Using Blender (continued)

[12] **(p) PLACE** 1-HS-62-140A, VCT MAKEUP CONTROL [1-M-6], to START. ________

[12.1] **CHECK** Red light is LIT. ________

[13] **ADJUST** 1-FC-62-139, BA TO BLENDER, and 1-FC-62-142, PW TO BLENDER, to desired flows. ________

[14] **ENSURE** at least 82 psid across operating Refueling Water Purification Pump. (**N/A** if none operating) ________

[15] **ENSURE** less than 100 gpm through SFP Demin. (**N/A** if **NOT** in service) ________

[16] **MONITOR** the following parameters:

Instrument	Location	Parameters
1-PI-62-122	1-M-6	VCT PRESS
1-LI-62-129A	1-M-6	VCT LEVEL
1-FI-62-139	1-M-6	BA TO BLENDER FLOW
1-FQ-62-139	1-M-6	BA BATCH COUNTER
1-FI-62-142	1-M-6	PW TO BLENDER FLOW
1-FQ-62-142	1-M-6	PW BATCH COUNTER
1-LI-62-238	1-M-6	BAT A LEVEL
1-LI-62-242	1-M-6	BAT C LEVEL

[17] **WHEN** desired RWST level is reached, **THEN**

PLACE 1-HS-62-140A, VCT MAKEUP CONTROL, to STOP. ________

[18] **ENSURE** at least 82 psid across operating Refueling Water Purification Pump. (**N/A** if none operating) ________

[19] **ENSURE** less than 100 gpm through SFP Demin. (**N/A** if **NOT** in service) ________

Date________ Initials

8.1 RWST Makeup Using Blender (continued)

[20] **PERFORM** the following:

NOMENCLATURE	LOCATION	POSITION	UNID	PERF INITIALS	VERIFIER INITIALS
CVCS BA BLENDER OUTLET ISOLATION	A4U/713	CLOSED	1-ISV-62-936		IV
RWST BORIC ACID MAKEUP	A4U/713	CLOSED	1-ISV-62-938		IV

NOTE

Step 8.1[11] may be performed from the ICS system menu or by using the "RTP" turn-on code or by using other ICS screens.

[21] **RESTORE** the following ICS points to processing:

[21.1] U0102 "BORIC ACID FLOW RATE" ________

[21.2] U0103 "PRIMARY MAKEUP WTR FLOW RATE" ________

[22] **IF** desired makeup mode is AUTO, **THEN**

COMPLETE Section 5.0. ________

[23] **IF** a Refueling Water Purification Pump was NOT being used to recirc the RWST prior to this evolution, **THEN**

RECIRCULATE RWST contents per SOI-78.01. ________

[24] **IF** BAT makeup is required, **THEN**

INITIATE makeup per SOI-62.05 (REFER TO Technical Requirements). ________

[25] **IF** desired makeup mode is **NOT** AUTO, **THEN**

GO TO Section 6.0, Normal Operation, for specific Section. ________

End of Section

Date________ Initials

8.2 Batching to Holdup Tank A Prior to Pumping Transfer Canal

CAUTION

Reactivity changes could occur while batching to Holdup Tank A.

NOTES

1) HUT low alarm (5%) or high alarm (93%) could actuate locally during this evolution.
2) The Unit SRO should be notified that LCO tracking may need to be initiated for TR 3.1.1 or 3.1.2.
3) Performance of this Section should be coordinated with performance of 1-TRI-62-3, Boric Acid Flow Paths: Valve Position Verification.

[1] **ENSURE** VCT level adequate for operation without makeup for expected duration of Holdup Tank A makeup. ________

[2] **ENSURE** no Containment Spray recirc to RWST evolutions in progress. ________

[3] **PERFORM** the following on Holdup Tank A per HUT Recirc Section of SOI-62.06. (**N/A** if acceptable Chemistry analysis available)

- **PLACE** on recirculation. ________
- **SAMPLE** contents. ________
- **REMOVE** from recirculation. ________

[4] **DETERMINE** Holdup Tanks A and B volume in gallons using TI-4, Part II, Appendix 16, CVCS Holdup Tank. ________

Date________ **Initials**

8.2 Batching to Holdup Tank A Prior to Pumping Transfer Canal (continued)

[5] **PERFORM** the following calculation to determine the amount of concentrated boric acid needed to adjust Holdup Tank A concentration to ≈3200 ppm (RWST concentration).

$$\frac{(Cf\ Vo - Co\ Vo)}{Ca - Cf} = Va$$

Va = Volume (gallons) of boric acid to add to Holdup Tank

Cf = Desired boric acid concentration (normally RWST concentration)

Vo = Holdup Tanks A and B initial volumes added together

Co = Holdup Tank A initial boric acid concentration (calculation assumes HUT A & B boric acid concentrations are the same)

Ca = Boric Acid Tank concentration

$$\frac{(\_\_\_\_)(\_\_\_\_) - (\_\_\_\_)(\_\_\_\_)}{(\quad\ ) - (\quad\ )} = \_\_\_\_\_\_\_\_ \textbf{ gallons}$$

____

[6] **PERFORM** the following:

NOMENCLATURE	LOCATION	POSITION	UNID	PERF INITIALS
CVCS BA BLENDER OUTLET ISOLATION	A4U/713	OPEN	1-ISV-62-936	

[7] **ENSURE** the following valves CLOSED: [C.3]

NOMENCLATURE	LOCATION	UNID	PERF INITIALS
MAKEUP TO VCT INLET	1-M-6	1-FCV-62-128	
MAKEUP TO VCT OUTLET	1-M-6	1-FCV-62-144	

[8] **PLACE** 1-HS-62-140B, VCT MAKEUP MODE (1-M-6) in MANUAL. _________

[9] **PLACE** flow controllers in MANUAL. _________

Date________ **Initials**

8.2 Batching to Holdup Tank A Prior to Pumping Transfer Canal (continued)

[9.1] **PERFORM** the following:

NOMENCLATURE	LOCATION	POSITION	UNID	PERF INITIALS
BA TO BLENDER	1-M-6	CLOSED	1-FC-62-139	
PW TO BLENDER	1-M-6	CLOSED	1-FC-62-142	

[10] **ADJUST** 1-FQ-62-139, BA BATCH COUNTER [1-M-6] to the amount determined in Step 8.2[5]. ________

[11] **ENSURE** the following:

NOMENCLATURE	LOCATION	POSITION	UNID	PERF INITIALS
HOLDUP TANK A BA BLENDER INLET ISOL	A8S/713	OPEN	1-ISV-62-948	

[12] **PLACE** 1-HS-62-140A, VCT MAKEUP CONTROL [1-M-6], to START. ________

[12.1] **CHECK** Red light is LIT. ________

[13] **OPEN** 1-FC-62-139, BA TO BLENDER. ________

[14] **MONITOR** the following parameters:

Instrument	Location	Parameters
1-PI-62-122	1-M-6	VCT PRESS
1-LI-62-129A	1-M-6	VCT LEVEL
1-FI-62-139	1-M-6	BA TO BLENDER FLOW
1-FQ-62-139	1-M-6	BA BATCH COUNTER
1-FI-62-142	1-M-6	PW TO BLENDER FLOW
1-FQ-62-142	1-M-6	PW BATCH COUNTER
1-LI-62-238	1-M-6	BAT A LEVEL
1-LI-62-242	1-M-6	BAT C LEVEL

[15] **WHEN** desired amount of boric acid is added to Holdup Tank A, **THEN**

PERFORM the following:

[15.1] **CLOSE** 1-FC-62-139, BA TO BLENDER. ________

Date________ Initials

8.2 Batching to Holdup Tank A Prior to Pumping Transfer Canal (continued)

[15.2] **ADJUST** 1-FQ-62-142, PW BATCH COUNTER [1-M-6] to 20 gallons. ________

[15.3] **OPEN** 1-FC-62-142, PW TO BLENDER. ________

[16] **WHEN** 20 gallons of primary water has been flushed to Holdup Tank A, **THEN**

CLOSE 1-FC-62-142, PW TO BLENDER. ________

[17] **PLACE** 1-HS-62-140A, VCT MAKEUP CONTROL, to STOP. ________

[18] **PERFORM** the following:

NOMENCLATURE	LOCATION	POSITION	UNID	PERF INITIALS	VERIFIER INITIALS
CVCS BA BLENDER OUTLET ISOLATION	A4U/713	CLOSED	1-ISV-62-936		IV
HOLDUP TANK A BA BLENDER INLET ISOL	A8S/713	CLOSED	1-ISV-62-948		IV

[19] **IF** desired makeup mode is AUTO, **THEN**

COMPLETE Section 5.0. ________

[20] **IF** BAT makeup is required, **THEN**

INITIATE makeup per SOI-62.05 (**REFER TO** Technical Requirements). ________

[21] **IF** desired makeup mode is **NOT** AUTO, **THEN**

GO TO Section 6.0, Normal Operation, for specific Section. ________

NOTE

0% on LI-62-146 is 21 in. actual HUT level, or 8,616 gal. Low level alarm will actuate during performance of the following Step.

[22] **PUMP** contents of HUT A to HUT B per SOI-62.06 until HUT A level is down to 0%. ________

Date________ **Initials**

8.2 Batching to Holdup Tank A Prior to Pumping Transfer Canal (continued)

[23] **PUMP** transfer canal to Holdup Tank A per SOI-78.01. ________

[24] **PERFORM** the following on Holdup Tank A per HUT Recirc Section of SOI-62.06 to determine if additional boron is required:

- **PLACE** on recirculation. ________
- **NOTIFY** Chemistry to SAMPLE contents. ________
- **REMOVE** from recirculation. ________

[25] **IF** additional boric acid batching to HUT A is required, **THEN**

[25.1] **DETERMINE** Holdup Tanks A volume in gallons using TI-4, Part II, Appendix 16, CVCS Holdup Tank. ________

[25.2] **OBTAIN** additional copies of procedure. ________

A. **RE-PERFORM** Step 8.2[5] through 8.2[21] to raise boric acid concentration in HUT A. ________

[26] **TRANSFER** contents of HUT A to HUT B per SOI-62.06. ________

End of Section

Date________ Initials

8.3 Boration with the Boric Acid Integrator Out of Service

NOTES

1) Use this Section only if the 1-FQ-62-139, BA BATCH COUNTER [1-M-6], is out of service for larger borations. Section 8.4 should be used for minor boration when the counter is out of service.
2) Boration is for long-term reactivity reduction, and may be used to:
   - compensate for Xenon burnout.
   - maintain control rods positioned as necessary to control AFD during reactivity maneuvers.
   - Compensate for IFBA burnout.
3) Appendix B has guidance for Blending at greater than 2500 ppm.
4) TI-4 Part II may be used to approximate the number of gallons required to adjust VCT to desired level.

[1] **IF** transition from AOI-39, RAPID LOAD REDUCTION, **THEN**

[1.1] **USE** AOI-39 boration table to determine required boric acid addition and flow rate. ________

[1.2] **GO TO** Step 8.3[4]. ________

[2] **IF** reactor is subcritical **AND** a boration is required, **THEN**

PERFORM Appendix D. ________

NOTE

Appendix D and E may be used by an SRO to approve and independently verify data provided by Reactor Engineering. In this case, an additional IV by another SRO is **NOT** required.

[3] **IF** reactor is critical **AND** Reactor power is to be changed by > 5%, **THEN**

PERFORM the following:

[3.1] Appendix D, Calculation For Amount Of Boric Acid Or Primary Water (TI-59). ________

[3.2] Appendix E, Reactivity Balance Calculation. ________

Date________ **Initials**

8.3 Boration with the Boric Acid Integrator Out of Service (continued)

[4] **ADJUST** 1-FC-62-139, BA TO BLENDER [1-M-6], for desired flow rate. ________

[5] **DETERMINE** time required for boric acid addition per Appendix F. ________

[6] **OBTAIN** appropriate timer (MCR clock or equivalent). ________

[7] **PLACE** 1-HS-62-140B, VCT MAKEUP MODE [1-M-6], in BOR. ________

[8] **(ρ) TURN** 1-HS-62-140A, VCT MAKEUP CONTROL [1-M-6], to START. ________

[8.1] **CHECK** Red light is LIT. ________

[8.2] **START** timed Boric Acid addition. ________

[9] **ENSURE** 1-HS-68-341H, BACKUP HEATER C [1-M-4], is ON, to equalize RCS-Pzr C_B. ________

[10] **MONITOR** the following parameters:

Instrument	Location	Parameters
1-PI-62-122	1-M-6	VCT PRESS
1-LI-62-129A	1-M-6	VCT LEVEL
1-FI-62-139	1-M-6	BA TO BLENDER FLOW
1-FI-62-142	1-M-6	PW TO BLENDER FLOW
1-FQ-62-142	1-M-6	PW BATCH COUNTER
1-LI-62-238	1-M-6	BAT A LEVEL
1-LI-62-242	1-M-6	BAT C LEVEL

NOTE

Rods may step OUT if in AUTO.

[11] **MONITOR** NIS and Rod movement to verify expected response. ________

Date________ Initials

8.3 Boration with the Boric Acid Integrator Out of Service (continued)

[12] **IF** 1-LI-62-129A, VCT LEVEL, rises to 63%, **THEN**

ENSURE 1-FCV-62-118A, LETDOWN DIVERT TO HUT, diverts to the HUT. ________

[13] **WHEN** time as determined by Appendix F has passed **THEN**

[13.1] **TURN** 1-HS-62-140A, VCT MAKEUP CONTROL [1-M-6], to OFF. ________

[13.2] **ENSURE** Boric Acid and Primary Water flows drop to zero. ________

End of Section

Date________ Initials

8.4 Minor Boration with the Boric Acid Integrator Out of Service

NOTES

1) Use this Section only if the 1-FQ-62-139, BA BATCH COUNTER [1-M-6], is out of service.
2) Minor Boration is defined as the addition of Boric Acid done several times each shift early in core life, to compensate for burnable poison burn-up, and maintain T_{avg} on program.

[1] **ADJUST** 1-FC-62-139, BA TO BLENDER [1-M-6], for desired flow rate. ________

[2] **DETERMINE** required quantity of Boric Acid to be added. ________

[3] **DETERMINE** time required for boric acid addition per Appendix F. ________

[4] **OBTAIN** appropriate timer (MCR clock or equivalent). ________

[5] **PLACE** 1-HS-62-140B, VCT MAKEUP MODE [1-M-6], in BOR. ________

[6] **(ρ) TURN** 1-HS-62-140A, VCT MAKEUP CONTROL [1-M-6], to START. ________

[6.1] **CHECK** Red light is LIT. ________

[7] **ENSURE** 1-HS-68-341H, BACKUP HEATER C [1-M-4], is ON, to equalize RCS-Pzr C_B. ________

[8] **MONITOR** the following parameters:

Instrument	Location	Parameters
1-PI-62-122	1-M-6	VCT PRESS
1-LI-62-129A	1-M-6	VCT LEVEL
1-FI-62-139	1-M-6	BA TO BLENDER FLOW
1-FI-62-142	1-M-6	PW TO BLENDER FLOW
1-FQ-62-142	1-M-6	PW BATCH COUNTER
1-LI-62-238	1-M-6	BAT A LEVEL
1-LI-62-242	1-M-6	BAT C LEVEL

Date________ Initials

8.4 Minor Boration with the Boric Acid Integrator Out of Service (continued)

[9] **WHEN** time as determined by Appendix F has passed **THEN**

[9.1] **TURN** 1-HS-62-140A, VCT MAKEUP CONTROL [1-M-6], to OFF. ________

[9.2] **ENSURE** Boric Acid and Primary Water flows drop to zero. ________

[10] **IF** DESIRED to flush affected piping, **THEN**

PERFORM Section 6.3. ________

[11] **WHEN** Boration is COMPLETE, **THEN**

PLACE 1-HS-62-140B, VCT MAKEUP MODE, in AUTO. ________

[12] **TURN** 1-HS-62-140A, VCT MAKEUP CONTROL, to START. ________

[12.1] **CHECK** Red light is LIT. ________

End of Section

Date________ **Initials**

8.5 VCT Level Reduction

NOTE
The Unit Supervisor should be notified that 1-HS-62-118A will be placed in divert, and what the new desired VCT level is, prior to performing Step 8.5[1].

[1] **IF** desired to reduce VCT level, **THEN**

PLACE 1-HS-62-118A, LETDOWN DIVERT TO HUT, to DIVERT. ________

[2] **MONITOR** VCT level decreasing to new desired level. ________

[3] **WHEN** desired VCT level is reached, **THEN**

PLACE 1-HS-62-118A, LETDOWN DIVERT TO HUT, to P-AUTO. ________

[4] **ENSURE** that 1-FCV-62-118 is aligned to VCT. ________

End of Section

9.0 RECORDS

9.1 QA Records

The following documents are QA records and handled per the Document Control and Records Management (DCRM) program:

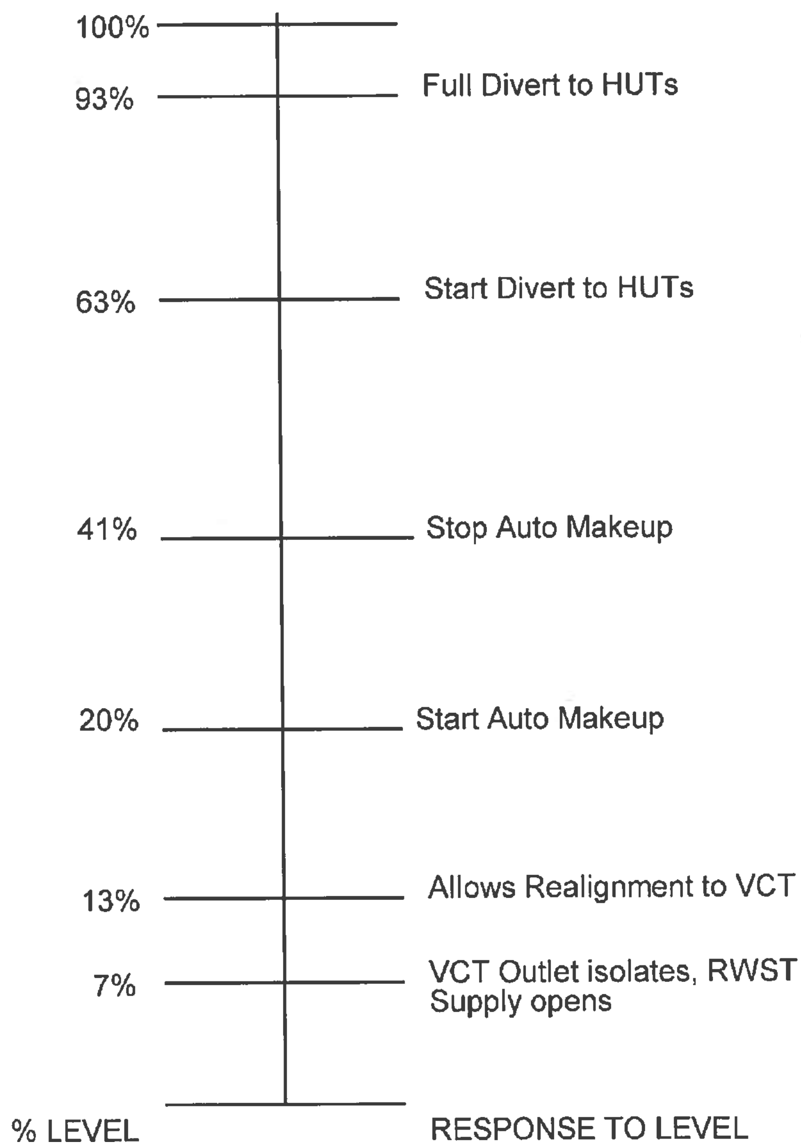
Completed Data Package

9.2 Non-QA Records

No non-QA records are created by this Instruction.

Appendix A
(Page 1 of 1)

VCT Level Program



Appendix B
(Page 1 of 2)
Blending Greater Than 2500 ppm

NOTE

This Appendix should only be used in conjunction with Sections 6.5 or 8.1. Primary water flow must be varied to blend at concentrations greater than 2500 ppm., therefore, blending is only possible when 1-HS-62-140B, VCT MAKEUP MODE is in MANUAL.

(Table is continued on next page)

Desired Blend Concentration ppm.	Boric Acid flow rate gpm*	1-FC-62-139 BA to Blender [1-M-6] %	Primary Water Flow rate gpm
2500	40	100	69
2550	40	100	67
2600	40	100	65
2650	40	100	63
2700	40	100	61
2750	40	100	59
2800	40	100	57

* For Boric Acid flow rates other than 40 gpm the following formula may be used:

$$\frac{\text{Actual BA flow rate}}{40} = \frac{\text{Required PW flow rate}}{\text{PW flow rate from Table}}$$

OR

$$\frac{\text{Actual BA flow rate}}{40} \times \text{PW flow rate from Table} = \text{Required PW flow rate}$$

Appendix B
(Page 2 of 2)

(Table is continued from previous page)

Desired Blend Concentration ppm.	Boric Acid flow rate gpm*	1-FC-62-139 BA to Blender [1-M-6] %	Primary Water Flow rate gpm
2850	40	100	56
2900	40	100	54
2950	40	100	52
3000	40	100	51
3050	40	100	49
3100	40	100	48
3150	40	100	47
3200	40	100	45
3300	40	100	43

* For Boric Acid flow rates other than 40 gpm the following formula may be used:

$$\frac{\text{Actual BA flow rate}}{40} = \frac{\text{Required PW flow rate}}{\text{PW flow rate from Table}}$$

OR

$$\frac{\text{Actual BA flow rate}}{40} \times \text{PW flow rate from Table} = \text{Required PW flow rate}$$

Appendix C
(Page 1 of 4)

CALCULATION OF BORIC ACID AND PRIMARY WATER INTEGRATOR SETTING FOR MANUAL MAKEUP TO VCT (RCS)

Date________ **Initials**

NOTES

1) Use page 1 of this appendix when using "VCT MAKEUP CALCULATION" program in REACTINW, otherwise use pages 2 and 3 when performing Hand Calculations.
2) The computer code named REACTINW (VCT MAKEUP CALCULATION) when used from the Y: server is a verified and validated program. The methodology used is based on the equations:

V1C1 + V2C2 = V3C3 & V1 + V2 = V3

Where: V is the volume flow rates of water and acid going into and out of the Boric Acid Blender and C is the boric acid concentration of the flow streams.

1.0 REACTINW "VCT MAKEUP CALCULATION"

[1] **OBTAIN** the following data for input to the REACTINW program: ________

[1.1] Current RCS Boric Acid Concentration. ________ PPM

[1.2] Current BAT Boric Acid Concentration. ________ PPM

[1.3] B-10 Depletion Value from Reactivity Management Briefing Sheet ________ PPM

[1.4] Current VCT Level ________ %

[1.5] Desired VCT Level ________ %

____

[2] **RUN** REACTINW calculation "VCT Makeup Calculation". ________

[3] **PRINT** the output file: "VCT MAKEUP INTEGRATOR SETTINGS CALCULATION" ________

[4] **SIGN** and DATE output sheets. ________

[5] **OBTAIN** independent verification and approval by an SRO on output sheets. ________

Appendix C
(Page 2 of 4)

CALCULATION OF BORIC ACID AND PRIMARY WATER INTEGRATOR SETTING FOR MANUAL MAKEUP TO VCT (RCS)

Date________ **Initials**

2.0 HAND CALCULATION

[1] **OBTAIN** the following data for use in the HAND CALCULATION: ________

[1.1] Current RCS Boric Acid Concentration. ________PPM

[1.2] Current BAT Boric Acid Concentration. ________PPM

[1.3] B-10 Depletion Value from Reactivity Management Briefing Sheet ________PPM

[1.4] Current VCT Level ________%

[1.5] Desired VCT Level ________%

[2] **CALCULATE** BAT Boric Acid Concentration Ratio (BACR):
6820 ppm ÷ Step 1.0[1.2]ppm =_________
(ENTER 1.0 for BACR following a reactor shutdown or for a conservative calculation). ________

[3] **CALCULATE** B-10 corrected boron concentration:
__________-______________=____________ PPM ________
STEP 1.0[1.1] STEP 1.0[1.3] B-10 corrected boron

[4] **CALCULATE** total VCT addition volume needed for desired level.

[__________% - ___________%] X 19.3 Gals/% = ____________ GALS ____________
Step 1.0[1.5] Step 1.0[1.4] Total Volume
(Round to nearest whole number)

Appendix C
(Page 3 of 4)

CALCULATION OF BORIC ACID AND PRIMARY WATER INTEGRATOR SETTING FOR MANUAL MAKEUP TO VCT (RCS)

Date________ **Initials**

2.0 HAND CALCULATION (continued)

NOTE
Corrected Boric Acid Flow Rate in Step 2.0[5] should be obtained from TI-59, Appendix C for the B-10 corrected boron value calculated in Step 2.0[3].

[5]

________ GPM	x	________	=	________ GPM		________
Corrected Boric Acid Flow Rate		BACR from Step 2.0[2]		**[X]** BA to Blender Flow		

[6]

________ GPM	+	70 GPM	=	________ GPM		________
Step 2.0[5] **[X]**		PW to Blender Flow		Total Flow Rate		

[7]

________ GPM	÷	________ GPM	=	________ GPM		________
Step 2.0[5] **[X]**		Step 2.0[6] Total Flow Rate		**[Y]** BA Fraction		

[8]

________	x	________ GALS	=	________ GALS		________
Step 2.0[7] **[Y]**		Step 2.0[4] Total Volume		Boric Acid Batch Counter Setting		

Appendix C
(Page 4 of 4)

CALCULATION OF BORIC ACID AND PRIMARY WATER INTEGRATOR SETTING FOR MANUAL MAKEUP TO VCT (RCS)

Date________ **Initials**

2.0 HAND CALCULATION (continued)

NOTE
Round answer to nearest whole number.

[9]

70 GPM	÷	GPM	=		
Primary H_2O		Step 2.0[6] Total Flow Rate		**[Z]** PW Fraction	________

[10]

	x	GALS	=	GALS	
Step 2.0[9] **[Z]**		Step 2.0[4] Total Volume		Primary Water Batch Counter Setting	________

[11] **APPROVE** calculation results. ________ IV/SRO

Calculation check: Step 2.0[8] results + Step 2.0[10] results should ~ = Step 2.0[4] results

Appendix D
(Page 1 of 1)

Calculation For Amount Of Boric Acid Or Primary Water (TI 59)

Date________ **Initials**

1.0 FOR AMOUNT OF BA OR PW (TI 59)

NOTES

1) One calculation is required for each major change

2) **N/A** IV & Approval column if calculation is performed by SRO.

[1] **IF** REACTW **NOT** used, **THEN**

RECORD amount of primary water or boric acid required using TI-59.

RCS BORON	PPM CHANGE	AMOUNT PRIMARY WATER OR BORIC ACID	PERFORMER	SRO IV & APPROVAL
_________ppm Current				
_________ppm Target				
		Total Gal(s)		

[2] **IF** REACTW used, attach printout to procedure, **AND**

APPROVE calculation and amount of Primary water/boric acid required.

____
IV/SRO

Appendix E
(Page 1 of 2)

REACTIVITY BALANCE CALCULATION

1.0 REACTIVITY BALANCE CALCULATION

NOTES

1) One calculation is required for each major change. Calculation is an approximation of Final Target C_B

2) Appendix E may be used by an SRO to approve and independently verify data provided by Reactor Engineering. In this case, an additional IV by another SRO is **NOT** required

[1] **CALCULATE** Target C_B by performing the following:

			Date:	Performer Initials:
DATA REQUIRED	**DATA**		**Where To Get**	
Initial RCS Boron C_B		ppm	Chem Lab	
Core Burnup		MWD/MTU	ICS U7981	
Initial Reactor power		%	NIS	
Final Reactor power		%	As required for plant conditions	
Total Reactor Power change		Δ%	Δ Initial to Final Reactor power	
Rate of Reactor power change		%/hr	As required for plant conditions	
Number of hours to change power		hr(s)	As required for plant conditions	
Current Rod Position		steps	ICS or MCR Board	
Final Rod Position		steps	Final rod position based on estimated number of steps required to control ΔI and insertion limits for power change.	

Initial Reactor Power: %		**Final Reactor Power:** %	
Parameter	**Where To Get**	**Calculation**	**Value**

Appendix E
(Page 2 of 2)

Date________ **Initials**

1.0 REACTIVITY BALANCE CALCULATION (continued)

$\Delta\rho$ POWER DEFECT	**NOTE**: Must be entered into equation as a positive value Power Defect From NUPOP, Table 7-17, 7-18, or 7-19.	________pcm PD – ________pcm PD = Initial Final	________pcm $\Delta\rho$ POWER DEFECT
$\Delta\rho$ XENON	**NOTE**: Must be entered into equation as a positive value Initial Xenon From REACTW (either current conditions or projection to initial condition). Final Xenon:From REACTW (projection over time).	________pcm XE – ________pcm XE = Initial Final	________pcm $\Delta\rho$ XENON
$\Delta\rho$ RODS	**NOTE** Must be entered into equation as a positive value Rods Integral worth From NUPOP, Figure 6-24, Figure 6-25, or Figure 6-26.	______pcm Rods – ______pcm Rods = Initial Final	________pcm $\Delta\rho$ RODS
$\Delta\rho$	Add reactivity values to determine pcm adjustment to be made by changing C_B. (**NOTE:** Watch the signs.)	**SUM**	________pcm $\Delta\rho$ needed
Convert to PPM Δ	(NUPOP Figure 6-21)________ppm/%$\Delta\rho$ (Inverse Boron Worth) **X**________pcm $\Delta\rho$ (needed) **X** 0.001 %$\Delta\rho$/pcm =		________ppm Total ΔC_B
TARGET PPM	________Current RCS C_B –________Total ΔC_B =		________ppm Target C_B
		PERFORMER:	

[2] **APPROVE** calculation and Target PPM change for planned change in reactor power. ________ SRO

Appendix F
(Page 1 of 1)

CALCULATION OF TIME FOR A BORIC ACID ADDITION WHILE THE BORIC ACID INTEGRATOR IS OUT OF SERVICE

Date________ **Initials**

1.0 CALCULATION OF TIME FOR A BORIC ACID ADDITION WHILE THE BORIC ACID INTEGRATOR IS OUT OF SERVICE

[1] **RECORD** amount of Boric Acid to be added to the primary from Section 8.3 or 8.4. ________GAL ________

[2] **RECORD** Boric Acid flowrate (1-FC-62-139, BA TO BLENDER) ________GPM ________

[3] **CALCULATE** the time for boric acid addition:

______________ ÷ ______________ = ______________ MINUTES ______________

Step 1.0[1] (GAL) Desired Boric Acid	Step 1.0[2] (GPM) Boric Acid flow-rate	Time for Boric Acid Addition	**PERFORMER (Initials)**

[4] **APPROVE** calculation and Time for Boric Acid Addition. ________ IV/SRO

Source Notes
(Page 1 of 1)

Requirements Statement	Source Document	Implementing Statement
Foreign Experience Regarding Boron Dilution.	1E NOTICE 91-054	C.1
Potential for reduction in Boron Concentration in the Reactor during Refueling	INPO SER 89-018	C.2
Unplanned Boron Dilution from Shutdown conditions	INPO SER 90-013	C.3
	Deleted	C.4
While making up to the VCT in MANUAL mode, the VCT inlet valve was in the open position for 20-30 minutes causing a reduction in reactor power	WBPER960545	C.5

B.1.e
Place RHR Spray in Service.

EVALUATION SHEET

Task: Place RHR Spray in service.

Alternate Path: When the applicant attempts to open 1-FCV-72-41, RHR SPRAY HDR B TO CNTMT, the valve will NOT open. This requires entry into the RNO in order to place Train A RHR Spray in service.

Facility JPM #: 3-OT-JPMR016A

Safety Function: 4P **Title:** Heat Removal From Reactor Core.

K/A 005 A4.01 Ability to manually operate and/or monitor in the control room: Controls and indication for RHR pumps.

Rating(s): 3.6/3.4 **CFR:** 41.7 / 45.5 to 45.8

Evaluation Method: Simulator __X__ In-Plant ______ **Classroom** ______

References: FR-Z.1, "High Containment Pressure,"Rev.11

Task Number: RO-113-FR-Z.1-001 **Title:** Respond to Phase B Containment Pressure.

Task Standard: After the applicant discovers that 1-FCV-72-41, RHR SPRAY HDR B TO CNTMT will not open the applicant places Train "A" of RHR Spray in-service per FR-Z.1, "High Containment Pressure."

Validation Time: 10 minutes **Time Critical:** Yes ____ No __X__

===

Applicant: ____________________ ______________ Time Start: ______

NAME Docket No. Time Finish: ______

Performance Rating: SAT ____ UNSAT ____ Performance Time ___

Examiner: ____________________ ____________________/________

NAME SIGNATURE DATE

===

COMMENTS

____

____

____

____

____

____

SIMULATOR OPERATOR INSTRUCTIONS:

1. ENSURE NRC Examination Security has been established.

2. RESET to Initial Condition 321 by performing the following actions:

   a. Select ICManager on the THUNDERBAR menu (right hand side of Instructor Console Screen).

   b. Locate IC 321.

   c. Right "click" on IC 321.

   d. Select Reset on the drop down menu.

   e. Right "click" on RESET.

   f. Enter the password for IC 321.

   g. Select "Yes" on the INITIAL CONDITION RESET pop-up window.

   h. Perform SWITCH CHECK.

3. ENSURE the following information appears on the Director Summary Screen:

	Key		Type	Event	Delay	Inserted	Ramp	Initial	Final	Value
	cs06g	air return fan a-a fail to start on phase b	M		00:00:00	00:00:00	00:00:00		Active	Active
	cs06h	air return fan b-b fail to start on phase b	M		00:00:00	00:00:00	00:00:00		Active	Active
	th02a	loca - cold leg loop 1	M		00:00:00	00:00:00	00:00:00		80	80
	xi-35-60sw6	xi-35-60sw6 generator condition monitor alarm silenc	O		00:00:00	00:00:00	00:00:00		contact	noncontact
	hs-72-41a	hs-72-41a rhr spray header b isolation valve sw	O		00:00:00	00:00:00	00:00:00		close	auto
	ch01a	containment pressure transmitter failure pdt-3-42	O		00:00:00	00:00:00	00:00:00		10.17	
	ch01b	containment pressure transmitter failure pdt-3-43	O		00:00:00	00:00:00	00:00:00		10.17	
	ch01c	containment pressure transmitter failure pdt-3-44	O		00:00:00	00:00:00	00:00:00		10.17	

	Key		Type	Event	Delay	Inserted	Ramp	Initial	Final	Value
	ch01d	containment pressure transmitter failure pdt-3-45	O		00:00:00	00:00:00	00:00:00		10.17	
	pdi-30-42	03160 cntmt press diff indicator	O		00:00:00	00:00:00	00:00:00		11.88	
	pdi-30-43	03170 cntmt press diff indicator	O		00:00:00	00:00:00	00:00:00		11.88	
	pdi-30-44	03180 cntmt press diff indicator	O		00:00:00	00:00:00	00:00:00		11.88	
	pdi-30-45	03190 cntmt press diff indicator	O		00:00:00	00:00:00	00:00:00		11.88	
	hs-72-10a-3	06010 cntmt spray pump b mtr sw(red)	O		00:00:00	00:00:00	00:00:00		on	
	hs-72-10a-1	06010 cntmt spray pump b mtr sw(green)	O		00:00:00	00:00:00	00:00:00		off	
	hs-72-27a-1	06020 cntmt spray pump a mtr sw(green)	O		00:00:00	00:00:00	00:00:00		off	
	hs-72-10a	hs-72-10a containment spray pump b mtr sw	O		00:00:00	00:00:00	00:00:00		ptlock	nastop
	ei-72-12a	07020 cntmt spray pmp b amps	O		00:00:00	00:00:00	00:00:00		35	0
	fi-72-13	07010 cntmt spray pmp b flow	O		00:00:00	00:00:00	00:00:00		3000	0
	hs-72-22a-1								off	off
	hs-72-44a-1								off	off
	hs-72-39a-1								off	off
	hs-72-34a-1								off	off

4. Place simulator in RUN and acknowledge any alarms.

5. ENSURE 1-HS-72-27A, CNTMT SPRAY PMP A is in the STOP, PULL-TO-LOCK position, and a Hold Order Tag is placed on the handswitch.

6. ENSURE a marked-up copy of FR-Z.1, "High Containment Pressure," circled-and-slashed through Step 9, with Step 10 circled, is available to the Examiner.

7. ENSURE "Extra Operator" is present in the simulator.

8. Place simulator in FREEZE until Examiner cue is given.

READ TO APPLICANT

DIRECTION TO APPLICANT:

I will explain the initial conditions, and state the task to be performed. All control room steps shall be performed for this JPM, including any required communications. I will provide initiating cues and reports on other actions when directed by you. Ensure you indicate to me when you understand your assigned task. To indicate that you have completed your assigned task return the cue sheet I provided you.

INITIAL CONDITIONS:

1. **1A-A Containment Spray Pump has been tagged out of service.**
2. **The unit was at 100% when a Large Break LOCA occurred.**
3. **1B-B Containment Spray Pump started and has been spraying containment.**
4. **The break occurred an hour and 10 minutes ago.**
5. **All ECCS equipment is performing its design functions and is on Containment Sump Recirc.**
6. **You are the Operator at the Controls (OAC).**

INITIATING CUES:

The Unit Supervisor directs you to perform FR-Z.1, "HIGH CONTAINMENT PRESSURE," beginning at Step 10.

STEP/STANDARD	SAT/UNSAT

START TIME: _______

STEP 1: 10. **DETERMINE** if RHR spray should be placed in service: a. **CHECK** the following conditions: • At least one hour has elapsed since the beginning of the accident. • Cntmt pressure is greater than 9.5 psig. • RHR suction is aligned to cntmt sump. • At least one charging pump and one SI pump running. STANDARD: Applicant determines: 1. from the INITIAL CONDITIONS that an hour has lapsed since the beginning of the accident. [Given in initial conditions] 2. From 1-M-6, containment pressure is approximately 10.5 psig, as indicated on 1-PDI-30-.42. 1=PDI-30-43, 1-PDI-30-44, and 1-PDI-30-45. 3. From 1-M-6, FCV-63-72 and FCV-63-73 verified to be open by RED indicating lights. 4. From 1-M-5, 1 CCP and from 1-M-6, 1 SIP is running by RED indicating lights or amps. COMMENTS:	___ SAT ___ UNSAT

STEP/STANDARD	SAT/UNSAT
STEP 2: 10. **DETERMINE** if RHR spray should be placed in service: b. **ALIGN** Train B RHR spray: 1) **ENSURE** Train B RHR pump RUNNING. STANDARD: Applicant locates 1-HS-74-20A RHR PMP B (ECCS) and determines that the pump is running based on the following: • The GREEN indicating light is DARK and the RED indicating light is LIT • 1-EI-74-17A indicates normal amps. • 1-FI-74-26 indicates normal pressure (approximately 150 psig). COMMENTS:	___ SAT ___ UNSAT
STEP 3: 10. **DETERMINE** if RHR spray should be placed in service: b. **ALIGN** Train B RHR spray: 2) **CLOSE** RHR crosstie 1-FCV-74-35. STANDARD: Applicant locates 1-HS-74-35, RHR HX B OUTLET XTIE and determines that the valve is CLOSED based on the GREEN indicating light LIT and RED indicating light DARK. COMMENTS:	___ SAT ___ UNSAT

STEP/STANDARD	SAT/UNSAT
STEP 4: 10. **DETERMINE** if RHR spray should be placed in service: b. **ALIGN** Train B RHR spray: 3) **CLOSE** RHR injection 1-FCV-63-94. STANDARD: Applicant locates 1-HS-63-94, RHR TO CL 1&4 and rotates the handswitch to the left to the CLOSE position. Applicant determines that 1-FCV-63-94 is CLOSED based on the GREEN indicating light LIT and the RED indicating light DARK. COMMENTS:	___ SAT ___ UNSAT

STEP/STANDARD	SAT/UNSAT
STEP 5: 10. **DETERMINE** if RHR spray should be placed in service: b. **ALIGN** Train B RHR spray: 4) **OPEN** RHR spray 1-FCV-72-41. STANDARD: Applicant locates 1-HS-72-41A, RHR SPRAY HDR B TO CNTMT and rotates the handswitch to the right to the OPEN position. Applicant determines that the valve will NOT open based on the GREEN indicating light remaining LIT and the RED indicating light remaining DARK. Based on the failure of 1-FCV-72-41 to OPEN, the applicant returns to sub-step 3 and OPENS 1-HS-63-94, RHR TO CL 1&4. After opening 1-HS-63-94, RHR TO CL 1&4, the applicant enters the **b. RESPONSE NOT OBTAINED COLUMN** for compensatory actions. COMMENTS:	___ SAT ___ UNSAT

STEP/STANDARD	SAT/UNSAT
STEP 6: 10. **DETERMINE** if RHR spray should be placed in service: b. **RESPONSE NOT OBTAINED: ALIGN** Train A RHR spray: 1) **ENSURE** Train A RHR pump RUNNING. STANDARD: Applicant locates 1-HS-74-10A RHR PMP A (ECCS) and determines that the pump is running based on the following: • The GREEN indicating light is DARK and the RED indicating light is LIT • 1-EI-74-5A indicates normal amps. • 1-FI-74-13 indicates normal pressure (approximately 150 psig). COMMENTS:	___ SAT ___ UNSAT
STEP 7: 10. **DETERMINE** if RHR spray should be placed in service: b. **RESPONSE NOT OBTAINED: ALIGN** Train A RHR spray: 2) **CLOSE** RHR crosstie 1-FCV-74-33. STANDARD: Applicant locates 1-HS-74-33, RHR HX A OUTLET XTIE and determines that the valve is CLOSED based on the GREEN indicating light LIT and RED indicating light DARK. COMMENTS:	___ SAT ___ UNSAT

STEP/STANDARD	SAT/UNSAT
STEP 8: 10. **DETERMINE** if RHR spray should be placed in service: b. **RESPONSE NOT OBTAINED: ALIGN** Train A RHR spray: 3) **CLOSE** RHR injection 1-FCV-63-93. STANDARD: Applicant locates 1-HS-63-93A, RHR TO CL 2&3 and rotates the handswitch to the left to the "CLOSE" position. Applicant observes the GREEN indicating light LIT and the RED indicating light DARK. **Step is critical to align Train A RHR to provide containment spray.** COMMENTS:	**CRITICAL STEP** ___ SAT ___ UNSAT
STEP 9: 10. **DETERMINE** if RHR spray should be placed in service: b. **RESPONSE NOT OBTAINED: ALIGN** Train A RHR spray: 4) **OPEN** RHR spray 1-FCV-72-40. STANDARD: Applicant locates 1-HS-72-40A, RHR SPRAY HDR A TO CNTMT and rotates the handswitch to the right to the OPEN position. Applicant observes GREEN indicating light DARK and the RED indicating light LIT. **Step is critical since this establishes RHR spray flow to containment to assist in reducing containment pressure.** COMMENTS:	**CRITICAL STEP** ___ SAT ___ UNSAT

STEP/STANDARD	SAT/UNSAT
STEP 10: Notify the Unit Supervisor that FR-Z.1, High Containment Pressure" is complete. STANDARD: Applicant notifies the Unit Supervisor that FR-Z.1, High Containment Pressure" is complete, and that Train A RHR is supplying spray flow. COMMENTS: **END OF TASK**	___ SAT ___ UNSAT

STOP TIME ________

APPLICANT CUE SHEET

(RETURN TO EXAMINER UPON COMPLETION OF TASK)

INITIAL CONDITIONS:

1. 1A-A Containment Spray Pump has been tagged out of service.
2. The unit was at 100% when a Large Break LOCA occurred.
3. 1B-B Containment Spray Pump started and has been spraying containment.
4. The break occurred an hour and 10 minutes ago.
5. All ECCS equipment is performing its design functions and is on Containment Sump Recirc.
6. You are the Operator at the Controls (OAC).

INITIATING CUES:

The Unit Supervisor directs you to perform FR-Z.1, "HIGH CONTAINMENT PRESSURE," beginning at Step 10.

TVA Watts Bar Nuclear Plant

Unit 1

Emergency Operating Instruction

FR-Z.1

High Containment Pressure

Revision 0011

Quality Related

Level of Use: Continuous Use

Effective Date: 12-20-2010

Responsible Organization: OPS, Operations

Prepared By: Nicholas Armour

Approved By: Brian McIlnay

Current Revision Description

Minor/editorial revision: Converted to Word 2007 (PCR 4893).

1.0 PURPOSE

This Instruction provides actions to respond to a high-high containment pressure.

2.0 SYMPTOMS AND ENTRY CONDITIONS

2.1 Indications

Containment press greater than 2.8 psig.

2.2 Transitions

FR-0, Status Trees, FR-Z in RED, ORANGE, or YELLOW condition.

Step	Action/Expected Response	Response Not Obtained

3.0 OPERATOR ACTIONS

CAUTION If ECA-1.1, Loss of RHR Sump Recirculation, is in effect, the number of cntmt spray pumps to be operated is directed in ECA-1.1 rather than in this Instruction.

NOTE Adverse containment setpoints [ADV] should be used where provided due to Phase B actuation.

Step	Action/Expected Response	Response Not Obtained
1.	**ENSURE** cntmt spray operation:	**ESTABLISH** at least one train of cntmt spray flow.

a. Cntmt spray signal ACTUATED.

b. Cntmt spray pumps RUNNING.

c. Cntmt spray valves 1-FCV-72-2 and 1-FCV-72-39 OPEN.

d. Cntmt spray pump suction valves OPEN:

- Valves from RWST:

  1-FCV-72-21and
  1-FCV-72-22

  OR

- Valves from cntmt sump:

  1-FCV-72-44 and
  1-FCV-72-45

e. Cntmt spray flow:

- 1-FI-72-34
- 1-FI-72-13

Step	Action/Expected Response	Response Not Obtained
2.	**ENSURE** cntmt isolation:	**ACTUATE** isolation signal,
	a. Phase A isolation: • Train A GREEN. • Train B GREEN.	a. **ACTUATE** Phase A and Cntmt Vent Isolation signal, **OR** Manually **CLOSE** valves and dampers as necessary.
	b. Cntmt vent isolation: • Train A GREEN. • Train B GREEN.	b. **ACTUATE** Phase A and Cntmt Vent Isolation signal, **OR** Manually **CLOSE** valves and dampers as necessary.
	c. Phase B isolation: • Train A GREEN. • Train B GREEN.	c. **ACTUATE** Phase B signal, **OR** Manually **CLOSE** valves and dampers as necessary.
3.	**ENSURE** MSIVs and bypasses CLOSED.	Manually **CLOSE** valves.
4.	**PLACE** steam dump controls OFF: • 1-HS-1-103A, STEAM DUMP FSV "A" • 1-HS-1-103B, STEAM DUMP FSV "B"	
5.	**ENSURE** all four RCPs STOPPED.	Manually **STOP** pumps.

Step	Action/Expected Response	Response Not Obtained
6.	**MONITOR** EGTS operation:	Manually **START** fans, **AND** **ALIGN** dampers per SOI-65.02, Emergency Gas Treatment System.
	a. EGTS fans RUNNING.	
	b. Filter bank dp between 5 and 9 inches of water.	
7.	**ENSURE** ABGTS operation:	
	a. ABGTS fans RUNNING.	a. Manually **START** fans.
	b. ABGTS dampers OPEN: • FCO-30-146A. • FCO-30-146B. • FCO-30-157A. • FCO-30-157B.	b. Locally **OPEN** dampers.
8.	**WHEN** 10 minutes has elapsed since Phase B actuation, **THEN** **ENSURE** cntmt air return fans start.	

Step	Action/Expected Response	Response Not Obtained

CAUTION

- RCS cooldown requires the availability of at least one S/G.
- If ALL S/Gs are Faulted, at least a minimum detectable feed flow to each S/G is required to limit thermal stress during subsequent S/G feed operations.

Step	Action/Expected Response	Response Not Obtained
9	**CHECK** S/G pressures: • All S/G pressures controlled or rising. • All S/G pressures greater than 120 psig.	**ISOLATE** Faulted S/G(s) not needed for cooldown. a. **ENSURE** the following valves CLOSED: • MSIV and MSIV bypasses • Feedwater isolation and bypass isolation valves • Feed reg and bypass reg valves • AFW level control valves • Local manual isolation for steam supply To TD AFP • PORV • S/G blowdown valve

Step	Action/Expected Response	Response Not Obtained
10.	**DETERMINE** if RHR spray should be placed in service:	
	a. **CHECK** the following conditions: • At least one hour has elapsed since the beginning of the accident. • Cntmt pressure is greater than 9.5 psig. • RHR suction is aligned to cntmt sump. • At least one charging pump and one SI pump running.	a. **WHEN** all conditions met, **THEN** **PERFORM** Substep 10b. ** **GO TO** Step 11.
	b. **ALIGN** Train B RHR spray: 1) **ENSURE** Train B RHR pump RUNNING. 2) **CLOSE** RHR crosstie 1-FCV-74-35. 3) **CLOSE** RHR injection 1-FCV-63-94. 4) **OPEN** RHR spray 1-FCV-72-41.	b. **ALIGN** Train A RHR spray: 1) **ENSURE** Train A RHR pump RUNNING. 2) **CLOSE** RHR crosstie 1-FCV-74-33. 3) **CLOSE** RHR injection 1-FCV-63-93. 4) **OPEN** RHR spray 1-FCV-72-40.
11.	**RETURN TO** Instruction in effect.	

End of Section

B.1.f
Place Recombiner A in Low Power Standby

NOTE: This JPM may be conducted on the Simulator OR in the Main Control Room

EVALUATION SHEET

Task: Place Recombiner A in Low Power Standby.

Alternate Path: n/a

Facility JPM #: None

Safety Function: 5 **Title:** Containment Integrity

K/A 028 A4.01 Ability to manually operate and/or monitor in the control room: HRPS controls

Rating(s): 4.0/4.0 **CFR:** 41.7 / 45.5 to 45.8

Evaluation Method: Simulator __X__ In-Plant ______ **Classroom** ______

References: SOI-83.01, "Containment Hydrogen Recombiners," Rev. 15.

Task Number: AUO-083-SOI-83.1-005 **Title:** Place Hydrogen Recombiner "A" ("B") in Low Power Standby.

Task Standard: The applicant places Hydrogen Recombiner "A" in Low Power Standby using SOI-83.01, "Containment Hydrogen Recombiners," Section 8.6."

Validation Time: 10 minutes **Time Critical:** Yes ____ No __X__

==

Applicant: ____________________ ____________ Time Start: ______
NAME Docket No. Time Finish: ______

Performance Rating: SAT ____ UNSAT ____ Performance Time ___

Examiner: ____________________ ____________________/________
NAME SIGNATURE DATE

==

COMMENTS

SIMULATOR OPERATOR INSTRUCTIONS:

1. ENSURE NRC Examination Security has been established.
2. RESET to Initial Condition 320 by performing the following actions:
   a. Select ICManager on the THUNDERBAR menu (right hand side of Instructor Console Screen).
   b. Locate IC 320.
   c. Right "click" on IC 320.
   d. Select Reset on the drop down menu.
   e. Right "click" on RESET.
   f. Enter the password for IC 320.
   g. Select "Yes" on the INITIAL CONDITION RESET pop-up window.
   h. Perform SWITCH CHECK.
3. ENSURE the following information appears on the Director Summary Screen:

	Key		Type	Event	Delay	Inserted	Ramp	Initial	Final	Value
	th02a	loca small leak loop 1	M		00:00:00		00:00:00		80	80
	xi-35-60sw6	xi-35-60sw6 generator condition monitor alarm silenc	O		00:00:00		00:00:00		contact	nocntact
	hs-63-118a	hs-63-118a sis accumulator tank 1 flow isolation valve	O		00:00:00		00:00:00		open	open
	hs-63-98a	hs-63-98a sis accumulator tank 2 flow isolation valve	O		00:00:00		00:00:00		open	open
	sir01	pwr to cold leg accumu isolation valves fcv-63-67, 80, 98, 119	R		00:00:00		00:00:00		On	On

4. ENSURE the "B" Hydrogen Recombiner is in service, per the setup.
5. Place simulator in RUN and acknowledge any alarms.
6. ENSURE a marked-up copy of SOI-83.01, "Containment Hydrogen Recombiners."
7. ENSURE "Extra Operator" is present in the simulator.
8. Place simulator in FREEZE until Examiner cue is given.
9. EVALUATOR NOTE: THIS SETUP IS COMMON TO SPARE JPM B.1.d.

IF CONDUCTED IN THE MAIN CONTROL ROOM, THEN:

Tools/Equipment/Procedures Needed:

ENSURE a marked-up copy of SOI-83.01, "Containment Hydrogen Recombiners," is available to the Examiner, marked as "EXAM MATERIAL, FOR TRAINING ONLY," for each applicant.

Begin the JPM at the Shift Manager's Desk.

DIRECTION TO APPLICANT:

I will explain the initial conditions, and state the task to be performed. All control room steps shall be performed for this JPM, including any required communications. I will provide initiating cues and reports on other actions when directed by you. Ensure you indicate to me when you understand your assigned task. To indicate that you have completed your assigned task return the cue sheet I provided you.

INITIAL CONDITIONS:

1. **Unit has experienced a LOCA.**
2. **MCR crew is implementing E-1, "Loss of Reactor or Secondary Coolant."**
3. **E-1, "Loss of Reactor or Secondary Coolant," directs that the hydrogen recombiners be placed in service using SOI-83.01, "Containment Hydrogen Recombiners."**
4. **You are the Control Room Operator.**

INITIATING CUES:

1. **The Unit Supervisor has directed you to place 1-H2C-83-1, Hydrogen Recombiner "A" in Low Power Standby, using SOI-83.01, Containment Hydrogen Recombiners."**
2. **Notify the Unit Supervisor when 1-H2C-83-1, Hydrogen Recombiner "A" is in Low Power Standby.**

STEP/STANDARD	SAT/UNSAT
EXAMINER: USE PAGES 6 through 10 if conducting JPM on the Simulator.	
SIMULATOR PERFORMANCE	

START TIME: _______

EXAMINER: The following actions are taken from SOI-83.01,"Containment Hydrogen Recombiners," Section 8.6,"Placing Recombiner A in Low Power Standby (1-H2C-83-1).	
STEP 1: [1] **ENSURE** POWER ADJUST potentiometer [1-M-10] set at 000. STANDARD: Applicant locates the POWER ADJUST potentiometer on 1-H2C-83-1 H2 RECOMBINER A (1-M-10) and verifies that three zeros ("000") are indicated. COMMENTS:	___ SAT ___ UNSAT
STEP 2: [2] **VERIFY** the White POWER IN AVAILABLE light LIT. STANDARD: Applicant locates the White POWER IN AVAILABLE light on 1-H2C-83-1 H2 RECOMBINER A (1-M-10) (below the TEMPERATURE OUT display) and determines that it is LIT. COMMENTS:	___ SAT ___ UNSAT

STEP/STANDARD	SAT/UNSAT
STEP 3: [3] **ENSURE** TEMPERATURE CHANNEL (thermocouple selector) selected to channel 1, 2, or 3. STANDARD: Applicant locates the TEMPERATURE CHANNEL on 1-H2C-83-1 H2 RECOMBINER A (1-M-10) (thermocouple selector) switch on 1-M-10 and verifies that Channel 1, 2 or 3 is selected. (Any switch position EXCEPT OFF.) **CUE: After the applicant has indicated how to establish the correct switch alignment, indicate CHANNEL on 1-H2C-83-1 H2 RECOMBINER A (1-M-10) (thermocouple selector) switch on 1-M-10 is selected to the channel specified by the applicant.** COMMENTS:	___ SAT ___ UNSAT
STEP 4: [4] **ENSURE** TEMPERATURE OUT (indicator dial) set on 1400°F. STANDARD: Applicant locates the TEMPERATURE OUT on 1-H2C-83-1 H2 RECOMBINER A (1-M-10) (indicator dial) on 1-M-10 and rotates the bezel until it is set on 1400°F. **CUE: After the applicant has indicated how adjust the bezel on 1-h2C-83-1 TEMPERATURE OUT, indicate that the bezel is set at 1400°F.** **Step is critical since it establishes the target temperature for the recombiner.** COMMENTS:	**CRITICAL STEP** ___ SAT ___ UNSAT

STEP/STANDARD	SAT/UNSAT
NOTE Red light on TEMPERATURE OUT (indicator dial) is lit when setpoint selected on indicator is reached.	
STEP 5: [5] **TURN** POWER OUT (MS Starter) switch to ON, and **VERIFY** switch plate Red light LIT. STANDARD: Applicant locates the POWER OUT (MS Starter) switch and lifts the switch to the UP position, and verifies the RED light above the switch is LIT. **CUE: After the applicant has indicated turn the POWER OUT switch to the ON position, indicate that the switch in the UP position and the RED light above the switch is LIT.** **Step is critical since this action provides power to the recombiner.** COMMENTS:	**CRITICAL STEP** ___ SAT ___ UNSAT

STEP/STANDARD	SAT/UNSAT
STEP 6: [6] **ADJUST** POWER ADJUST potentiometer clockwise to obtain 5 kW on POWER OUT meter, and **MAINTAIN** for 10 minutes. STANDARD: Applicant adjusts the potentiometer and obtains 5 kW on the POWER OUT meter. **CUE: After the applicant has indicated how to adjust the POWER ADJUST potentiometer clockwise to obtain 5 kW on POWER OUT meter, state that the POWER OUT meter is at 5 kW.** **CUE: Time compression - 10 minutes have elapsed.** **Step is critical to warm up the recombiner.** COMMENTS:	**CRITICAL STEP** ___ SAT ___ UNSAT
STEP 7: [7] **ADJUST** POWER ADJUST potentiometer to obtain 10 kW on POWER OUT meter, and **MAINTAIN** Recombiner in this pre-heated configuration for the duration of the post-accident hydrogen removal need, **OR** until needed for additional hydrogen control. STANDARD: **CUE: After the applicant has indicated how to adjust the POWER ADJUST potentiometer clockwise to obtain 10 kW on POWER OUT meter, state that the POWER OUT meter is at 10 kW.** **CUE: Time compression - 10 minutes have elapsed.** **Step is critical to warm up the recombiner.** COMMENTS:	**CRITICAL STEP** ___ SAT ___ UNSAT

STEP/STANDARD	SAT/UNSAT
STEP 8: [8] **IF** Recombiner A is needed for additional hydrogen control, **THEN GO TO** Section 8.1, Startup of Recombiner A (1-H2C-83-1), Step 8.1[13]. STANDARD: Applicant request information to support Step [8] action. ***EXAMINER: If asked, state that Recombiner A is not needed for additional hydrogen control at this time.*** COMMENTS:	___ SAT ___ UNSAT
STEP: Notify the Unit Supervisor that 1-H2C-83-1; H2 RECOMBINER A has been placed in Low Power Standby. STANDARD: Applicant reports to the Unit Supervisor that 1-H2C-83-1, H2 RECOMBINER A has been placed in Low Power Standby ***EXAMINER: Repeat back information provided by the applicant.*** COMMENTS:	___ SAT ___ UNSAT

STOP TIME ________

STEP/STANDARD	SAT/UNSAT
EXAMINER: USE PAGES 11 through 16 if conducting JPM in the Main Control Room.	
MAIN CONTROL ROOM PERFORMANCE	

START TIME ________

EXAMINER: The following actions are taken from SOI-83.01,"Containment Hydrogen Recombiners," Section 8.6,"Placing Recombiner A in Low Power Standby (1-H2C-83-1).	
STEP 1: [1] **ENSURE** POWER ADJUST potentiometer [1-M-10] set at 000. STANDARD: Applicant locates the "POWER ADJUST" potentiometer on 1-H2C-83-1 H2 RECOMBINER A (1-M-10) and verifies that three zeros ("000") are indicated. **CUE: If the "POWER ADJUST" potentiometer does not actually indicate three zeros ("000"), then inform the applicant that there are three zeros indicated.** COMMENTS:	___ SAT ___ UNSAT
STEP 2: [2] **VERIFY** the White POWER IN AVAILABLE light LIT. STANDARD: Applicant locates the White POWER IN AVAILABLE light on 1-H2C-83-1 H2 RECOMBINER A (1-M-10) (below the TEMPERATURE OUT display) and indicates that it should be LIT. COMMENTS:	___ SAT ___ UNSAT

STEP/STANDARD	SAT/UNSAT
STEP 3: [3] **ENSURE** TEMPERATURE CHANNEL (thermocouple selector) selected to channel 1, 2, or 3. STANDARD: Applicant locates the TEMPERATURE CHANNEL (thermocouple selector) switch on 1-H2C-83-1 H2 RECOMBINER A (1-M-10) on 1-M-10 and verifies that Channel 1, 2 or 3 is selected. (Any switch position EXCEPT OFF.) The "as found" position of the selector switch is expected to be "OFF". The applicant will explain that he selector switch must be rotated to select a specific channel. **CUE: After the applicant has demonstrated correct placement indicate that TEMPERATURE CHANNEL (thermocouple selector) switch is in the position requested by the applicant.** COMMENTS:	___ SAT ___ UNSAT
STEP 4: [4] **ENSURE** TEMPERATURE OUT (indicator dial) set on 1400°F. STANDARD: Applicant locates the TEMPERATURE OUT on 1-H2C-83-1 H2 RECOMBINER A (1-M-10) (indicator dial) on 1-M-10 and indicates that the bezel must be rotated until it is set on 1400°F. **CUE: After the applicant has demonstrated method for the TEMPERATURE OUT bezel, indicate that the setting is1400°F.** **Step is critical since it establishes the target temperature for the recombiner.** COMMENTS:	**CRITICAL STEP** ___ SAT ___ UNSAT

STEP/STANDARD	SAT/UNSAT
NOTE Red light on TEMPERATURE OUT (indicator dial) is lit when setpoint selected on indicator is reached.	
STEP 5: [5] **TURN** POWER OUT (MS Starter) switch to ON, and **VERIFY** switch plate Red light LIT. STANDARD: Applicant locates the POWER OUT (MS Starter) switch and indicates that the switch must be raised to the UP position, and indicates that the RED light above the switch will be LIT. **CUE: After the applicant has demonstrated how to position the POWER OUT switch, indicate that the switch is in the UP position and the RED light is LIT.** **Step is critical since this action provides power to the recombiner.** COMMENTS:	**CRITICAL STEP** ___ SAT ___ UNSAT

STEP/STANDARD	SAT/UNSAT
STEP 6: [6] **ADJUST** POWER ADJUST potentiometer clockwise to obtain 5 kW on POWER OUT meter, and **MAINTAIN** for 10 minutes. STANDARD: Applicant locates the potentiometer and indicates that the knob must be rotated in the clockwise direction to obtain 5 kW on the POWER OUT meter. **CUE: After the applicant has demonstrated how to rotate the POWER ADJUST potentiometer, indicate that the 5KW is indicated on the POWER OUT meter.** **Step is critical to warm up the recombiner.** ***EXAMINER: Time Compression - 10 minutes have elapsed.*** COMMENTS:	**CRITICAL STEP** ___ SAT ___ UNSAT

STEP/STANDARD	SAT/UNSAT
STEP 7: [7] **ADJUST** POWER ADJUST potentiometer to obtain 10 kW on POWER OUT meter, and **MAINTAIN** Recombiner in this pre-heated configuration for the duration of the post-accident hydrogen removal need, **OR** until needed for additional hydrogen control. STANDARD: Applicant locates the potentiometer and indicates that the knob must be rotated in the clockwise direction to obtain 10 kW on the POWER OUT meter. **CUE: After the applicant has demonstrated how to rotate the POWER ADJUST potentiometer, indicate that the 10KW is indicated on the POWER OUT meter.** **Step is critical to warm up the recombiner.** COMMENTS:	**CRITICAL STEP** ___ SAT ___ UNSAT
STEP 8: [8] **IF** Recombiner A is needed for additional hydrogen control, **THEN GO TO** Section 8.1, Startup of Recombiner A (1-H2C-83-1), Step 8.1[13]. STANDARD: Applicant request information to support Step [8] action. ***EXAMINER: If asked, state that Recombiner A is not needed for additional hydrogen control at this time.*** COMMENTS:	___ SAT ___ UNSAT

STEP/STANDARD	SAT/UNSAT
STEP: Notify the Unit Supervisor that 1-H2C-83-1; H2 RECOMBINER A has been placed in Low Power Standby. STANDARD: Applicant reports to the Unit Supervisor that 1-H2C-83-1, H2 RECOMBINER A has been placed in Low Power Standby ***EXAMINER: Repeat back information provided by the applicant.*** COMMENTS:	___ SAT ___ UNSAT

STOP TIME ________

APPLICANT CUE SHEET

(RETURN TO EXAMINER UPON COMPLETION OF TASK)

INITIAL CONDITIONS:

1. Unit has experienced a LOCA.

2. MCR crew is implementing E-1, "Loss of Reactor or Secondary Coolant."

3. E-1, "Loss of Reactor or Secondary Coolant," directs that the hydrogen recombiners be placed in service using SOI-83.01, "Containment Hydrogen Recombiners."

4. You are the Control Room Operator.

INITIATING CUES:

1. The Unit Supervisor has directed you to place 1-H2C-83-1, Hydrogen Recombiner "A" in Low Power Standby, using SOI-83.01, Containment Hydrogen Recombiners."

2. Notify the Unit Supervisor when 1-H2C-83-1, Hydrogen Recombiner "A" is in Low Power Standby.

Watts Bar Nuclear Plant

Unit 1

System Operating Instruction

SOI-83.01

Containment Hydrogen Recombiners

Revision 0015

Quality Related

Level of Use: Continuous Use

Effective Date: 08-30-2007

Responsible Organization: OPS, Operations

Prepared By: Jessica Goddard

Approved By: Kathy Keefer

Revision Log

Revision or Change Number	Effective Date	Affected Page Numbers	Description of Revision/Change
CN-4	10/18/97	2, 26	Revised App. A for DCN-39746.
10	2/28/01	2, 5, 10, 12-15, 17, 19, 20, 22, 24, 26, 27	Non-intent. Implemented DCN E-50601. Added new curve, Appendix B, Required Power-vs-Cntmt Pressure for Hydrogen Recombiner 1B-B. Reworded "increase" and "decrease" per WANO recommendations. Incorporated CN-1 through CN-4.
11	10/3/02	2,6,12,19,26	Non-intent. Changed 6% H_2 to 5% for consistency with E procedures. Revised power ranges based on DCN E-51168 for 1A-A Recombiner.
12	07/12/04	2, 7, 28	Non-intent. Revised to add Concurrent Verification requirements to breaker and fuse manipulations. (PER 03-012913-000).
13	01/19/05	1, 2	Non-Intent. Changed procedure usage to CONTINUOUS due to Operations Improvement Plan action.
14	06/15/05	1-2, 4-5, 7, 9, 11, 12, 15, 18, 19, 22	Implemented EDC 51420 which removed the H2 Recombiner Curves from the system description and placed them in new TI-83.01. App A and B are deleted and SOI-83.01 which will refer TI-83.01 for the Rqrd Power vs. Cntmt Press data to operate the recombiners. EDC 51420 is corrective action for PER 6057. Also updated Section 4.2 by deletion of pre-startup review requirement step [2].
15	08/30/07	All	This procedure was converted from Word 95 to Word (2002)XP using Rev. 14, By Barbara Perry.

Table of Contents

Table of Contents (continued)

1.0 INTRODUCTION

1.1 Purpose

To provide instructions for operation of the Hydrogen Recombiners System (HRS).

1.2 Scope

This Instruction includes the following operations:

A. Standby Readiness

B. Normal Operation

C. Shutdown

D. Infrequent Operations

2.0 REFERENCES

2.1 Performance Reference

A. TI-83.01, HYDROGEN RECOMBINER REQUIRED POWER-VS-CONTAINMENT PRESSURE CURVES.

2.2 Developemental References

A. OTI-83.01, Hydrogen Recombiner 1A-A 18 Month Heatup Test

B. OTI-83.02, Hydrogen Recombiner 1B-B 18 Month Heatup Test

C. Systems Description Manual, N3-83-4001, “Combustible Gas Control System”

D. Tech Specs 3.6.7, Hydrogen Recombiners

E. TVA Drawings: 45W755-1 and -3

F. WBN-VTM-W120-2296, Vendor Technical Manual for Westinghouse Electric Hydrogen Recombiner System

G. Westinghouse letter, WAT-D-9913, 01/13/95, RIMS # T33 950114 806

H. Westinghouse letter, WAT-D-9946, 02/17/95, RIMS # T33 950217 801

I. Westinghouse letter, WAT-D-9964, 03/08/95, RIMS # T33 950309 812

3.0 PRECAUTIONS AND LIMITATIONS

A. If the smallest difference in temperature (between any 2 thermocouples) after recombiner temperature has stabilized, exceeds 50°F, then the thermocouple is considered inaccurate and inoperable.

B. If all 3 thermocouples are operable, an average of the 3 temperatures must be used.

C. If only 2 thermocouples are operable, an average of the 2 temperatures must be used, disregarding the inoperable thermocouple.

D. Recombiner temperature of 1400°F is **NOT** to be exceeded on any operable thermocouple.

E. After starting the first recombiner, and within 10 days after a LOCA, the second Recombiner is to be placed in Low Power Standby (if available).

F. A maximum of 75kW per recombiner is **NOT** to be exceeded.

G. Chemistry must sample containment H_2 concentration every 4 hrs during first 24 hrs after a Design Basis Accident (DBA), after which, the need for continuing sampling may be reassessed.

H. Recombiners shall **NOT** be placed in service if containment H_2 concentration is greater than 5% (to ensure Recombiners are used less than 6%, taking instrument accuracy into account), due to a possible explosive atmosphere.

Date________ **INITIALS**

4.0 PREREQUISITE ACTIONS

4.1 Preliminary Actions

NOTES
1) Signoffs/ information in unused Sections may be left blank.
2) Throughout this instruction, Concurrent Verification (CV) may be marked **N/A** for breaker or fuse steps where no manipulation is performed

[1] **INDICATE** Section to be performed, and reason for use.

5.0	Standby Readiness	________	7.0	Shutdown	________
6.0	Normal Operation	N/A	8.0	Infrequent Operations	________

Section/ Reason/ Remarks: ____________________

____

____

____

4.2 Field Preparations

[1] **ENSURE** Precautions and Limitations, Section 3.0, REVIEWED. ________

4.3 Approvals and Notifications

[1] **COORDINATE** system operations/manipulations with UO. ________

Date________ **INITIALS**

5.0 STANDBY READINESS

5.1 Place Recombiner A in Standby (1-H2C-83-1)

[1] **ENSURE** POWER ADJUST potentiometer [1-M-10] set at 000. ________

[2] **VERIFY** the White POWER IN AVAILABLE light LIT. ________

[3] **ENSURE** TEMPERATURE CHANNEL (thermocouple selector) selected to channel 1, 2, or 3. ________

[4] **ENSURE** TEMPERATURE OUT (indicator dial) set on 1400°F. ________

5.2 Place Recombiner B in Standby (1-H2C-83-2)

[1] **ENSURE** POWER ADJUST potentiometer [1-M-10] set at 000. ________

[2] **VERIFY** the White POWER IN AVAILABLE light LIT. ________

[3] **ENSURE** TEMPERATURE CHANNEL (thermocouple selector) selected to channel 1, 2, or 3. ________

[4] **ENSURE** TEMPERATURE OUT (indicator dial) set on 1400°F. ________

6.0 NORMAL OPERATION

The Hydrogen Recombiner System consists of an inlet Pre-heater section, a Heater-recombiner section, and a Mixing chamber. The Pre-heater consists of a shroud placed around the central heaters. The Heater-recombiner section consists of 5 banks of electric heaters stacked vertically. Each bank contains 60 individual U-type heating elements. Each bank of heating elements is connected in series-parallel arrangements as required to obtain the power rating for each bank. Each recombiner is rated for 75 kW. TI-83.01, HYDROGEN RECOMBINER REQUIRED POWER-VS-CONTAINMENT PRESSURE contains the curves used to adjust the power level for the recombiners, as required for the particular containment pressure, when placing the recombiners in service.

The HRS has the capability to limit the post-Design Basis Accident (DBA) containment hydrogen concentration within the primary containment to below 4% by volume. The HRS is part of the Containment Gas Control System (CGCS), which is considered to be an Engineered Safety Feature (ESF) and as such, is required to be Seismic Category I.

Normal HRS configuration during power operation is in STANDBY. Since the Recombiner is only used during accidents, operation is covered under Section 8.0, INFREQUENT OPERATIONS.

Applicable checklists will be performed at the discretion of the Operations Superintendent or designee. Checklists will normally be performed for system alignment verification in Mode 5 whenever alignment verification is needed.

Date________ **INITIALS**

7.0 SHUTDOWN

7.1 SHUT DOWN Recombiner A (1-H2C-83-1)

[1] **REDUCE** POWER ADJUST potentiometer [1-M-10] to 000, and

VERIFY POWER OUT meter reducing to 0. ________

[2] **TURN** POWER OUT (MS Starter) switch to OFF, and

VERIFY switch plate Red light **NOT** lit. ________

[3] **ENSURE** TEMPERATURE CHANNEL (thermocouple selector) in position 1, 2, or 3, and

VERIFY temperature reducing. ________

7.2 SHUT DOWN Recombiner B (1-H2C-83-2)

[1] **REDUCE** POWER ADJUST potentiometer [1-M-10] to 000, and

VERIFY POWER OUT meter reducing to 0. ________

[2] **TURN** POWER OUT (MS starter) switch to OFF, and

VERIFY switch plate Red light **NOT** lit. ________

[3] **ENSURE** TEMPERATURE CHANNEL (thermocouple selector) in position 1, 2, or 3, AND

VERIFY temperature reducing. ________

Date________ INITIALS

8.0 INFREQUENT OPERATIONS

8.1 Startup of Recombiner A (1-H2C-83-1)

CAUTIONS

1) Temperature of 1400°F is **NOT** to be exceeded on any operable thermocouple.
2) On DG power, DG load should remain 4400 kW or less.
3) If there is any indication Recombiner A is **NOT** operating properly (through recombiner instrumentation), the Recombiner should be shutdown, a WR written, and the other Recombiner placed in service.

NOTE

TI-83.01, HYDROGEN RECOMBINER REQUIRED POWER-VS-CONTAINMENT PRESSURE contains the curves that will be needed to adjust the power level for the recombiner.

[1] **ENSURE** POWER ADJUST potentiometer [1-M-10] set at 000. ________

[2] **VERIFY** the White POWER IN AVAILABLE light LIT. ________

[3] **ENSURE** TEMPERATURE CHANNEL (thermocouple selector) is selected for channel 1, 2, or 3. ________

[4] **ENSURE** TEMPERATURE OUT (indicator dial), set on 1400°F. ________

NOTE

Red light on TEMPERATURE OUT (indicator dial) is lit when setpoint selected on indicator is reached.

[5] **REQUEST** Chemistry to sample containment atmosphere for H_2 concentration. ________

[6] **RECORD** the Date and Time on Data Sheet 1. ________

INITIALS

Date________

8.1 Startup of Recombiner A (1-H2C-83-1) (continued)

[7] **RECORD** CNTMT H_2 % on Data Sheet 1, **THEN**

INDICATE from which source H_2 percentage was obtained:

[7.1] ANAL A CNTMT H2,1-H21-43-200 [1-M-10] ☐

[7.2] ANAL B CNTMT H2, 1-H21-43-210 [1-M-10] ☐

[7.3] Chemistry sample analysis ☐

[8] **IF** containment H_2 is greater than 5%, **THEN**

DO NOT place H_2 Recombiner in service, and

NOTIFY the SM. ________

[9] **RECORD** CNTMT PRESS (psig) on Data Sheet 1, **THEN**

INDICATE which indicator was used:

[9.1] 1-PI-30-310, CNTMT WR PRESS [1-M-9] ☐

[9.2] 1-PI-30-311, CNTMT WR PRESS [1-M-9] ☐

[10] **TURN** POWER OUT (MS Starter) switch to ON, and

VERIFY switch plate Red light LIT. ________

________ IV

[11] **ADJUST** POWER ADJUST potentiometer clockwise to obtain 5 kW on POWER OUT meter, and

MAINTAIN for 10 minutes. ________

[12] **ADJUST** POWER ADJUST potentiometer to obtain 10 kW on POWER OUT meter, and

MAINTAIN for 10 minutes. ________

[13] **ADJUST** POWER ADJUST potentiometer to obtain 20 kW on POWER OUT meter, and

MAINTAIN for 5 minutes. ________

Date________ INITIALS

8.1 Startup of Recombiner A (1-H2C-83-1) (continued)

[14] **DETERMINE** the REQUIRED POWER (kW) based on current CNTMT PRESSURE (psig) using Attachment 3 of TI-83.01, HYDROGEN RECOMBINER REQUIRED POWER-VS-CONTAINMENT PRESSURE CURVES. ________

[15] **ADJUST** POWER ADJUST potentiometer to obtain the REQUIRED POWER (kW) using Attachment 3 of TI-83.01, HYDROGEN RECOMBINER REQUIRED POWER-VS-CONTAINMENT PRESSURE CURVES. ________

____
IV

NOTES

1) Periodic potentiometer adjustment is necessary to maintain Required Power setting. Temperature is obtained by selecting an average temperature of all operable thermocouples. Temperature should rise to 1150-1400°F in approximately 4 hours depending on initial containment temperature.
2) Recombiner temperature should be allowed to stabilize before making power changes due to the lag time between adjustment and actual temperature change.
3) 1 kW power change is approximately equal to 20°F recombiner temperature change.

[16] **AFTER** recombiner temperature has stabilized for approximately 30 minutes, **THEN**

ADJUST POWER ADJUST potentiometer to maintain 1225 - 1400°F recombiner average temperature. ________

[17] **IF** at any time the CNTMT H_2 % rises to greater than 2.5%, **THEN**

RAISE Recombiner POWER OUT by 4 kW. ________

[18] **NOTIFY** SRO that Recombiner A is in service and will be monitored at least once every 24 hours per Section 8.2. ________

INITIALS

Date________

8.2 Continuous Monitoring of Recombiner A (1-H2C-83-1)

NOTES

1) This Section is to be repeated every 24 hours.
2) IF, THEN Steps are **N/A** if the stated condition does **NOT** occur.

[1] **REVIEW** Precautions and Limitations, Section 3.0. ________

[2] **RECORD** the Date and Time on Data Sheet 1. ________

[3] **RECORD** CNTMT H_2 % on Data Sheet 1, and

INDICATE from which source the H_2 percentage was obtained:

[3.1] ANAL A CNTMT H2, 1-H21-43-200 [1-M-10] ☐

[3.2] ANAL B CNTMT H2, 1-H21-43-210 [1-M-10] ☐

[3.3] Chemistry sample analysis ☐

NOTE

When possible, the same source should be used for comparing H_2 percentages.

[4] **COMPARE** the CNTMT H_2 % recorded in Step 8.2[3] on Data Sheet 1, with the CNTMT H_2 % recorded the previous 24 hours.

[5] **IF** CNTMT H_2 % is greater than 2.5% OR has risen 0.5% during the last 24 hours, **THEN**

RAISE Recombiner POWER OUT by 4 kW.

[6] **RECORD** CNTMT PRESS (psig) on Data Sheet 1, and

INDICATE which indicator was used:

[6.1] 1-PI-30-310, CNTMT WR PRESS [1-M-9] ☐

[6.2] 1-PI-30-311, CNTMT WR PRESS [1-M-9] ☐

Date________ **INITIALS**

8.2 Continuous Monitoring of Recombiner A (1-H2C-83-1) (continued)

[7] **IF** (during the last 24 hours) CNTMT H_2 % has remained constant OR reduced, AND CNTMT PRESSURE (psig) has changed, **THEN**

[7.1] **DETERMINE** the REQUIRED POWER (kW) based on current CNTMT PRESSURE (psig) using Attachment 3 of TI-83.01, HYDROGEN RECOMBINER REQUIRED POWER-VS-CONTAINMENT PRESSURE CURVES. ________

[7.2] **IF** the determined REQUIRED POWER (kW) is greater than the current power, **THEN**

RAISE POWER OUT to the determined value. ________

[7.3] **IF** the determined REQUIRED POWER (kW) is less than the current power, **THEN**

DO **NOT** make a power change. ________

NOTES

1) Periodic potentiometer adjustment is necessary to maintain the Required Power setting. Temperature is obtained by selecting an average temperature of all operable thermocouples.
2) Recombiner temperature should be allowed to stabilize before making power changes due to the lag time between adjustment and actual temperature change.
3) 1 kW power change is approximately equal to 20°F recombiner temperature change.

[8] **IF** recombiner POWER OUT has been changed, AND recombiner temperature has stabilized for 30 minutes, **THEN**

ADJUST POWER ADJUST potentiometer, if necessary, to maintain 1225 - 1400°F recombiner average temperature. ________

NOTE

10 days following a LOCA, Recombiner B (if available) is to be placed in Low Power Standby per Section 8.3.

INITIALS

Date________

8.3 Placing Recombiner B in Low Power Standby (1-H2C-83-2)

[1] **ENSURE** POWER ADJUST potentiometer [1-M-10] set at 000. ________

[2] **VERIFY** the White POWER IN AVAILABLE light LIT. ________

[3] **ENSURE** TEMPERATURE CHANNEL (thermocouple selector) selected to channel 1, 2, or 3. ________

[4] **ENSURE** TEMPERATURE OUT (indicator dial) set on 1400°F. ________

NOTE
Red light on TEMPERATURE OUT (indicator dial) is lit when setpoint selected on indicator is reached.

[5] **TURN** POWER OUT (MS Starter) switch to ON, and

VERIFY switch plate Red light LIT. ________

____
IV

[6] **ADJUST** POWER ADJUST potentiometer clockwise to obtain 5 kW on POWER OUT meter, and

MAINTAIN for 10 minutes. ________

[7] **ADJUST** POWER ADJUST potentiometer to obtain 10 kW on POWER OUT meter, and

MAINTAIN Recombiner in this pre-heated configuration for the duration of the post-accident hydrogen removal need, **OR** until needed for additional hydrogen control. ________

[8] **IF** Recombiner B is needed for additional hydrogen control, **THEN**

GO TO Section 8.4, Startup of Recombiner B (1-H2C-83-2), Step 8.4[13]. ________

Date________ **INITIALS**

8.4 Startup of Recombiner B (1-H2C-83-2)

CAUTIONS

1) Temperature of 1400°F is **NOT** to be exceeded on any operable thermocouple.
2) On DG power, DG load should remain 4400 kW or less.
3) If there is any indication Recombiner B is **NOT** operating properly (through recombiner instrumentation), the Recombiner should be shutdown, a WR written, and the other Recombiner placed in service.

NOTE

TI-83.01, HYDROGEN RECOMBINER REQUIRED POWER-VS-CONTAINMENT PRESSURE contains the curves that will be needed to adjust the power level for the recombiner.

[1] **ENSURE** POWER ADJUST potentiometer [1-M-10] set at 000. ________

[2] **VERIFY** the White POWER IN AVAILABLE light LIT. ________

[3] **ENSURE** TEMPERATURE CHANNEL (thermocouple selector) is selected for channel 1, 2, or 3. ________

[4] **ENSURE** TEMPERATURE OUT (indicator dial) set on 1400°F. ________

NOTE

Red light on TEMPERATURE OUT (indicator dial) is lit when setpoint selected on indicator is reached.

[5] **REQUEST** Chemistry to sample containment atmosphere for H_2 concentration. ________

[6] **RECORD** the Date and Time on Data Sheet 2. ________

[7] **RECORD** CNTMT H_2 % Data Sheet 2, **THEN**

INDICATE from which source H_2 percentage was obtained:

[7.1] ANAL A CNTMT H2,1-H21-43-200 [1-M-10] ☐

[7.2] ANAL B CNTMT H2, 1-H21-43-210 [1-M-10] ☐

[7.3] Chemistry sample analysis ☐

Date________ INITIALS

8.4 Startup of Recombiner B (1-H2C-83-2) (continued)

[8] **IF** containment H_2 is greater than 5%, **THEN**

DO NOT place H_2 Recombiner in service, and

NOTIFY the SM. ________

[9] **RECORD** CNTMT PRESS (psig) on Data Sheet 2, **THEN**

INDICATE which indicator was used:

[9.1] 1-PI-30-310, CNTMT WR PRESS [1-M-9] ☐

[9.2] 1-PI-30-311, CNTMT WR PRESS [1-M-9] ☐

____

[10] **TURN** POWER OUT (MS Starter) switch to ON, and

VERIFY switch plate red light LIT. ________

________ IV

[11] **ADJUST** POWER ADJUST potentiometer clockwise to obtain 5 kW on POWER OUT meter, and

MAINTAIN for 10 minutes. ________

[12] **ADJUST POWER** ADJUST potentiometer to obtain 10 kW on POWER OUT meter, and

MAINTAIN for 10 minutes. ________

[13] **ADJUST** POWER ADJUST potentiometer to obtain 20 kW on POWER OUT meter, and

MAINTAIN for 5 minutes. ________

[14] **DETERMINE** the REQUIRED POWER (kW) based on current CNTMT PRESSURE (psig) using Attachment 4 of TI-83.01, HYDROGEN RECOMBINER REQUIRED POWER-VS-CONTAINMENT PRESSURE CURVES. ________

Date________ INITIALS

8.4 Startup of Recombiner B (1-H2C-83-2) (continued)

[15] **ADJUST** POWER ADJUST potentiometer to obtain the REQUIRED POWER (kW) using Attachment 4 of TI-83.01, HYDROGEN RECOMBINER REQUIRED POWER-VS-CONTAINMENT PRESSURE CURVES. ________

____
IV

NOTES

1) Periodic potentiometer adjustment is necessary to maintain Required Power setting. Temperature is obtained by selecting an average temperature of all operable thermocouples. Temperature should rise to 1150-1400°F in approximately 4 hours depending on the initial containment temperature.
2) Recombiner temperature should be allowed to stabilize before making power changes due to the lag time between adjustment and actual temperature change.
3) Recombiner temperature should be allowed to stabilize before making power changes due to the lag time between adjustment and actual temperature change.

[16] **AFTER** recombiner temperature has stabilized for approximately 30 minutes, **THEN**

ADJUST POWER ADJUST potentiometer to maintain 1225 - 1400°F recombiner average temperature. ________

[17] **IF** at any time the CNTMT H_2 % rises to greater than 2.5%, **THEN**

RAISE the Recombiner POWER OUT by 4 kW. ________

[18] **NOTIFY** SRO that Recombiner B is in service and will be monitored at least once every 24 hours per Section 8.5. ________

Date________ **INITIALS**

8.5 Continuous Monitoring of Recombiner B (1-H2C-83-2)

NOTES

1) This section is to be repeated every 24 hours.
2) **IF,** THEN Steps are **N/A** if the stated condition does **NOT** occur.

[1] **REVIEW** Precautions and Limitations, Section 3.0. ________

[2] **RECORD** the Date and Time on Data Sheet 2. ________

[3] **RECORD** CNTMT H_2 % on Data Sheet 2, and

INDICATE from which source the H_2 percentage was obtained: ________

[3.1] ANAL A CNTMT H2,1-H21-43-200 [1-M-10] ☐

[3.2] ANAL B CNTMT H2, 1-H21-43-210 [1-M-10] ☐

[3.3] Chemistry sample analysis ☐

NOTE

When possible, the same source should be used for comparing H_2 percentages.

[4] **COMPARE** the CNTMT H_2 % recorded in Step 8.5[3] on Data Sheet 2, with the CNTMT H_2 % recorded the previous 24 hours. ________

[5] **IF** CNTMT H_2 % is greater than 2.5% OR has risen 0.5% during the last 24 hours, **THEN**

RAISE the Recombiner POWER OUT by 4 kW. ________

Date________ **INITIALS**

8.5 Continuous Monitoring of Recombiner B (1-H2C-83-2) (continued)

[6] **RECORD** CNTMT PRESS (psig) on Data Sheet 2, and

INDICATE which indicator was used: ________

[6.1] 1-PI-30-310, CNTMT WR PRESS [1-M-9] ☐

[6.2] 1-PI-30-311, CNTMT WR PRESS [1-M-9] ☐

[7] **IF** (during the last 24 hours) CNTMT H_2 % has remained constant **OR** reduced, **AND** CNTMT PRESSURE (psig) has changed, **THEN**

[7.1] **DETERMINE** the REQUIRED POWER (kW) based on current CNTMT PRESSURE (psig) using Attachment 4 of TI-83.01, HYDROGEN RECOMBINER REQUIRED POWER-VS-CONTAINMENT PRESSURE CURVES. ________

[7.2] **IF** the determined REQUIRED POWER (kW) is greater than the current power, **THEN**

RAISE POWER OUT to the determined value. ________

[7.3] **IF** the determined REQUIRED POWER (kW) is less than the current power, **THEN**

DO NOT make a power change. ________

Date________ **INITIALS**

8.5 Continuous Monitoring of Recombiner B (1-H2C-83-2) (continued)

NOTES
1) Periodic potentiometer adjustment is necessary to maintain the Required Power setting. Temperature is obtained by selecting an average temperature of all operable thermocouples.
2) Recombiner temperature should be allowed to stabilize before making power changes due to the lag time between adjustment and actual temperature change.
3) 1 kW power change is approximately equal to 20°F recombiner temperature change.

[8] **IF** recombiner POWER OUT has been changed, AND recombiner temperature has stabilized for 30 minutes, **THEN**

ADJUST POWER ADJUST potentiometer, if necessary, to maintain 1225 - 1400°F recombiner average temperature. ________

NOTE
10 days following a LOCA, Recombiner A (if available) is to be placed in Low Power Standby per Section 8.6.

Date________ INITIALS

8.6 Placing Recombiner A in Low Power Standby (1-H2C-83-1)

[1] **ENSURE** POWER ADJUST potentiometer [1-M-10] set at 000. ________

[2] **VERIFY** the White POWER IN AVAILABLE light LIT. ________

[3] **ENSURE** TEMPERATURE CHANNEL (thermocouple selector) selected to channel 1, 2, or 3. ________

[4] **ENSURE** TEMPERATURE OUT (indicator dial) set on 1400°F. ________

> **NOTE**
>
> Red light on TEMPERATURE OUT (indicator dial) is lit when setpoint selected on indicator is reached.

[5] **TURN** POWER OUT (MS Starter) switch to ON, and

VERIFY switch plate Red light LIT. ________

____
IV

[6] **ADJUST** POWER ADJUST potentiometer clockwise to obtain 5 kW on POWER OUT meter, and

MAINTAIN for 10 minutes. ________

[7] **ADJUST** POWER ADJUST potentiometer to obtain 10 kW on POWER OUT meter, and

MAINTAIN Recombiner in this pre-heated configuration for the duration of the post-accident hydrogen removal need, **OR** until needed for additional hydrogen control.

[8] **IF** Recombiner A is needed for additional hydrogen control, **THEN**

GO TO Section 8.1, Startup of Recombiner A (1-H2C-83-1), Step 8.1[13].

9.0 RECORDS

9.1 QA Records

The following documents are QA records and handled in accordance with the Document Control and Records Management (DCRM) program:

Completed Data Packages

9.2 Non-QA Records

None

Checklist 1
(Page 1 of 1)

Recombiner Power Alignment Verification

NOMENCLATURE	LOCATION	POSITION	UNID	PERF INITIAL		VERIFIER INITIAL
Reactor Vent Board 1A-A						
ELEC H2 RECOMBINER HTR 1A-A (1-HTR-83-1)	C/2D	ON	1-BKR-83-1		CV	IV
Reactor Vent Board 1B-B						
ELEC H2 RECOMBINER HTR 1B-B (1-HTR-83-2)	C/2D	ON	1-BKR-83-2		CV	IV

Data Sheet 1
(Page 1 of 1)

Recombiner A Data Sheet

*Page_________

DATE TIME	CNTMT H2 %	CNTMT PRESS (psig)
Date________ Time________		
Date________ Time________		
Date________ Time________		
Date________ Time________		
Date________ Time________		
Date________ Time________		
Date________ Time________		
Date________ Time________		
Date________ Time________		
Date________ Time________		
Date________ Time________		

* This Data Sheet is used to record containment hydrogen concentration and pressure every 24 hours. It may be duplicated as needed. Record page count at the beginning of each new page.

Data Sheet 2
(Page 1 of 1)

Recombiner B Data Sheet

*Page_________

DATE TIME	CNTMT H2 %	CNTMT PRESS (psig)
Date________ Time________		
Date________ Time________		
Date________ Time________		
Date________ Time________		
Date________ Time________		
Date________ Time________		
Date________ Time________		
Date________ Time________		
Date________ Time________		
Date________ Time________		
Date________ Time________		

* This Data Sheet is used to record containment hydrogen concentration and pressure every 24 hours. It may be duplicated as needed. Record page count at the beginning of each new page.

Source Notes
(Page 1 of 1)

Requirements Statement	Source Document	Implementing Statement
None		

B.1.g
Isolate Cold Leg Accumulators per E-1

EVALUATION SHEET

Task: Isolate Cold Leg Accumulators per E-1.

Alternate Path: Cold Leg Accumulators 1 and 2 cannot be isolated and must be vented to comply with E-1.

Facility JPM #: 2009-05 NRC Exam

Safety Function: 3 **Title:** Reactor Pressure Control

K/A 011 EA1.09 Ability to operate and monitor the following as they apply to a Large Break LOCA: Core flood tank initiation

Rating(s): 4.3/4.3 **CFR:** 41.7 / 45.5 / 45.6

Evaluation Method: Simulator __X__ In-Plant ______ **Classroom** ______

References: E-1,"Loss of Reactor or Secondary Coolant", Rev. 16.

Task Number: RO-063-SOI-63-003 **Title:** Vent nitrogen from the cold leg accumulators.

Task Standard: The applicant:

1.) Isolates Cold Leg Accumulators 3 and 4 per E-1 Step 25 AER.

2.) Vents Cold Leg Accumulators 1 and 2 per E-1, Step 25 RNO

Validation Time: 12 minutes **Time Critical:** Yes ____ No __X__

==

Applicant: ____________________ _______________ Time Start: ______
NAME Docket No. Time Finish: ______

Performance Rating: SAT ____ UNSAT ____ Performance Time ___

Examiner: ____________________ ____________________/________
NAME SIGNATURE DATE

==

COMMENTS

SIMULATOR OPERATOR INSTRUCTIONS:

1. ENSURE NRC Examination Security has been established.
2. RESET to Initial Condition by performing the following actions:
   a. Select ICManager on the THUNDERBAR menu (right hand side of Instructor Console Screen).
   b. Locate IC 320.
   c. Right "click" on IC 320.
   d. Select Reset on the drop down menu.
   e. Right "click" on RESET.
   f. Enter the password for IC 320.
   g. Select "Yes" on the INITIAL CONDITION RESET pop-up window.
   h. Perform SWITCH CHECK.
3. ENSURE the following information appears on the Director Summary Screen:

	Key		Type	Event	Delay	Inserted	Ramp	Initial	Final	Value
	th02a	loca small leak loop 1	M		00:00:00		00:00:00		80	80
	xi-35-60sw6	xi-35-60sw6 generator condition monitor alarm silenc	O		00:00:00		00:00:00		contact	nocntact
	hs-63-118a	hs-63-118a sis accumulator tank 1 flow isolation valve	O		00:00:00		00:00:00		open	open
	hs-63-98a	hs-63-98a sis accumulator tank 2 flow isolation valve	O		00:00:00		00:00:00		open	open
	sir01	pwr to cold leg accumu isolation valves fcv-63-67, 80, 98, 119	R		00:00:00		00:00:00		On	On

6. Place simulator in RUN and acknowledge any alarms.
7. ENSURE a marked-up copy of E-1,"Loss of Reactor or Secondary Coolant," signed (circled-and-slashed) through Step 25, with Step 26 circled, is available to the Examiner.
8. ENSURE "Extra Operator" is present in the simulator.
9. Place simulator in FREEZE until Examiner cue is given.

READ TO APPLICANT

DIRECTION TO APPLICANT:

I will explain the initial conditions, and state the task to be performed. All control room steps shall be performed for this JPM, including any required communications. I will provide initiating cues and reports on other actions when directed by you. Ensure you indicate to me when you understand your assigned task. To indicate that you have completed your assigned task return the cue sheet I provided you.

INITIAL CONDITIONS:

1. **A large break LOCA has occurred.**
2. **E-1, "Loss of Reactor or Secondary Coolant" performance has just been resumed after performance of ES-1.3, "Transfer to Containment Sump."**
3. **E-1, "Loss of Reactor or Secondary Coolant," Appendices A through C have been completed.**
4. **You are the Control Room Operator.**

INITIATING CUES:

The Unit Supervisor directs you continue performance of E-1, "Loss of Reactor or Secondary Coolant," beginning at Step 25.

STEP/STANDARD	SAT/UNSAT

START TIME: _______

STEP 1: 25. **DETERMINE** if cold leg accumulators should be isolated: a. **ENSURE** power to isolation valves restored USING Appendix A (E-1), CLA Breaker Operation. STANDARD: Applicant determines from the INITIAL CONDITIONS that power has been restored to the isolation valves. COMMENTS:	___ SAT ___ UNSAT
STEP 2: 25. **DETERMINE** if cold leg accumulators should be isolated: b. **CHECK** RCS pressure less than 250 psig. STANDARD: Applicant reads RCS pressure from ONE of the following PAM instruments and determines that pressure is approximately 13 psig. RVLIS-ICCM PLASMA DISPLAY on 1-M-4 or 1-M-6 Loop 4 HL PRESS 1-PI-68-70 Loop 3 HL PRESS 1-PI-68-64 Loop 2 HL Press 1-PI-68-63 COMMENTS:	___ SAT ___ UNSAT

STEP/STANDARD	SAT/UNSAT
STEP 3: 25. **DETERMINE** if cold leg accumulators should be isolated: c. **CLOSE** cold leg accumulator isolation valves. STANDARD: Applicant performs the following: ___Places 1-HS-63-118A, 1-HS-63-98A, 1-HS-63-80A and 1-HS-63-67A to CLOSE. ___Observes that 1-HS-63-118A indicating lights do NOT change. ___Determines 1-FCV-63-118, CLA 1 Isolation valve remains OPEN. ___Observes that 1-HS-63-98A indicating lights do NOT change. ___Determines 1-FCV-63-98, CLA 2 Isolation valve remains OPEN. **Step is critical to minimize the chance of nitrogen injection into the RCS, and to determine that RNO is warranted.** COMMENTS:	**CRITICAL STEP** ___ SAT ___ UNSAT

STEP/STANDARD	SAT/UNSAT
STEP 4: 25. **DETERMINE** if cold leg accumulators should be isolated: c. **RESPONSE NOT OBTAINED:** **PERFORM** the following: 1) **RESET** Phase B. STANDARD: ____Observes Phase B lights on the Master Isolation Signal Status panels, 1-XX-55-6C and 1-XX-55-6D on 1-M-6 are LIT, indicating that Phase B has been RESET. COMMENTS:	___ SAT ___ UNSAT

STEP/STANDARD	SAT/UNSAT
STEP 4: 25. **DETERMINE** if cold leg accumulators should be isolated: c. **RESPONSE NOT OBTAINED:** **PERFORM** the following: 2) **ENSURE** aux air pressure to cntmt is greater than 75 psig [M-15]. **AND OPEN** cntmt air supply valves • 1-FCV-32-80. • 1-FCV-32-102. • 1-FCV-32-110. STANDARD: Observes air pressure on 0-PI-32-104A, Aux Air A Press and 0-PI-32-105A, Aux Air Press indicate 95 psig and that 1-FCV-32-80, 1-FCV-32-102, and 1-FCV-32-110 are OPEN. COMMENTS:	___ SAT ___ UNSAT

STEP/STANDARD	SAT/UNSAT
STEP 5: 25. **DETERMINE** if cold leg accumulators should be isolated: c. **RESPONSE NOT OBTAINED:** **PERFORM** the following: 3) **OPEN** any unisolated accumulator nitrogen makeup valve: • 1-FCV-63-127 accumulator 1. • 1-FCV-63-107 accumulator 2. • 1-FCV-63-87 accumulator 3. • 1-FCV-63-63 accumulator 4. STANDARD: ___Applicant determines that 1-FCV-63-118 for CLA 1 must be OPENED. ___Applicant places 1-HS-63-118A N2 TO CL ACCUM 1 to OPEN position, and verifies RED light is LIT GREEN light is DARK. ___Applicant determines that 1-FCV-63-98 for CLA 2 must be OPENED. ___Applicant places 1-HS-63-98A N2 TO CL ACCUM 2 to OPEN position, and verifies RED light is LIT GREEN light is DARK. **Step is critical since this action is taken to minimize the chance of nitrogen injection into the RCS.** COMMENTS:	**CRITICAL STEP** ___ SAT ___ UNSAT

STEP/STANDARD	SAT/UNSAT
STEP 5: 25. **DETERMINE** if cold leg accumulators should be isolated: c. **RESPONSE NOT OBTAINED:** **PERFORM** the following: 4) **OPEN** 1-FCV-63-65 vent header. STANDARD: Applicant rotates 1-HIC-63-65A in the counterclockwise direction to OPEN 1-FCV-63-65 FULLY. **Step is critical since this action is taken to minimize the chance of nitrogen injection into the RCS.** COMMENTS:	**CRITICAL STEP** ___ SAT ___ UNSAT
STEP 10: Notify the Unit Supervisor that E-1, Step 26 is complete. STANDARD: Performer notifies the Unit Supervisor that Step 26 is complete COMMENTS: **END OF TASK**	___ SAT ___ UNSAT

STOP TIME ________

APPLICANT CUE SHEET

(RETURN TO EXAMINER UPON COMPLETION OF TASK)

INITIAL CONDITIONS:

1. A large break LOCA has occurred.

2. E-1, "Loss of Reactor or Secondary Coolant" performance has just been resumed after performance of ES-1.3, "Transfer to Containment Sump."

3. E-1, "Loss of Reactor or Secondary Coolant," Appendices A through C have been completed.

4. You are the Control Room Operator.

INITIATING CUES:

The Unit Supervisor directs you continue performance of E-1, "Loss of Reactor or Secondary Coolant," beginning at Step 25.

TVA

Watts Bar Nuclear Plant

Unit 1

Emergency Operating Instruction

E-1

Loss of Reactor or Secondary Coolant

Revision 0016

Quality Related

Level of Use: Continuous Use

Effective Date: 12-15-2010

Responsible Organization: OPS, Operations

Prepared By: R. A. O'Rear

Approved By: Brian McIlnay

Current Revision Description

Conversion to Word 2007 template using Rev 15. Minor formatting/editorial changes to conform to template requirements. Added local reset of hydrogen analyzer alarm panel. [PCR 3287] Removed steps energizing hydrogen igniters and de-energizing ice condenser air handling units (Appendix B). Revised cross referenced steps throughout to accommodate removal of these two steps. These steps are being moved to E-0 for performance within 30 minutes of accident initiation in order to comply with System Description N3-83-4001, Combustible Gas Control. Added Hydrogen Igniters and ICE Condenser AHUs to Appendix D Equipment Evaluation.

1.0 PURPOSE

This Instruction provides action to recover from a loss of reactor or secondary coolant.

2.0 SYMPTOMS AND ENTRY CONDITIONS

2.1 Indications

2.1.1 Indications of a Loss of Reactor Coolant

A. Cntmt parameters abnormal:

1. High pressure, High radiation, High temperature, or
2. High sump level.

B. Pzr PORV open and block valve cannot be closed.

C. Pzr safety valve failed open.

2.1.2 Indications of a Loss of Secondary Coolant

A. Any S/G pressure less than 120 psig.

B. Any S/G pressure dropping in an uncontrolled manner.

2.2 Transitions

A. E-0, Reactor Trip or Safety Injection.

B. ES-1.1, SI Termination.

C. E-2, Faulted Steam Generator Isolation.

D. FR-C.1, Inadequate Core Cooling.

E. FR-C.2, Degraded Core Cooling.

F. FR-H.1, Loss of Secondary Heat Sink.

G. FR-I.2, Low Pzr Level.

H. ECA-0.2, Recovery From Loss of All AC Power With SI Required.

2.2 Transitions (continued)

I. ECA-1.2, LOCA Outside Containment.

J. ECA-2.1, Uncontrolled Depressurization of All Steam Generators.

3.0 OPERATOR ACTIONS

Step	Action/Expected Response	Response Not Obtained
	NOTE Seal injection flow should be maintained to all RCPs.	
1.	**CHECK** if RCPs should remain in service:	
	a. Phase B DARK [MISSP].	a. **STOP** all RCPs. ** **GO TO** Step 2.
	b. RCS pressure greater than 1500 psig.	b. **ENSURE** at least one Charging pump or SI pump injecting. **WHEN** injection flow established, **THEN** **STOP** all RCPs.
2.	**REFER TO** EPIP-1, Emergency Plan Classification Flowchart.	
	NOTE Time since initiation of event is defined by performance of Step 3.	
3.	**RECORD** current time to mark initiation of LOCA and determination of time for hot leg recirc.	
4.	**CHECK** S/G pressures: • All S/G pressures controlled or rising. • All S/Gs pressures greater than 120 psig.	**IF** Faulted S/G has **NOT** been isolated, **THEN** ** **GO TO** E-2, Faulted Steam Generator Isolation.

Step	Action/Expected Response	Response Not Obtained
5.	**MAINTAIN** Intact S/G NR levels:	
	a. **MONITOR** levels greater than 29% [39% ADV].	a. **MAINTAIN** total feed flow greater than 410 gpm UNTIL level is greater than 29% [39% ADV] in at least one S/G.
	b. **CONTROL** intact S/G levels between 29% and 50% [39% and 50% ADV].	b. **IF** level in any intact S/G continues to rise without feed flow, **THEN** ** **GO TO** E-3, Steam Generator Tube Rupture.

6.	**CHECK** secondary radiation:
	• S/G discharge monitors NORMAL.
	• Condenser vacuum exhaust rad monitors NORMAL.
	• S/G blowdown rad monitor recorders NORMAL trend prior to isolation.
		IF rad monitors **NOT** available, **THEN**
		a. **NOTIFY** RADPROT to survey main steamlines and S/G blowdown lines.
		b. **NOTIFY** Chemistry to sample S/G activity.
		
		IF radiation is high, **THEN**
		
		** **GO TO** E-3, Steam Generator Tube Rupture.

Step	Action/Expected Response	Response Not Obtained
7.	**ENSURE** cntmt hydrogen analyzers in service: • **PLACE** 1-HS-43-200A in ANALYZE [M-10]. • **PLACE** 1-HS-43-210A in ANALYZE [M-10]. • **CHECK** low flow lights **NOT** lit [M-10]. • **LOCALLY CHECK** low analyzer temp lights **NOT** lit **AND** **RESET** local alarm panel. [North wall of Train A 480V SD Bd rm].	**NOTIFY** Chemistry to evaluate sampling cntmt for hydrogen concentration.
8.	**MONITOR** pzr PORVs and block valves:	
	a. Pzr PORVs CLOSED.	a. **WHEN** RCS pressure is less than 2335 psig, **THEN** **ENSURE** pzr PORV or associated block valve CLOSED.
	b. At least one block valve OPEN.	b. **OPEN** one block valve UNLESS it was closed to isolate an open PORV.

Step	Action/Expected Response	Response Not Obtained
23.	**DETERMINE** if RCS cooldown and depressurization is required:	
	a. **CHECK** RCS pressure greater than 150 psig.	a. **IF** RHR pump injecting to RCS, **THEN** ** **GO TO** Step 24.
	b. ** **GO TO** ES-1.2, Post LOCA Cooldown and Depressurization.	
24.	**PREPARE** for switchover to RHR cntmt sump:	
	a. **ENSURE** power restored to 1-FCV-63-1 USING Appendix B (E-1), 1-FCV-63-1 Breaker Operation.	
	b. **CHECK** RWST level less than 34%.	b. ** **GO TO** Step 19.
	c. ** **GO TO** ES-1.3, Transfer to Containment Sump.	

Step	Action/Expected Response	Response Not Obtained
25.	**DETERMINE** if cold leg accumulators should be isolated:	
	a. **ENSURE** power to isolation valves restored USING Appendix A (E-1), CLA Breaker Operation.	
	b. **CHECK** RCS pressure less than 250 psig.	b. **WHEN** RCS pressure is less than 250 psig, **THEN** **PERFORM** Substep 25c. ** **GO TO** Step 26.

Step continued on next page

Step	Action/Expected Response	Response Not Obtained
25.	(continued)	
	c. **CLOSE** cold leg accumulator isolation valves.	c. **PERFORM** the following: 1) **RESET** Phase B. 2) **ENSURE** aux air pressure to cntmt is greater than 75 psig [M-15] **AND** **OPEN** cntmt air supply valves • 1-FCV-32-80. • 1-FCV-32-102. • 1-FCV-32-110. 3) **OPEN** any unisolated accumulator nitrogen makeup valve: • 1-FCV-63-127 accumulator 1. • 1-FCV-63-107 accumulator 2. • 1-FCV-63-87 accumulator 3. • 1-FCV-63-63 accumulator 4. 4) **OPEN** 1-FCV-63-65 vent header.

Step	Action/Expected Response	Response Not Obtained
26.	**DETERMINE** if RHR spray should be placed in service:	
	a. **CHECK** the following conditions: • Cntmt pressure is greater than 9.5 psig. • At least one hour elapsed since the beginning of the accident. • RHR suction is aligned to the cntmt sump. • At least one charging pump and one SI pump running.	a. **WHEN** all conditions met, **THEN** **PERFORM** Substep 26b. ** **GO TO** Step 27.
	b. **ALIGN** Train B RHR spray: 1) **ENSURE** Train B RHR pump RUNNING. 2) **CLOSE** RHR crosstie 1-FCV-74-35. 3) **CLOSE** RHR injection 1-FCV-63-94. 4) **OPEN** RHR spray 1-FCV-72-41.	b. **IF** Train B can **NOT** be aligned, **THEN** **ALIGN** Train A RHR spray: 1) **ENSURE** Train A RHR pump RUNNING. 2) **CLOSE** RHR crosstie 1-FCV-74-33. 3) **CLOSE** RHR injection 1-FCV-63-93. 4) **OPEN** RHR spray 1-FCV-72-40.

Step	Action/Expected Response	Response Not Obtained
27.	**DETERMINE** if Intact S/Gs should be depressurized to RCS pressure:	
	a. **CHECK** RCS pressure less than Intact S/G pressures.	a. ** **GO TO** Step 28.
	b. **CHECK** S/G radiation NORMAL: • S/G discharge monitors. • S/G blowdown rad monitor recorders. • Chemistry sample of S/Gs. • RADPROT survey of main steamlines and S/G blowdown lines.	
	c. **CONSULT** TSC to determine dose projection for steaming S/Gs.	c. **WHEN** available, **CONSULT** TSC, **THEN** **PERFORM** substeps 27d and e. ** **GO TO** Step 28.
	d. **CHECK** dose projection for each S/G acceptable.	d. **DO NOT DUMP** steam from any S/G with unacceptable dose projection.
	e. **DUMP** steam to the condenser to depressurize Intact S/Gs below RCS pressure.	e. **USE** S/G PORVs to depressurize Intact S/Gs to less than RCS pressure.
28.	**CHECK** RVLIS greater than 95%.	**CONSULT** TSC for evaluation of vessel head venting.

Step	Action/Expected Response	Response Not Obtained
29.	**DETERMINE** if hydrogen recombiners should be placed in service:	
	a. **CHECK** hydrogen analyzers in service.	a. **NOTIFY** Chemistry to evaluate sampling cntmt concentration.
	b. **CHECK** cntmt hydrogen less than 5% [M-10].	b. **CONSULT** TSC to determine further action. ** **GO TO** Step 30.
	c. **CHECK** cntmt hydrogen less than 0.6% [M-10].	c. **PLACE** hydrogen recombiners in service USING SOI-83.01, Containment Hydrogen Recombiners.

Step	Action/Expected Response	Response Not Obtained
	NOTE Time since initiation of event is defined by performance of Step 3.	
30.	**PREPARE** for switchover to hot leg recirc:	
	a. **ENSURE** power restored to 1-FCV-63-22 USING Appendix C (E-1), 1-FCV-63-22 Breaker Operation.	
	b. **CHECK** transfer to cntmt sump COMPLETE.	b. ** **GO TO** Step 31.
	c. **CHECK** 3 hours has elapsed since initiation of event.	c. **WHEN** 3 hours has elapsed since initiation of event, **THEN** **PERFORM** Substep 30d. ** **GO TO** Step 31.
	d. ** **GO TO** ES-1.4, Transfer to Hot Leg Recirc.	
31.	**CONSULT** TSC for long term plant operation.	

End of Section

Appendix A
(Page 1 of 1)
CLA Breaker Operation

CLOSE the following to restore power to cold leg accumulator isolation valves:

BOARD	COMPT	NOMENCLATURE
480 V Reactor MOV Board 1A1-A	3F2	1-BKR-63-118A SIS CL ACCUM 1 OUT ISOL (1-FCV-63-118)
480 V Reactor MOV Board 1A1-A	17F2	1-BKR-63-80A SIS CL ACCUM 3 OUT ISOL (1-FCV-63-80)
480 V Reactor MOV Board 1B1-B	3F2	1-BKR-63-98A SIS CL ACCUM 2 OUT ISOL (1-FCV-63-98)
480 V Reactor MOV Board 1B1-B	16F2	1-BKR-63-67A SIS CL ACCUM 4 OUT ISOL (1-FCV-63-67)

Appendix B
(Page 1 of 1)

1-FCV-63-1 Breaker Operation

CLOSE the following to restore power to 1-FCV-63-1:

BOARD	COMPT	NOMENCLATURE
480 V Reactor MOV Board 1A1-A	2E1	1-BKR-63-1A RWST TO RHR SUCT (1-FCV-63-1)

Appendix D
(Page 1 of 1)

Equipment Evaluation

A. **EVALUATE** plant equipment and systems needed to support long term cooling and recovery actions, as time and personnel availability permits:

1. Cntmt Isolation Status.
2. Emergency Gas Treatment System: One train in operation, **REFER TO** SOI-65.02.
3. Auxiliary Building Gas Treatment: One train in operation, **REFER TO** SOI-30.06.
4. Auxiliary Building Isolation alignment: **REFER TO** SOI-30.06.
5. Main Control Room Isolation alignment: **REFER TO** SOI-31.01.
6. ERCW System: Both trains in operation.
7. Component Cooling Water System: Both trains in operation.
8. Ice Condenser System: AHUs energized after cntmt hydrogen concentration verified (if applicable). **REFER TO** SOI-61.01.
9. Permanent Hydrogen Mitigation System: Igniters de-energized when no longer needed. **REFER TO** SOI-268.01.

Foldout Page
(Page 1 of 1)

SI REINITIATION CRITERIA

Manually **START** ECCS pumps as necessary:

- Pzr level cannot be maintained greater than 15% [33% ADV], OR
- RCS subcooling less than 65°F [85°F ADV]

RCP TRIP CRITERIA

- Phase B Isolation, **OR**
- One charging pump or one SI pump injecting **AND**

  RCS press reduced uncontrolled to less than 1500 psig.

EVENT DIAGNOSTIC TRANSITIONS

- **IF** any S/G press low or dropping uncontrolled **AND**

  S/G has **NOT** been isolated,
  THEN

  ** **GO TO** E-2, Faulted Steam Generator Isolation.

- **IF** S/G radiation abnormal or S/G level rising uncontrolled,
  THEN

  START SI pumps as necessary, **AND**

  ** **GO TO** E-3, Steam Generator Tube Rupture.

SUMP RECIRC SWITCHOVER CRITERIA

- **IF** RWST level less than 34%,
  THEN

  ** **GO TO** ES-1.3, Transfer to RHR Containment Sump.

AFW OPERATION

- **IF** CST volume less than 5000 gal,
  THEN

  MONITOR AFW pumps to ensure suction transfer.

B.1.h
Establish Local Control of 1-FCV-62-93, Charging Flow Control Valve.

WATTS BAR NUCLEAR PLANT
JOB PERFORMANCE MEASURE
B.1.h
06-2011 NRC Exam

EVALUATION SHEET

Task: Establish Local Control of 1-FCV-62-93, Charging Flow Control Valve.

Alternate Path: n/a

Facility JPM #: 3-OT-JPMA010

Safety Function: 2 **Title:** Inventory Control

K/A 004 A4.08 Ability to manually operate and/or monitor in the control room: Charging

Rating(s): 3.8/3.4 **CFR:** 41/7 / 45.5 to 45.8

Evaluation Method: Simulator ________ In-Plant ____________ **Classroom** ___X___

References: SOI-62.01, CVCS - Charging and Letdown, Rev.61.

Task Number: AUO-062-SOI-62.1-006 **Title:** Operate Chemical and Volume Control System flow control valve FCV-62-93 locally.

Task Standard: The applicant has placed 1-HIC-62-93B in manual and pressurizer level has been raised to and stabilized at 60% in accordance with SOI-62.01 Section 8.5.

Validation Time: 15 minutes **Time Critical:** Yes _____ No ___X___

==

Applicant: __________________________ ________________ Time Start: ________
NAME Docket No. Time Finish: ________

Performance Rating: SAT ____ UNSAT ____ Performance Time ___

Examiner: ____________________________ ____________________________/________
NAME SIGNATURE DATE

==

COMMENTS

____

____

____

____

____

____

TOOLS/EQUIPMENT/PROCEDURES NEEDED:

Hard-hat,

Safety Glasses,

Hearing Protection

Plant Approved Shoes

Gloves

ALARA considerations

Note: Have a copy of SOI-62.01, Section 8.5 to give to each applicant.

Note: **START THIS JPM AT THE RADWASTE AUO DESK IN THE AUX BLDG,**

WATTS BAR NUCLEAR PLANT

JOB PERFORMANCE MEASURE

B.1.h

06-2011 NRC Exam

READ TO APPLICANT

DIRECTION TO APPLICANT:

I will explain the initial conditions, and state the task to be performed. All control room steps shall be performed for this JPM, including any required communications. I will provide initiating cues and reports on other actions when directed by you. Ensure you indicate to me when you understand your assigned task. To indicate that you have completed your assigned task return the cue sheet I provided you.

INITIAL CONDITIONS:

1. **Unit at 100% power.**
2. **Centrifugal Charging Pump 1A-A is in service.**
3. **Pressurizer level is being maintained by 1-FCV-62-93, but the control system is malfunctioning.**
4. **Pressurizer level is stable at 55%.**
5. **The controller for 1-FCV-62-93 is going to be repaired by Instrument Maintenance.**
6. **You are an AUO on shift.**

INITIATING CUES:

The Unit Operator has directed you to check out a radio then take local control of 1-FCV-62-93 per procedure and slowly raise the pressurizer level to 60% while maintaining radio contact with the MCR operator (Allowing the MCR operator to adjust the seal flow with 1-FCV-62-89), then return charging flow to normal.

You are to notify the Unit Operator when local flow rate has returned to normal.

STEP/STANDARD	**SAT/UNSAT**

START TIME: _______

NOTE
1-FCV-62-93, CVCS CHARGING HEADER FLOW/PZR LEVEL CONTROL, fails **OPEN** (power or air).

STEP 1: [1] **ESTABLISH** communication with UO before transfer to manual control. STANDARD: Applicant indicates that the control room must be contacted prior to the transfer of control to manual. **CUE: When notified, acknowledge the report as the Operator-at-the-Controls using repeat back.** COMMENTS:	___ SAT ___ UNSAT

STEP/STANDARD	SAT/UNSAT
STEP 2: [2] **ADJUST** 1-HIC-62-93B, CVCS CHARGING HEADER FLOW CTLR [PNL 1-L-112A, el 692], so the Red indicator (desired) and Black indicator (actual) are MATCHED. (0% is **OPEN**, 100% is **CLOSED**). STANDARD: Applicant locates 1-HIC-62-93B, 1-HIC-62-93B, CVCS CHARGING HEADER FLOW CTLR and indicates that the controller must be adjusted such that the red indicator has been matched to the black indicator on 1-HIC-62-93B. **CUE: When CHECKED indicate that the black indicator READS 34% and the red indicator reads 0%. After ADJUSTED, indicate that the red is matched with the black indicator.** **Step is critical to proper alignment for local control.** COMMENTS:	**CRITICAL STEP** ___ SAT ___ UNSAT

STEP/STANDARD	SAT/UNSAT

NOTE

XI-62-93, MANUAL CHARGING FLOW CONTROL [1-M-5], is LIT when HIC-62-93B is in MANUAL.

STEP 3: [3] **PLACE** 1-HIC-62-93B, CVCS CHARGING HEADER FLOW CTLR, in MANUAL. STANDARD: Applicant locates and indicates that the AUTO/MANUAL selector switch on 1-HIC-62-93B is to be placed in the MANUAL position. **CUE: If UO contacted, State that XI-62-93 red transfer light is illuminated.** **Step is critical to proper alignment for local control.** COMMENTS:	**CRITICAL STEP** ___ SAT ___ UNSAT

STEP/STANDARD	SAT/UNSAT

NOTE

Turning 1-HIC-62-93B clockwise reduces flow, counter-clockwise raises flow (UP is CLOSED, DOWN is OPEN on HIC).

STEP 4: [4] **ADJUST** 1-HIC-62-93B, CVCS CHARGING HEADER FLOW CTLR, to vary charging flow and to balance Charging/Letdown flow per UO. STANDARD: Applicant indicates how charging flow will be adjusted based on direction from the Unit Operator (UO). The applicant indicates that adjustment in the clockwise direction will reduce flow and adjustment in the counterclockwise direction will raise flow. Applicant either checks local indications for charging flow/pressurizer level or requests Unit Operator feedback for appropriate parameters. Note: Initial adjustment is CCW to raise level. **CUE: When UO contacted, direct the performer to slowly raise charging from 87 gpm to raise Pressurizer level.** **CUE: When checked, indicate that charging flow rising as CCW adjustment is made, or reducing as CW adjustment is made.** **Step is critical to proper control of flow path.** COMMENTS:	**CRITICAL STEP** ___ SAT ___ UNSAT

STEP/STANDARD	SAT/UNSAT
STEP 5: [5] **MONITOR** Charging flow: [5.1] 1-LI-68-335B, PRESSURIZER LEVEL [1-L-369, A6T/692]. [5.2] 1-FI-62-93B, CVCS CHARGING HEADER FLOW [1-L-112A, A5T/692]. STANDARD: Applicant monitors pressurizer level and charging flow or has requested parameters monitored in the control room. **CUE:** **When checked, or if UO has been requested to report levels/flows, inform the performer that PZR level is 60% and direct performer to slowly reduce charging flow back to 87 gpm.** **CUE:** **When checked, indicate that charging flow reducing as CW adjustment is made or rising if CCW adjustment is made and indicate flow is now 87 gpm.** COMMENTS:	___ SAT ___ UNSAT

STEP/STANDARD	**SAT/UNSAT**
STEP 6: [6] **WHEN** desired to return 1-FCV-62-93 to normal control from Control Room, **THEN** [6.1] **REQUEST** UO in Control Room to **ADJUST** 1-HIC-62-93A, CVCS CHARGING HEADER FLOW CTLR, so that the Red indicator and Black indicator are MATCHED. STANDARD: Applicant determines The MCR operator has been notified that charging flow has been returned to normal. **CUE: When notified, acknowledge the report using repeat back.** **CUE: Inform the applicant that "the Rad Waste AUO will take over & maintain charging flow per UO directions." State "This JPM has been completed." "We will stop here."** COMMENTS: **END OF TASK**	___ SAT ___ UNSAT

STOP TIME ________

APPLICANT CUE SHEET

(RETURN TO EXAMINER UPON COMPLETION OF TASK)

INITIAL CONDITIONS:

1. Unit at 100% power.
2. Centrifugal Charging Pump 1A-A is in service.
3. Pressurizer level is being maintained by 1-FCV-62-93, but the control system is malfunctioning.
4. Pressurizer level is stable at 55%.
5. The controller for 1-FCV-62-93 is going to be repaired by Instrument Maintenance.
6. You are an AUO on shift.

INITIATING CUES:

The Unit Operator has directed you to check out a radio then take local control of 1-FCV-62-93 per procedure and slowly raise the pressurizer level to 60% while maintaining radio contact with the MCR operator (Allowing the MCR operator to adjust the seal flow with 1-FCV-62-89), then return charging flow to normal.

You are to notify the Unit Operator when local flow rate has returned to normal.

TVA

Watts Bar Nuclear Plant

Unit 1

System Operating Instruction

SOI-62.01

CVCS-Charging and Letdown

Revision 0061

Quality Related

Level of Use: Continuous Use

Effective Date: 01-04-2011

Responsible Organization: OPS, Operations

Prepared By: Travis Uptegrove

Approved By: Brian McIlnay

Revision Log

Revision or Change Number	Effective Date	Affected Page Numbers	Description of Revision/Change
59	05/06/10	2, 8, 11, 12, 13, 20, 21, 23, 28, 29, 31, 33, 35, 41, 43, 44, 46, 48, 51, 55, 56-58, 61, 62, 66, 69, 73, 74, 76, 78, 79, 81, 83-87, 108, 118	Non intent. Added note to notify chemistry when bypassing Demin (PER 202910 and PCR 4214) Enhanced step to return 1-HS-62-118 to VC TK position(PCR4205) Added Greek symbol (ρ) for steps that have a direct affect on reactivity. Added new numbering format for commitments.
60	07/14/10	4, 6, 7, 11, 13, 18, 19, 20, 30, 31, 39, 46, 52, 85	Added requirements to check closing springs charged when starting or shutting down CCPs. Added Precaution FF.(PER 161559) Added 4.3[4], RP Notification. (PER 161559) Added WARNING to section 6.3 and 8.18. (PER 161559) Added RP Notification steps 6.3[1], 8.7[6], and 8.18[1]. (PER 161559) Corrected Note 3 for External Attachment 1V.(PCR 4190) Changed Excess Letdown and CCS temp. in section 8.3 to be consistent with normal range of section 6.1and below alarm setpoint. (PCR 2733) Changed to reflect the split of 1-SI-63-10-A into 1-SI-63-10.1-A and 1-SI-10.2-A.(PER 161741)
61	01/04/11	2, 10, 14, 21 ,24, 30, 33, 35, 37, 43, 45, 46, 48, 50, 53, 57, 59, 60, 64, 68, 71, 76, 78, 80, 81, 83, 85, 86-89	Minor/Editorial Change to remove blank step 10 from Section 6.2 [SR 301667][PCR 4651] [PCR 4761]. Corrected nomenclature of 1-HS-62-79A from DMNRLZR to DEMIN [PCR 4494] and corrected configuration position to P-Auto due to spring return from DEMIN position. Changed Rad Con to Radiation Protection and WO to SR/ WO Added End of Section statements.

Table of Contents

Table of Contents (continued)

ATTACHMENTS

1.0 INTRODUCTION

1.1 Purpose

To provide the instructions for operation of the Chemical and Volume Control System (CVCS).

1.2 Scope

This Instruction includes operation of the following CVCS subsystems:

A. Charging

B. Letdown

C. RCP Seal Injection

D. Chemical Addition

2.0 REFERENCES

2.1 Performance References

A. 0-PI-OPS-17.0, 18 Month Locked Valve Verification

B. 0-PI-OPS-17.1, 18 Month Locked Breaker Verification

C. 1-SI-63-10.1-A, ECCS Pump and Discharge Pipe Venting-Train A Inside Containment

D. 1-SI-63-10-B, ECCS Pumps Venting-Train B

E. 1-SI-68-33, Measurement of Controlled Leakage of the Reactor Coolant Pump Seals

F. 1-TRI-62-901, ASME Section XI Inservice System Pressure Test CVCS Inside Containment

G. GOI-7, Generic Equipment Operating Guidelines

H. SOI-62.02, Boron Concentration Control

I. SOI-62.04, CVCS Purification Systems

J. SOI-70.01, Component Cooling System (CCS)

K. SOI-74.01, Residual Heat Removal System (RHR)

L. SOI-77.01, Liquid Waste Disposal

M. SOI-77.02, Waste Gas Disposal

N. SOI-77.04, Auxiliary Building Nitrogen System

O. SOI-77.09, Auxiliary Building Hydrogen System

P. SOI-81.01, Primary Makeup Water System

Q. SOI-90.01, Radiation Monitoring System

R. SOI-235.01, 120V AC Vital Power System 1-I

S. SOI-235.03, 120V AC Vital Power System 1-III

T. SOI-235.04, 120V AC Vital Power System 1-IV

U. SOI-236.01, 125V DC Vital Battery Board I

2.1 Performance References (continued)

V. SOI-236.02, 125V DC Vital Battery Board II

W. CM-6.24, Sampling CVCS Mixed Bed Demineralizers

X. CM-5.09, Shutdown Primary Chemistry Control

Y. TI-4, Part II, Plant Curve Book, Tank Curves, Turbine Curves

Z. TI-59, Boron Tables

AA. 1-SI-63-10.2-A, ECCS Pump and Discharge Pipe Venting-Train A Outside Containment

2.2 Developmental References

A. GO-1, Plant Startup from Cold Shutdown to Hot Standby

B. GO-2, Plant Startup from Hot Standby to Minimum Load

C. GO-3, Plant Shutdown from Minimum Load to Cold Shutdown

D. 1-SI-0-8, Monitoring Component Cyclic or Transient Limits

E. N3-62-4001, Chemical and Volume Control System

F. SOI-68.01, Reactor Coolant System

G. TVA Drawings:

1. 1-45N600-62 Series
2. 45N706-1, -3
3. 45W751-1, -7
4. 45N760-62 Series
5. 45N1645-1, -2
6. 47B601-62
7. 47W809-1
8. 47W809-2
9. 47W809-9 -3, -6
10. 47W859-2

3.0 PRECAUTIONS AND LIMITATIONS

NOTE

During power changes, letdown should be maximized when possible to reduce Crud Induced Power Shift, also know as, Axial Offset Anomaly.

A. Maximum letdown flow is 120 gpm.

B. If Letdown Heat Exchanger (LDHX) outlet temperature reaches 140°F, demineralizer resin damage could occur.

C. During summer months, the lowest achievable letdown heat exchanger outlet temperature is limited by the CCS temperature, which in turn is limited by river temperature (via ERCW cooling to the CCS heat exchanger). The lowest achievable letdown heat exchanger outlet temperature is approximately 6 degrees higher than the river temperature. Attempting to operate with a letdown temperature less than 6 degrees higher than the river temperature will force 1-TCV-70-192 full open rendering 1-HIC-62-78A ineffective. Letdown temperature will then vary slightly as river temperature varies throughout the day. This causes slight changes in reactor power as boron affinity changes in the demin beds as the letdown temperature changes. Therefore, 1-HIC-62-78A, LETDOWN HX OUTLET TEMP TCV-70-192 CNTL should not be allowed to control 1-TCV-70-192 at its full open position.

D. If Reactor Coolant (RC) filter is bypassed, flow through demins should be secured or diverted to the HUT to prevent resin entering RCS if the demin resin screen fails.[C.2]

E. Charging and Letdown are in service together. If Letdown isolates or Charging is lost, the other must be isolated (see exception below). If Charging is lost and Letdown remains in service, flashing or lifting of the letdown relief could occur. If Letdown is lost and Charging remains in service, thermal shock or a positive reactivity insertion could result from cold water entering RCS.
EXCEPTION: If all the following conditions exist:

1. Any RCP Thermal Barrier Out Of Service

2. In service Charging Pump trips

3. RCP seal flow is required.
Then the Operator may immediately start an available charging pump.

F. RCP seal damage can occur if VCT press is below 15 psig with RCPs running.

3.0 PRECAUTIONS AND LIMITATIONS (continued)

G. A pneumatic relay, added to panel L-112 to limit the signal to 1-FCV-62-93, ensures 32 to 35 gpm RCP seal injection flow in the event of an Appendix R fire, by preventing valve closure. This pneumatic relay has a bypass valve on panel L-112 to allow effective flow control at low RCS pressures (i.e., heatup and cooldown).

H. Operating CCPs on miniflow for extended periods could cause pump damage due to the small amount of water being recirculated at high pressure.

I. H_2 concentration should be maintained 25 to 50 cc/kg (STP) of water when plant is at power.

J. Safety practices are required when handling hazardous chemicals. Face shields, rubber gloves, and protective clothing must be worn in preparation, handling, and sampling operations.

K. Lithium Hydroxide is a strong caustic and a strong irritant to the eyes, skin and membranes. It is also toxic by ingestion and inhalation. Precautions must be taken to prevent direct contact with or ingestion or inhalation of this chemical.

L. After each start of a CCP, ensure ACB closing spring recharges.

M. Explosive mixtures of hydrogen and oxygen in the VCT and the HUTs must be avoided at all times. The oxygen content in the tanks must **NOT** exceed 2% by volume when hydrogen concentration in the tanks exceeds 4% by volume. Nitrogen gas may be used for purging.

N. Concurrent closure of 1-ISV-62-953 and 2-ISV-62-953 is prohibited to ensure a discharge path for the VCT and BIT relief valves.

O. When operating at a minimum charging flow rate, check that the letdown flow is being cooled below 380°F. If **NOT**, raise charging and/or reduce letdown flow to lower letdown temperature.

P. After significant change in letdown and charging flow, RCP seal injection flows require checking, and adjusting if necessary.

Q. Alternating between the Alternate and Normal Charging paths should be done at cold shutdown when possible to avoid charging line transients.

R. Pressure downstream of the letdown orifices must remain high enough to preclude flashing.

S. Pressure drop across #1 seals should be checked to ensure seal injection flow is adequate and labyrinth pressure drop is normal before RCS pressure exceeds approximately 380 psig.

3.0 PRECAUTIONS AND LIMITATIONS (continued)

T. During Cold Shutdown (Mode 5), auxiliary spray is used to provide a rapid means of cooling down the pressurizer near the end of plant cooldown. During this mode of operation, charging flowrate shall be controlled to a maximum of 232 gpm to ensure auxiliary spray flowrate does **NOT** exceed 200 gpm.

U. A minimum charging flow of 15 gpm through the regenerative HX should be maintained at all times.

V. When water Solid with letdown from RHR, FCV-62-83 RHR letdown should be full **OPEN**, and RCS press controlled by PCV-62-81, LETDOWN PRESS CONTROL. The normal letdown system including all orifices must remain in service.

W. Early notification of Instrument Maintenance will ensure instruments are available to support system operations.

X. Instrument Maintenance Department should be notified to ensure required instrumentation is placed in service to support system operation.

Y. Work in Radiologically Controlled Areas (RCAs) requires the use of existing Radiation Work Permits (RWPs) and may require additional ALARA Preplans. Failure to follow posted Rad control requirements can cause unnecessary radiation exposure. Radiation Protection should be notified of work having the potential to change radiological conditions.

Z. When isolating any boron injection flow path to the core, care must be taken to ensure that the remaining available boron injection flowpaths are sufficient to meet the requirements of TR3.1.1 (Modes 4, 5, & 6), and TR3.1.2 (Modes 1, 2, & 3).[C.8]

AA. If hydrogen peroxide is to be added prior to refueling, the RCS should be borated to the refueling boron concentration as soon as possible to achieve acidic conditions by at least 400°F.

BB. If the primary system is to be opened, then Hydrazine must **NOT** be added to the RCS during any phase of unit cooldown or shutdown.

CC. Before starting idle CCPs, possible reactivity effects from dilution or boration due to water trapped in local piping must be considered, e.g., different CB at last pump run.

3.0 PRECAUTIONS AND LIMITATIONS (continued)

DD. VCT Hydrogen and Nitrogen supply pressure limit of 15-20 psi is established to provide margin associated with APP R manual operator actions. The analysis assumes this pressure range while at the low end of VCT level range (~20% level). It is anticipated that pressure may increase above 20 psi when evolutions that cause the VCT level to increase are in progress (ie. burping the VCT or during boration/dilution evolutions) as a result of the raising VCT liquid level compressing the gas volume.

EE. Steps that directly affect reactivity will be preceded with the Greek symbol (ρ).

FF. Steps within this instruction may require venting, draining or breaching radioactive components or systems to the atmosphere. Appropriate radiation protection controls must be established to prevent the spread of contamination and avoid the generation of airborne radioactivity.

Date ________ INITIALS

4.0 PREREQUISITE ACTIONS

4.1 Preliminary Actions

NOTES

1) Throughout instruction where an **IF/THEN** statement occurs, the step is **N/A** if the stated condition does **NOT** exist.
2) Signoffs/information in unused Sections may be left blank.

[1] **INDICATE Section to be performed, and reason for use.**

5.0	Startup	________	7.0	Shutdown	________
6.0	Normal Operation	________	8.0	Infrequent Operations	________

Subsection/Reason/Remarks ______________________________

____

____

4.2 Field Preparations

[1] **REVIEW** Plant procedures, processes, and programs in progress to ensure accurate configuration of components necessary for system operation. ________

[2] **ENSURE** VCT Makeup available per SOI-62.02. ________

[3] **ENSURE** N_2 available to VCT per SOI-77.04. ________

[4] **ENSURE** H_2 available to VCT per SOI-77.09. ________

[5] **ENSURE** Waste Gas Vent Header in service (or available) per SOI-77.02. ________

[6] **ENSURE** Liquid Waste System in service (or available) per SOI-77.01. ________

[7] **ENSURE** CCS in service (or available) per SOI-70.01. ________

Date ________ **INITIALS**

8.5 Local Control of 1-FCV-62-93, CHARGING HEADER FLOW

NOTE

1-FCV-62-93, CVCS CHARGING HEADER FLOW/PZR LEVEL CONTROL, fails **OPEN** (power or air).

[1] **ESTABLISH** communication with UO before transfer to manual control. ________

[2] **ADJUST** 1-HIC-62-93B, CVCS CHARGING HEADER FLOW CTLR [PNL 1-L-112A, el 692], so the Red indicator (desired) and Black indicator (actual) are MATCHED. (0% is **OPEN**, 100% is **CLOSED**). ________

NOTE

XI-62-93, MANUAL CHARGING FLOW CONTROL [1-M-5], is LIT when HIC-62-93B is in MANUAL.

[3] **PLACE** 1-HIC-62-93B, CVCS CHARGING HEADER FLOW CTLR, in MANUAL. ________

NOTE

Turning 1-HIC-62-93B clockwise reduces flow, counter-clockwise raises flow (UP is **CLOSED**, **DOWN** is **OPEN** on HIC).

[4] **ADJUST** 1-HIC-62-93B, CVCS CHARGING HEADER FLOW CTLR, to vary charging flow and to balance Charging/Letdown flow per UO. ________

Date ________ INITIALS

8.5 Local Control of 1-FCV-62-93, CHARGING HEADER FLOW (continued)

[5] **MONITOR** Charging flow:

[5.1] 1-LI-68-335B, PRESSURIZER LEVEL [1-L-369, A6T/692]. ________

[5.2] 1-FI-62-93B, CVCS CHARGING HEADER FLOW [1-L-112A, A5T/692]. ________

[6] **WHEN** desired to return 1-FCV-62-93 to normal control from Control Room, **THEN** ________

[6.1] **REQUEST** UO in Control Room to **ADJUST** 1-HIC-62-93A, CVCS CHARGING HEADER FLOW CTLR, so that the Red indicator and Black indicator are MATCHED. ________

NOTE
XI-62-93, MANUAL CHARGING FLOW CONTROL [1-M-5], is LIT when HIC-62-93B is in MANUAL.

[6.2] **PLACE** 1-HIC-62-93B, CVCS CHARGING HEADER FLOW CTLR, in AUTO and **REQUEST** UO to CHECK control of 1-FCV-62-93 from Control Room. ________

[6.3] **ADJUST** 1-HIC-62-93B Red indicator to “0” position. ________

End of Section

B.1.i
Operate SG 1 Power Operated Relief Valve Locally with Nitrogen

WATTS BAR NUCLEAR PLANT
JOB PERFORMANCE MEASURE
B.1.i
06-2011 NRC Exam
EVALUATION SHEET

Task: Operate SG 1 Power Operated Relief Valve Locally with Nitrogen

Alternate Path: The initial nitrogen bottle placed in service has a lower pressure than the criteria provided in SOI-1.01, "Main Steam System," requiring additional actions to place another nitrogen bottle in service.

Facility JPM #: 3-OT-JPMA045C

Safety Function: 8 **Title:** Plant Systems

K/A 068 AA1.01 Ability to operate and / or monitor the following as they apply to the Control Room Evacuation: S/G atmospheric relief valve

Rating(s): 4.3/4.5 **CFR:** 41.7 / 45.5 / 45.6

Evaluation Method: Simulator ________ In-Plant ____X____ **Classroom** __________

References: SOI-1.01, "Main Steam System," Rev. 40

Task Number: AUO-001-SOI-1.01-008 **Title:** Perform local operations of a Steam Generator PORV with Emergency Control Station (Nitrogen available).

Task Standard: The #1 S/G PORV has been opened per Unit Operators instructions using the local controller per SOI-1.01 Section 8.2.3

Validation Time: 20 minutes **Time Critical:** Yes ______ No __X__

===

Applicant: ________________________ ________________ Time Start: ________
NAME Docket No. Time Finish: ________

Performance Rating: SAT ____ UNSAT ____ Performance Time ___

Examiner: ________________________ ________________________/________
NAME SIGNATURE DATE

===

COMMENTS

____

____

____

____

____

____

Tools/Equipment/Procedures Needed:

Hard Hat, Safety Glasses, Hearing Protection, Gloves and Plant Approved Shoes

SOI-1.01 latest revision

SAFETY CONSIDERATIONS:

Hot pipes, high noise, and heat.

NOTE: **Start this JPM at the Rad Waste AUO desk.**

READ TO APPLICANT

DIRECTION TO APPLICANT:

I will explain the initial conditions, and state the task to be performed. All control room steps shall be performed for this JPM, including any required communications. I will provide initiating cues and reports on other actions when directed by you. Ensure you indicate to me when you understand your assigned task. To indicate that you have completed your assigned task return the cue sheet I provided you.

INITIAL CONDITIONS:

1. **The unit has been manually tripped due to smoke in the MCR.**
2. **The MSIVs have been closed.**
3. **The Unit Operator was unable to get the Steam Generator (SG) 1 Power Operated Relief Valve (PORV) open from the MCR.**
4. **The Main Control Room has been abandoned.**
5. **You are an AUO on shift.**

INITIATING CUES:

The Unit Operator has dispatched you to the local N_2 Control Station for #1 S/G PORV with instructions to use the local N_2 station per SOI-1.01 section 8.2.3 to throttle the valve (1-PCV-1-5) per Unit Operators instructions.

The Unit Operator has directed you to establish radio communications with the Aux. Control Room. You are to notify the UO when you have completed the appropriate procedure for opening #1 S/G PORV per the Unit Operators instructions

STEP/STANDARD	SAT/UNSAT

START TIME: _______

STEP 1: Obtain a copy of the procedure. STANDARD: Applicant locates and obtains a copy of SOI-1.01, Section 8.2.3 **CUE: After the performer has demonstrated the method of obtaining the correct instruction, the evaluator can provide a copy of the instruction.** COMMENTS:	___ SAT ___ UNSAT

NOTES

1) Coordination between Operators at AFW pumps, SG PORV N2 Stations, and the AFW LCV isol valves may be required to control plant cooldown.
2) TIR 14.10.j. of the Fire Protection Report requires nitrogen pressure to be ≥ 1200 psig (1100 psig + 100 psig for instrument inaccuracy).

STEP 2: [1] **ENSURE** communications with UO established BEFORE local SG PORV manipulation. STANDARD: Applicant demonstrates that Radio Communication with the Aux. Control Room has been established. **CUE: Acknowledge that operator is proceeding with Section 8.2.3 to locally operate S/G #1 PORV using the N_2 Station** COMMENTS:	___ SAT ___ UNSAT

STEP/STANDARD	SAT/UNSAT
NOTE Only ONE N2 cylinder should be valved into service per SG PORV.	
STEP 3: [2] **ENSURE** ONE N2 cylinder valve for each Applicable SG PORV is OPEN: [2.1] 1-TANK-1-404A (SG 1 TANK A), or 1-TANK-1-404B (SG 1 TANK B) [737 o/s SVR] [2.2] 1-TANK-1-400A (SG 2 TANK A), or 1-TANK-1-400B (SG 2 TANK B) [737 o/s SVR] [2.3] 1-TANK-1-403A (SG 3 TANK A), or 1-TANK-1-403B (SG 3 TANK B) [AEB/729] [2.4] 1-TANK-1-402A (SG 4 TANK A), or 1-TANK-1-402B (SG 4 TANK B)[AEB/729] STANDARD: Applicant locates and demonstrates how to place one N_2 Cylinder in service by opening a cylinder valve on either SG 1 Tank A or Tank B by turning selected valve counter clockwise. **CUE: Valve rotates several turns CCW and then stops.** **This step is critical to supply nitrogen to operate PORV.** COMMENTS:	**CRITICAL STEP** ___ SAT ___ UNSAT

STEP/STANDARD	SAT/UNSAT
STEP 4: [3] **ENSURE** cylinder pressure greater than 1200 psig for N2 cylinders used in Step:8.2.3[2] [3.1] 1-PI-1-404A (SG 1 TANK A), or 1-PI-1-404B (SG 1 TANK B). [3.2] 1-PI-1-400A (SG 2 TANK A), or 1-PI-1-400B (SG 2 TANK B). [3.3] 1-PI-1-403A (SG 3 TANK A), or 1-PI-1-403B (SG 3 TANK B). [3.4] 1-PI-1-402A (SG 4 TANK A), or 1-PI-1-402B (SG 4 TANK B). STANDARD: Applicant ensures that either 1-PI-1-404A SG 1 TANK A, or 1-PI-1-404B SG 1 TANK B (the cylinder selected in the previous step) is indicating >1200 psig. **CUE: When asked indicate that the gage for the cylinder selected in JPM Step 3 reads 900 psig.** After the applicant is aware of the low pressure condition, the applicant isolates cylinder placed in service on previous step and places the remaining cylinder in service. **CUE: When asked indicate that the gage for the cylinder just placed in service reads 2100 psig.** ***NOTE TO EXAMINER: Note which bottle placed in service, as this will determine subsequent valves that will be used, to enable appropriate cues to be given.*** **This step is critical to enable nitrogen pressure sufficient to operate PORV.** COMMENTS:	**CRITICAL STEP** ___ SAT ___ UNSAT

STEP/STANDARD	SAT/UNSAT
STEP 5: [4] **CLOSE** appropriate PORV N2 vent isolation: [4.1] 1-VTIV-1-5D, SG 1 (1-PCV-1-5) N2 Vent [4.2] 1-VTIV-1-12D, SG 2 (1-PCV-1-12) N2 Vent [4.3] 1-VTIV-1-23D, SG 3 (1-PCV-1-23) N2 Vent [4.4] 1-VTIV-1-30D, SG 4 (1-PCV-1-30) N2 Vent STANDARD: Applicant locates and demonstrates how to close 1-VTIV-1-5D, SG1 (1-PCV-1-5) N_2 Vent by rotating the handwheel in the clockwise direction. **CUE: Valve handwheel rotates several turns clockwise and then gets snug.** **This step is critical to enable nitrogen pressure sufficient to operate PORV.** COMMENTS:	**CRITICAL STEP** ___ SAT ___ UNSAT

STEP/STANDARD	SAT/UNSAT
STEP 6: [5] **OPEN** N2 supply isolation valve for N2 cylinders used in Step:8.2.3[2] [5.1] 1-ISIV-1-404A, (SG 1 TANK A) or 1-ISIV-1-404B, (SG 1 TANK B). [5.2] 1-ISIV-1-400A, (SG 2 TANK A) or 1-ISIV-1-400B, (SG 2 TANK B). [5.3] 1-ISIV-1-403A, (SG 3 TANK A) or 1-ISIV-1-403B, (SG 3 TANK B). [5.4] 1-ISIV-1-402A, (SG 4 TANK A) or 1-ISIV-1-402B, (SG 4 TANK B). STANDARD: Applicant demonstrates how to open **ONE** N_2 supply isolation valve 1-ISIV-1-404A or 1-ISIV-1-404B for the cylinder placed in service in JPM STEP 3 by turning the valve counter clockwise to open. **CUE: Valve handwheel rotates several turns Counter Clockwise and then gets snug.** **This step is critical to supply nitrogen to operate PORV.** COMMENTS:	**CRITICAL STEP** ___ SAT ___ UNSAT

STEP/STANDARD	SAT/UNSAT
STEP 7: [6] **ENSURE** pressure regulator bottom selector knob is pointing to N2 cylinders selected in Step 8.2.3[2]. [6.1] 1-SPV-1-404, SG 1 (1-PI-1-404D) [6.2] 1-SPV-1-400, SG 2 (1-PI-1-400D) [6.3] 1-SPV-1-403, SG 3 (1-PI-1-403D) [6.4] 1-SPV-1-402, SG 4 (1-PI-1-402D) STANDARD: Applicant ensures that pressure regulator 1-SPV-1-404 bottom selector knob is selected to cylinder chosen in step [2]. **CUE: If checked initially state that valve is pointing away from regulator (or supply line chosen in JPM step 3). After valve is rotated, state that valve points to regulator (or supply line chosen in JPM step 3).** **This step is critical to supply nitrogen to operate PORV.** COMMENTS:	**CRITICAL STEP** ___ SAT ___ UNSAT

STEP/STANDARD	SAT/UNSAT
STEP 8: [7] **ENSURE** the following pressure regulators top selector knobs are set to provide 85 to 95 psig: [7.1] 1-PREG-1-404, SG 1 (1-PI-1-404D) [7.2] 1-PREG-1-400, SG 2 (1-PI-1-400D) [7.3] 1-PREG-1-403, SG 3 (1-PI-1-403D) [7.4] 1-PREG-1-402, SG 4 (1-PI-1-402D) STANDARD: Applicant locates 1-PI-1-404D and ensures that pressure is ≥85 to ≤95 psig. **CUE: Pressure indicates 90 psig.** COMMENTS:	___ SAT ___ UNSAT

STEP/STANDARD	SAT/UNSAT
STEP 9: [8] **ENSURE** the following regulators are set to zero by ensuring the locking screw on top of the adjustment knob is loose AND turning the adjustment knob fully counter-clockwise. [8.1] 1-PREG-1-5B, SG 1, [PNL-1-L-737] [8.2] 1-PREG-1-12B, SG 2, [PNL-1-L-738] [8.3] 1-PREG-1-23B, SG 3, [PNL-1-L-256] [8.4] 1-PREG-1-30B, SG 4, [PNL-1-L-236] STANDARD: Applicant locates 1-PREG-1-5B and determines locking screw is loose and regulator adjustment knob is fully counter-clockwise. **CUE: The adjustment screw is finger tight.** COMMENTS:	___ SAT ___ UNSAT

STEP/STANDARD	SAT/UNSAT
STEP 10: [9] **OPEN** the following N2 supply isolation valves (downstream of PREG): [9.1] 1-ISIV-1-404EI (SG 1) [9.2] 1-ISIV-1-404E2 (SG 1) [9.3] 1-ISIV-1-400EI (SG 2) [9.4] 1-ISIV-1-400E2 (SG 2) [9.5] 1-ISIV-1-403EI (SG 3) [9.6] 1-ISIV-1-403E2 (SG 3) [9.7] 1-ISIV-1-402EI (SG 4) [9.8] 1-ISIV-1-402E2 (SG 4) STANDARD: Applicant locates 1-ISIV-1-404E1 and 404E2 and then demonstrates how to open the valves (by rotating valve hand wheel counter clock wise.) **CUE: If checked initially state that valve is "IN". After valve is rotated counter-clockwise, state that valve hand wheel rotated several turns in the CCW direction and got snug.** **This step is critical to supply nitrogen to operate PORV.** COMMENTS:	**CRITICAL STEP** ___ SAT ___ UNSAT

STEP/STANDARD	SAT/UNSAT

NOTES

1) PORVs may be manipulated locally by turning PREG adjustment knob. Clockwise raises N2 pressure to OPEN the PORV. Counter-clockwise (CCW) lowers N2 pressure to CLOSE the PORV. These regulators also contain an internal relief valve feature. It is intended to provide a more uniform controlled pressure and to permit adjusting the outlet pressure downward without venting the line. It is not intended as an overpressure relief device.
2) When changing output from a higher to a lower pressure, initially go to lower than desired pressure, then increase to the desired pressure.
3) Since the locking screw on top of 1-PREG-1-5B, -12B, 23B, and 30B is not required to lock in a pressure, the screw is not required to be tightened, but must be installed to keep the adjusting knob in place and loose enough to allow movement of adjusting knob.

STEP/STANDARD	SAT/UNSAT
STEP 11: [10] **ADJUST** the following PREGs as required to position selected SG PORVs per Unit Operator's instruction: [10.1] 1-PREG-1-5B, (SG 1)[PNL-1-L-737, 737 o/s SVR] (observe 1-PI-1-5A, MAIN STEAM LOOP 1 PORV N2 SUP PRESS). [10.2] 1-PREG-1-12B, (SG 2)[PNL-1-L-738, 737 o/s SVR] (observe 1-PI-1-12A, MAIN STEAM LOOP 2 PORV N2 SUP PRESS). [10.3] 1-PREG-1-23B, (SG 3)[PNL-1-L-256, AEB/729] (observe 1-PI-1-23A, MAIN STEAM LOOP 3 PORV N2 SUP PRESS). [10.4] 1-PREG-1-30B, (SG 4)[PNL-1-L-256, 729 AEB] (observe 1-PI-1-30A, MAIN STEAM LOOP 4 PORV N2 SUP PRESS). STANDARD: Applicant places Performer operates the 1-PREG-5B adjusting screw clockwise to open SG 1 PORV per Unit Operator direction. Applicant may contact the Unit Operator to determine if the SG PORV is in the correct position. CUE: **1-PI-1-5A reads 0 psig. After clockwise adjustment of 1-PREG-1-5B, indicate that gage pressure is rising.** CUE: **If contacted as the Unit Operator, acknowledge report and state that #1 S/G PORV is open sufficiently for present plant conditions. Another person will be contacted if further adjustments are necessary.** **This step is critical to supply nitrogen to operate PORV.** COMMENTS:	**CRITICAL STEP** ___ SAT ___ UNSAT

STEP/STANDARD	SAT/UNSAT
STEP 12: Notify the Unit Supervisor that SG 1 PORV is now open and properly adjusted. STANDARD: Applicant reports that nitrogen has been aligned to SG 1 PORV and the PORV is now open. **CUE: Repeat back report.** COMMENTS: **END OF TASK**	___ SAT ___ UNSAT

STOP TIME ________

APPLICANT CUE SHEET

(RETURN TO EXAMINER UPON COMPLETION OF TASK)

INITIAL CONDITIONS:

1. The unit has been manually tripped due to smoke in the MCR.
2. The MSIVs have been closed.
3. The Unit Operator was unable to get the #1 S/G PORV open from the MCR.
4. The Main Control Room has been abandoned.
5. You are an AUO on shift.

INITIATING CUES:

The Unit Operator has dispatched you to the local N_2 Control Station for #1 S/G PORV with instructions to use the local N_2 station per SOI-1.01 section 8.2.3 to throttle the valve (1-PCV-1-5) per Unit Operators instructions.

The Unit Operator has directed you to establish radio communications with the Aux. Control Room. You are to notify the UO when you have completed the appropriate procedure for opening #1 S/G PORV per the Unit Operators instructions

TVA

Watts Bar Nuclear Plant

Unit 1

System Operating Instruction

SOI-1.01

Main Steam System

Revision 0040

Quality Related

Level of Use: Continuous Use

Effective Date: 04-18-2008

Responsible Organization: OPS, Operations

Prepared By: A. K. Keefer

Approved By: Scot Newell

Revision Log

Revision or Change Number	Effective Date	Affected Page Numbers	Description of Revision/Change
36	07/08/04	2, 81	Non-intent. Revised to add Concurrent Verification requirements (PER 03-012913-000).
UC-1		2, 78-80	Correct typos in Section 8.7[6], [8], [9].
37	09/25/06	All 2, 6, 11, 32, 59, 77, 90-93, 94, 98	This procedure has been converted from W95 to Word 2002 (XP) using rev 36 by Lorie Dake Changed "Verify" to "Check" or "Ensure". Deleted reference to wet layup recirc per DCN 51724. Deleted main steam vents and press test valves no longer being used per DCN 51730. Add new root valves per DCN 51753. Add new air valves for MS stop valves per DCN 51935. Incorporated UC-1 of SOI-1.01.
38	10/17/06	53, 54, 58, 66	Revised step 8.2.3 [8], notes before [10], and [12.4] with new guidance related to generic substitution of regulator PER 11890
39	03/09/07	31	Low Steamline press rate time constant when P-11 is blocked was changed from 5 Seconds to 50 seconds. PER 112938.
40	04/18/08	2, 51, 58, 85, 133	Changed nitrogen pressure for S/G PORVs from 1650 psig to 1200 psig. This is in accordance with FPR and system description pressure. Deleted duplicate valves in checklist 2 for S/G #2.

Table of Contents

Table of Contents (continued)

1.0 INTRODUCTION

1.1 Purpose

To provide instructions for operation of the Main Steam System (MSS).

1.2 Scope

This Instruction includes the following MSS operations:

A. Startup (MSIVs and Warming Valves Closed)

B. Maintaining Hot Standby
   1. MSIVs Open
   2. MSIVs and Warming Valves Closed

C. Local Operation of PORVs

D. Addition and Removal of N_2 for SGs

2.0 REFERENCES

2.1 Performance References

A. GO-3, “Unit Startup from less than 4% Reactor Power to 30% Reactor Power”

B. 0-PI-OPS-17.0, “18 Month Locked Valve Verification”

C. SOI-1.02, “Steam Dump System”

D. SOI-1.04, “Moisture Separator Reheaters”

E. SOI-2&3.01, “Condensate and Feedwater System”

F. SOI-3.02, “Auxiliary Feedwater System”

G. SOI-5&6.01, “Extraction Steam, Heater Drains, and Vent System”

H. SOI-7.01, “Turbine Extraction Traps and Drains System”

I. SOI-15.01, “Steam Generator Blowdown System”

J. SOI-27.01, “Condenser Circulating Water System”

K. SOI-37.01, “Gland Seal System”

L. SOI-47.01, “Main Turbine Turning Gear Operation”

M. SOI-47.02, “Turbo-Generator Startup Operation”

N. SOI-47.03, “Main Turbine Steam Seal System”

O. SOI-77.01, “Liquid Waste Disposal”

P. SOI-77.04, “Auxiliary Building Nitrogen and Hydrogen Systems”

Q. SOI-235 Series, “120V AC Vital Power System”

R. SOI-236 Series, “125V DC Vital Battery Boards”

2.2 Developmental References

A. N3-1-4002,'System Description for Main Steam System"

B. Tech Spec 3.4.2

C. TVA Drawings

1. 45W600-1-2, -3, -4, -5, -6, -7 & -8
2. 45W600-7
3. 45W600-30-12
4. 45W600-47-7
5. 45W600-57-2, -3, -22, & -26
6. 45W703-1, -2
7. 45W706-4
8. 45W708-4
9. 45W600-46-6
10. 45W760-1-1, -2, -3, & -4
11. 47W600-221A, -221B
12. 47W801-1
13. 47W803-2
14. 47W807-1

D. Vendors Manual: WBN-VTM-C635-0010, Vendor Technical Manual for Copes-Vulcan Valves and Actuators, Contract #83081

E. Fire Protection Report, Fire Protection Plan, Part II

3.0 PRECAUTIONS AND LIMITATIONS

A. Before warming steam lines, ALL Throttle, Governor, Stop, and Intercept valves must be CLOSED, and Main Turbine tripped.

B. Before pressurizing Main Steam lines up to the Throttle Valves, turbine must be on Turning Gear (except momentary stops) to avoid turbine shaft bowing.

C. Before admitting steam to Turbine, Turbine Inlet Steam Temp must be within 100°F of SG Saturation Temp to ensure steam lines are warmed.

D. Until Reactor Coolant System (RCS) Temp is greater than 400°F, steam must **NOT** be drawn from SGs to Main Turbine, MFPTs, or TD AFW Pump.

E. Steam Dumps and PORVs may be used for drawing steam from SGs, as necessary by UO. Extreme care in Steam Dump & PORV operation must be used to prevent excessive temp excursions or inadvertent mode change.

F. Steam must **NOT** be used to raise Turbine Speed above 600 rpm until RCS Temp is raised to 557°F.

G. Steam may be used at any RCS Temp to warm lines and for sealing Main and MFP Turbines, provided it is drawn slowly so as **NOT** to cause sudden RCS Temp reduction.

H. Primary-to-Secondary ΔP should **NOT** exceed 1600 psid.

I. Turbine Exhaust Shell Temps will be checked periodically.

J. Main Steam piping Heatup Rate should **NOT** exceed 100°F/hr and must **NOT** exceed 200°F/hr.

K. If necessary to initially **OPEN** MSIVs after RCS greater than 212°F, caution must be used to prevent causing excessive RCS cooldown (e.g., RCS cooldown rate, steam line isolation, or minimum temp for Rx criticality, depending on RCS temp). Before opening MSIV Bypasses to warm steamlines and equalize MSIV ΔP, there must be adequate decay/RCP heat available, OR Rx critical and capable of producing power to replace heat removed by opening MSIV Bypasses.

3.0 **PRECAUTIONS AND LIMITATIONS (continued)**

L. Opening MSIVs with greater than 25 psid across them could cause a water hammer in the steam lines, or a negative rate SI or Steam Line Isolation.

M. SG PORV manual handwheel is reverse action (clockwise to open).

N. When indication of water is entering Main Turbine, Unit should be tripped.

O. Damage may occur to Main Turbine if main steam drains are **NOT** opened immediately upon turbine trip. On startup, they remain open until there is no chance unacceptable amounts of water will enter Main Turbine.

P. Instrument Maintenance (MIG) should be notified to ensure required instruments are placed in service as necessary to support system operation.

Q. Work in Radiologically Controlled Area (RCA) requires the use of existing RWPs, and may require additional ALARA Preplans. Failure to follow posted Rad control requirements can cause unnecessary radiation exposure. Rad Con should be notified of work having the potential to change radiological conditions.

Date________ Initials_____

4.0 PREREQUISITE ACTIONS

NOTES

1) Throughout Instruction where **IF/THEN** exists, the step is **N/A** if stated condition does **NOT** exist.

2) Signoffs/information in unused Sections may be left blank.

4.1 Preliminary Actions

[1] **INDICATE** below which performance section will be used and the reason for the performance. ________

5.0	Startup	________	7.0	Shutdown	________
6.0	Normal Operation	N/A	8.0	Infrequent Operations	________

Section/ Reason/ Remarks: ______________________________

____

____

____

4.2 Field Preparations

[1] **REVIEW** Plant procedures, processes, and programs in progress to ensure accurate configuration of components necessary for System operation. ________

[2] **ENSURE** CCW System available to Condenser (ref SOI-27.01). ________

[3] **ENSURE** Gland Seal Water System available (ref SOI-37.01). ________

[4] **ENSURE** Main Turbine on Turning Gear (ref SOI-47.01). ________

[5] **ENSURE** Turbine Steam Seal System available and vacuum of least 25″ Hg (2.5 psia) in Condenser (ref SOI-47.03). ________

[6] **ENSURE** SG levels established in the normal range and Condensate and Feedwater available (ref SOI-2.0 & 3.01). ________

Date________ Initials_____

4.2 Field Preparations (continued)

[7] **ENSURE** SG Blowdown Flash Tank available to receive Main Steam trap drains per SOI-15.01. ________

> **NOTE**
>
> The following step will isolate SGBD. If SGBD is in service, then Step 4.2[8] is **N/A**.

[8] **ENSURE** the SG Blowdown isolation valves are closed, using the following handswitches: ________

[8.1] 1-HS-1-7/81 ☐

[8.2] 1-HS-1-14/182 ☐

[8.3] 1-HS-1-25/183 ☐

[8.4] 1-HS-1-32/184 ☐

[9] **ENSURE** Floor Drain Collector Tank is available with capacity to receive MSIV steam trap drains per SOI-77.01. ________

[10] **ENSURE** Steam trap drains upstream of 1-FCV-1-51-S & -52, AUX FEEDWATER PUMP TURBINE STP & GOV VLVs, are available per SOI-3.02. ________

[11] **ENSURE** 125Vdc Vital Batt Bds available per SOI-236.01 thru 236.04. ________

[12] **ENSURE** 120Vac Vital Power Systems available per SOI-235.01 thru 235.04. ________

[13] **IF** a SG's MSIV is CLOSED**, THEN**

ENSURE the PORV for that SG is OPERABLE. ________

[14] **REVIEW** anticipated sections for necessary WO preparation. ________

4.3 Approvals and Notifications

[1] **COORDINATE** system operations/manipulations with UO. ________

Date________ Initials_____

8.2.3 Local Operation with Emergency Control Station (N_2 available)

NOTES

1) Coordination between Operators at AFW pumps, SG PORV N_2 Stations, and the AFW LCV isol valves may be required to control plant cooldown.
2) TIR 14.10.j. of the Fire Protection Report requires nitrogen pressure to be ≥ 1200 psig (1100 psig + 100 psig for instrument inaccuracy).

[1] **ENSURE** communications with UO established BEFORE local SG PORV manipulation. ________

NOTE

Only ONE N_2 cylinder should be valved into service per SG PORV.

[2] **ENSURE** ONE N_2 cylinder valve for each Applicable SG PORV is OPEN:

[2.1] 1-TANK-1-404A (SG 1 TANK A), or
1-TANK-1-404B (SG 1 TANK B) [737 o/s SVR] ________

[2.2] 1-TANK-1-400A (SG 2 TANK A), or
1-TANK-1-400B (SG 2 TANK B) [737 o/s SVR] ________

[2.3] 1-TANK-1-403A (SG 3 TANK A), or
1-TANK-1-403B (SG 3 TANK B) [AEB/729] ________

[2.4] 1-TANK-1-402A (SG 4 TANK A), or
1-TANK-1-402B (SG 4 TANK B)[AEB/729] ________

[3] **ENSURE** cylinder pressure greater than 1200 psig for N_2 cylinders used in Step:8.2.3[2]

[3.1] 1-PI-1-404A (SG 1 TANK A), or
1-PI-1-404B (SG 1 TANK B). ________

[3.2] 1-PI-1-400A (SG 2 TANK A), or
1-PI-1-400B (SG 2 TANK B). ________

[3.3] 1-PI-1-403A (SG 3 TANK A), or
1-PI-1-403B (SG 3 TANK B). ________

[3.4] 1-PI-1-402A (SG 4 TANK A), or
1-PI-1-402B (SG 4 TANK B). ________

Date________ Initials_____

8.2.3 Local Operation with Emergency Control Station (N_2 available) (continued)

[4] **CLOSE** appropriate PORV N_2 vent isolation:

[4.1] 1-VTIV-1-5D, SG 1 (1-PCV-1-5) N_2 Vent ________

[4.2] 1-VTIV-1-12D, SG 2 (1-PCV-1-12)N_2 Vent ________

[4.3] 1-VTIV-1-23D, SG 3 (1-PCV-1-23) N_2 Vent ________

[4.4] 1-VTIV-1-30D, SG 4 (1-PCV-1-30) N_2 Vent ________

[5] **OPEN** N2 supply isolation valve for N_2 cylinders used in Step:8.2.3[2]

[5.1] 1-ISIV-1-404A, (SG 1 TANK A) or 1-ISIV-1-404B, (SG 1 TANK B). ________

[5.2] 1-ISIV-1-400A, (SG 2 TANK A) or 1-ISIV-1-400B, (SG 2 TANK B). ________

[5.3] 1-ISIV-1-403A, (SG 3 TANK A) or 1-ISIV-1-403B, (SG 3 TANK B). ________

[5.4] 1-ISIV-1-402A, (SG 4 TANK A) or 1-ISIV-1-402B, (SG 4 TANK B). ________

[6] **ENSURE** pressure regulator bottom selector knob is pointing to N_2 cylinders selected in Step 8.2.3[2].

[6.1] 1-SPV-1-404, SG 1 (1-PI-1-404D) ________

[6.2] 1-SPV-1-400, SG 2 (1-PI-1-400D) ________

[6.3] 1-SPV-1-403, SG 3 (1-PI-1-403D) ________

[6.4] 1-SPV-1-402, SG 4 (1-PI-1-402D) ________

[7] **ENSURE** the following pressure regulators top selector knobs are set to provide 85 to 95 psig:

[7.1] 1-PREG-1-404, SG 1 (1-PI-1-404D) ________

[7.2] 1-PREG-1-400, SG 2 (1-PI-1-400D) ________

[7.3] 1-PREG-1-403, SG 3 (1-PI-1-403D) ________

[7.4] 1-PREG-1-402, SG 4 (1-PI-1-402D) ________

Date________ Initials_____

8.2.3 Local Operation with Emergency Control Station (N_2 available) (continued)

[8] **ENSURE** the following regulators are set to zero by ensuring the locking screw on top of the adjustment knob is loose AND turning the adjustment knob fully counter-clockwise.

[8.1] 1-PREG-1-5B, SG 1, [PNL-1-L-737] ________

[8.2] 1-PREG-1-12B, SG 2, [PNL-1-L-738] ________

[8.3] 1-PREG-1-23B, SG 3, [PNL-1-L-256] ________

[8.4] 1-PREG-1-30B, SG 4, [PNL-1-L-236] ________

[9] **OPEN** the following N_2 supply isolation valves (downstream of PREG):

[9.1] 1-ISIV-1-404El (SG 1) ________

[9.2] 1-ISIV-1-404E2 (SG 1) ________

[9.3] 1-ISIV-1-400El (SG 2) ________

[9.4] 1-ISIV-1-400E2 (SG 2) ________

[9.5] 1-ISIV-1-403El (SG 3) ________

[9.6] 1-ISIV-1-403E2 (SG 3) ________

[9.7] 1-ISIV-1-402El (SG 4) ________

[9.8] 1-ISIV-1-402E2 (SG 4) ________

Date________ Initials_____

8.2.3 Local Operation with Emergency Control Station (N_2 available) (continued)

NOTES

1) PORVs may be manipulated locally by turning PREG adjustment knob. Clockwise raises N_2 pressure to OPEN the PORV. Counter-clockwise (CCW) lowers N_2 pressure to CLOSE the PORV. These regulators also contain an internal relief valve feature. It is intended to provide a more uniform controlled pressure and to permit adjusting the outlet pressure downward without venting the line. It is not intended as an overpressure relief device.

2) When changing output from a higher to a lower pressure, initially go to lower than desired pressure, then increase to the desired pressure.

3) Since the locking screw on top of 1-PREG-1-5B, -12B, 23B, and 30B is not required to lock in a pressure, the screw is not required to be tightened, but must be installed to keep the adjusting knob in place and loose enough to allow movement of adjusting knob.

[10] **ADJUST** the following PREGs as required to position selected SG PORVs per Unit Operator's instruction:

[10.1] 1-PREG-1-5B, (SG 1)[PNL-1-L-737, 737 o/s SVR] (observe 1-PI-1-5A, MAIN STEAM LOOP 1 PORV N2 SUP PRESS). ________

[10.2] 1-PREG-1-12B, (SG 2)[PNL-1-L-738, 737 o/s SVR] (observe 1-PI-1-12A, MAIN STEAM LOOP 2 PORV N2 SUP PRESS). ________

[10.3] 1-PREG-1-23B, (SG 3)[PNL-1-L-256, AEB/729] (observe 1-PI-1-23A, MAIN STEAM LOOP 3 PORV N2 SUP PRESS). ________

[10.4] 1-PREG-1-30B, (SG 4)[PNL-1-L-256, 729 AEB] (observe 1-PI-1-30A, MAIN STEAM LOOP 4 PORV N2 SUP PRESS). ________

[11] **IF** in-service N_2 Cylinder pressure fails LOW, **THEN**

PERFORM Appendix D to place a spare cylinder in service. ________

Date_________ Initials_____

8.2.3 **Local Operation with Emergency Control Station (N_2 available) (continued)**

[12] **WHEN** use of N_2 for local SG PORV control is complete, **THEN**

[12.1] **ENSURE** the following N_2 supply isolation valves are CLOSED:

- 1-ISIV-1-404A, (SG 1) _______ _______ IV
- 1-ISIV-1-404B, (SG 1 _______ _______ IV
- 1-ISIV-1-400A, (SG 2) _______ _______ IV
- 1-ISIV-1-400B, (SG 2) _______ _______ IV
- 1-ISIV-1-403A, (SG 3) _______ _______ IV
- 1-ISIV-1-403B, (SG 3) _______ _______ IV
- 1-ISIV-1-402A, (SG 4) _______ _______ IV
- 1-ISIV-1-402B, (SG 4) _______ _______ IV

Date_________ Initials_____

8.2.3 **Local Operation with Emergency Control Station (N_2 available) (continued)**

[12.2] **ENSURE** the following Nitrogen cylinder valves are CLOSED:

- 1-TANK-1-404A (SG 1 TANK A) [737 o/s SVR] _______ _______ IV
- 1-TANK-1-404B (SG 1 TANK B) [737 o/s SVR] _______ _______ IV
- 1-TANK-1-400A (SG 2 TANK A) [737 o/s SVR] _______ _______ IV
- 1-TANK-1-400B (SG 2 TANK B) [737 o/s SVR] _______ _______ IV
- 1-TANK-1-403A (SG 3 TANK A) [AEB 739] _______ _______ IV
- 1-TANK-1-403B (SG 3 TANK B) [AEB 739] _______ _______ IV
- 1-TANK-1-402A (SG 4 TANK A) [AEB 739] _______ _______ IV
- 1-TANK-1-402B (SG 4 TANK B) [AEB 739] _______ _______ IV

Date_________ Initials_____

8.2.3 **Local Operation with Emergency Control Station (N_2 available) (continued)**

[12.3] **ENSURE** N_2 supply isolation valves are CLOSED:

- 1-ISIV-1-404EI, (SG 1) _______ _______ IV
- 1-ISIV-1-404E2, (SG 1) _______ _______ IV
- 1-ISIV-1-400EI, (SG 2) _______ _______ IV
- 1-ISIV-1-400E2, (SG 2) _______ _______ IV
- 1-ISIV-1-403EI, (SG 3) _______ _______ IV
- 1-ISIV-1-403E2, (SG 3) _______ _______ IV
- 1-ISIV-1-402EI, (SG 4) _______ _______ IV
- 1-ISIV-1-402E2, (SG 4) _______ _______ IV

Date________ Initials_____

8.2.3 Local Operation with Emergency Control Station (N_2 available) (continued)

[12.4] **BLEED** press off line of associated PORV(s) by turning adjustment knob fully CLOCK WISE to back off the regulator valve, and using regulator petcock to VENT N_2. Leave lock screw on top of adjusting screw finger tight:

- 1-PREG-1-5B (observe 1-PI-1-5A), SG 1 PORV ________
- 1-PREG-1-12B (observe 1-PI-1-12A), SG 2 PORV ________
- 1-PREG-1-23B (observe 1-PI-1-23A), SG 3 PORV ________
- 1-PREG-1-30B (observe 1-PI-1-30A), SG 4 PORV ________

[12.5] **OPEN** PORV N_2 vent(s) Closed in Step 8.2.3[4]:

- 1-VTIV-1-5D, SG 1 PORV N_2 Vent ________ ________ IV
- 1-VTIV-1-12D, SG 2 PORV N_2 Vent ________ ________ IV
- 1-VTIV-1-23D, SG 3 PORV N_2 Vent ________ ________ IV
- 1-VTIV-1-30D, SG 4 PORV N_2 Vent ________ ________ IV

[12.6] **NOTIFY** UO when complete. ________

[12.7] **IF** cylinder pressure is below 1200 psig, **THEN**

INITIATE WO to fill used N_2 cylinders. ________

B.1.j
Place the CVCS Cation Demineralizer in Service

EVALUATION SHEET

Task: Place the CVCS Cation Demineralizer in Service.

Alternate Path: n/a

Facility JPM #: 3-OT-JPMA041

Safety Function: **Title:**

K/A 004A1.07 Ability to predict and/or monitor changes in parameters (to prevent exceeding design limits) associated with operating the CVCS controls including: Maximum specified letdown flow

Rating(s): 2.7/3.1 **CFR:** 41.5/45.5

Evaluation Method: Simulator ________ In-Plant ___X___ **Classroom** ________

References: SOI-62.04, CVCS PURIFICATION SYSTEM, Rev. 55

Task Number: AUO-062-AOI-028-001 **Title:** Place a Cation Bed in service.

Task Standard: The appropriate valves have been located and opened to place the CVCS cation bed in service per SOI-62.04.

Validation Time: 20 minutes **Time Critical:** Yes _____ No __X__

==

Applicant: ______________________ ________________ Time Start: ________
NAME Docket No. Time Finish: ________

Performance Rating: SAT ____ UNSAT ____ Performance Time ___

Examiner: ______________________ ______________________/__________
NAME SIGNATURE DATE

==

COMMENTS

____

____

____

____

____

____

Tools/Equipment/Procedures Needed:

Hard Hat, Safety Glasses, Hearing Protection, Gloves and Plant Approved Shoes
Copy of SOI-62.04, CVCS PURIFICATION SYSTEM, Rev. 55, Section 8.2 and Attachment 1 with data entered.

SAFETY CONSIDERATIONS:

Hot pipes, high noise, and heat.
Radiation levels.
Ladder use to reach valve handwheels

READ TO APPLICANT

DIRECTION TO APPLICANT:

I will explain the initial conditions, and state the task to be performed. All control room steps shall be performed for this JPM, including any required communications. I will provide initiating cues and reports on other actions when directed by you. Ensure you indicate to me when you understand your assigned task. To indicate that you have completed your assigned task return the cue sheet I provided you.

INITIAL CONDITIONS:

1. **The Unit is at 100% power.**
2. **Reactor Coolant System boron concentration is 870 ppm.**
3. **AOI-28, "High Activity in the Reactor Coolant" has been entered.**
4. **Chemistry has determined that the Cation Demin needs to be placed in service.**
5. **You are an AUO assigned to the shift.**

INITIATING CUES:

1. **The Unit Supervisor has directed you to place the CVCS Cation Bed in service per SOI-62.04, "CVCS Purifications System," Section 8.2.**
2. **You are to notify the Unit Supervisor when the CVCS Cation Bed is in service.**

STEP/STANDARD	SAT/UNSAT

START TIME: _______

STEP 1: Obtain a copy of the procedure. STANDARD: Applicant locates and obtains a copy of SOI-62.04, Section 8.2 **CUE: After the performer has demonstrated the method of obtaining the correct instruction, the evaluator can provide a copy of the instruction.** COMMENTS:	___ SAT ___ UNSAT
STEP 2: [1] **ENSURE** CB FILLED and VENTED per Section 8.1. STANDARD: Applicant requests information to determine if the Cation Bed is filled and vented. **CUE: When asked, inform the performer that Section 8.1 is complete.** COMMENTS:	___ SAT ___ UNSAT

STEP/STANDARD	SAT/UNSAT
STEP 3: [2] **PERFORM** the following:	___ SAT ___ UNSAT

NOMENCLATURE	LOCATION	POSITION	UNID	PERF INITIAL	VERIFIER INITIAL
CVCS CATION DEMIN BED INLET	A3T/713	CLOSED	1-ISV-62-915		CV
CVCS CATION DEMIN BED OUTLET	A3T/713	CLOSED	1-ISV-62-916		CV
CVCS CATION DEMIN BED VENT	A3T/713	CLOSED	1-VTV-62-917		CV
CVCS CATION DEMIN BED RESIN FILL	A5U/737	CLOSED	1-ISV-62-918		CV
CVCS CATION DEMIN BED RESIN DISCH	A7U/713	CLOSED	1-ISV-62-919		CV
CVCS CATION DEMIN BED DRAIN	A3T/713	CLOSED	1-DRV-62-920		CV
CVCS CATION BED FLUSH	A3T/713	CLOSED	1-FLV-62-921		CV

STANDARD:

Applicant locates and checks the listed valves in the CLOSED position (clockwise to close).

CUE: After the applicant locates and then describes how to determine that each valve is CLOSED (moving the handwheel clockwise then counterclockwise), for each valve state"the handwheel will not rotate."

COMMENTS:

STEP/STANDARD	SAT/UNSAT
STEP 4: [3] **ENSURE** 1-ISV-62-922, CVCS MIXED BED DEMIN OUTLET [A3T/713], is OPEN. STANDARD: Applicant locates 1-ISV-62-922, CVCS MIXED BED DEMIN OUTLET, and determines that the valve is open. **CUE: If the performer attempts to move the handwheel clockwise then counterclockwise state "the handwheel will not rotate."** COMMENTS:	___ SAT ___ UNSAT
STEP 5: [4] **REVIEW** Attachment 1, Resin Status Sheet to ensure CB is FILLED and BORATED. STANDARD: Applicant requests information to determine that the Cation Bed is filled and borated, and then proceeds to the next step. **CUE: When asked, state "the Resin Status Sheet indicates the CB is filled and vented and borated to the 870 ppm, the same concentration as the RCS)."** COMMENTS:	___ SAT ___ UNSAT

STEP/STANDARD	SAT/UNSAT
STEP 6: [5] **NOTIFY** SRO of intent to place CB in service, and its current boron concentration as recorded on Attachment 1, Resin Status Sheet. STANDARD: Applicant contacts the SRO and notifies the SRO of the intent to place cation bed in service, advises the SRO of the boron concentration recorded on Attachment 1. ***EXAMINER: Task assignment sheet provides the boron concentration derived from Attachment 1. The Rad Waste desk contains the current Attachment 1 for cation bed which will be different than task assignment sheet.*** COMMENTS:	___ SAT ___ UNSAT

CAUTION

Cation Bed may need to be flushed to minimize reactivity effects if cation bed boron concentration varies more than 20 ppm from that of the RCS boron concentration or if a new cation bed is being placed in service.

STEP/STANDARD	SAT/UNSAT
STEP 7: [6] **OPEN** 1-ISV-62-915, CVCS CATION DEMIN BED INLET. STANDARD: Applicant locates 1-ISV-62-915, CVCS CATION DEMIN BED INLET and demonstrates how to open the valve (turned in the counter-clockwise direction). **CUE: After valve hand wheel is moved in the counterclockwise direction, state "the hand wheel rotates several turns and stops."** **If position indicator checked, indicate it points to the open position.** **Step is critical to establish flow through the cation demineralizer.** COMMENTS:	**CRITICAL STEP** ___ SAT ___ UNSAT
STEP 8: [7] **IF** flush is desired for cation bed, **THEN GO TO** Section 8.7, Flushing Cation Bed to Adjust Boron Prior to Use. STANDARD: Applicant determines that flush is not required (per CUE) and N/As step. **CUE: State that flush is not necessary, nor desired at this time.** COMMENTS:	___ SAT ___ UNSAT

CAUTION

Maximum Cation Bed flow is 75 gpm. May be read locally at 1-FI-62-113 (Panel 1-L-57 at A3T/713).

STEP/STANDARD	SAT/UNSAT
STEP 9: [8] **(ρ) Slowly OPEN** 1-ISV-62-916, CVCS CATION DEMIN BED OUTLET. STANDARD: Applicant locates 1-ISV-62-916, CVCS CATION DEMIN BED OUTLET and demonstrates how to open the valve (turned in the counter-clockwise direction). **CUE: After valve hand wheel is moved in the counter-clockwise direction, state that the hand wheel rotates several turns and stops.** ***If position indicator is checked, indicate it points to the open position.*** ***Step is critical to establish flow through the cation demineralizer.*** COMMENTS:	**CRITICAL STEP** ___ SAT ___ UNSAT

STEP/STANDARD	SAT/UNSAT
STEP 10: [9] **Slowly THROTTLE** CLOSE 1-ISV-62-922, CVCS MIXED BED DEMIN OUTLET, until desired cation bed flow rate achieved. STANDARD: Applicant locates 1-ISV-62-922, CVCS MIXED BED DEMIN OUTLET, and demonstrates how to slowly throttle the valve (turned in the clockwise direction). ***CUE:*** ***After valve hand wheel is moved in the clockwise direction, state "the hand wheel rotates several turns and stops." If indicator checked, indicate it points to the closed position.*** ***CUE:*** ***When 1 FI-62-113 is checked by the local indicator OR the CRT Monitor located near the demineralizer control valves, state it indicates 75 gpm. IF the MCR is contacted, state the letdown flow is 75 gpm.*** ***Step is critical to establish flow through the cation demineralizer.*** COMMENTS:	**CRITICAL STEP** ___ SAT ___ UNSAT

STEP/STANDARD	SAT/UNSAT
STEP 11: [10] **RECORD** Time, Date, and Flowrate when CB was placed in service on Attachment 1, Resin Status Sheet. STANDARD: Applicant addresses entry of the Date, Time and Flow rate that the Cation Bed was placed in service on Attachment 1. ***CUE: Another operator will enter the information on Attachment 1, Resin Status Sheet.*** COMMENTS:	___ SAT ___ UNSAT
STEP 12: [11] **NOTIFY** Chemistry of Time, Date, and Flowrate when CB was placed in service. STANDARD: Applicant notifies Chemistry of Time, Date, and Flowrate when Cation Bed was placed in service ***CUE: As Chemistry, repeat back information provided by the applicant.*** COMMENTS:	___ SAT ___ UNSAT

STEP/STANDARD	SAT/UNSAT
STEP 13: [12] Section 8.2, Place Cation Bed in Service, COMPLETE. STANDARD: Applicant notifies the Unit Supervisor that the Cation Bed has been placed in service COMMENTS: **END OF TASK**	___ SAT ___ UNSAT

STOP TIME ________

APPLICANT CUE SHEET

(RETURN TO EXAMINER UPON COMPLETION OF TASK)

INITIAL CONDITIONS:

1. The Unit is at 100% power.
2. Reactor Coolant System boron concentration is 870 ppm.
3. AOI-28, "High Activity in the Reactor Coolant" has been entered.
4. Chemistry has determined that the Cation Demin needs to be placed in service.
5. You are an AUO assigned to the shift.

INITIATING CUES:

1. The Unit Supervisor has directed you to place the CVCS Cation Bed in service per SOI-62.04, "CVCS Purifications System," Section 8.2.
2. You are to notify the Unit Supervisor when the CVCS Cation Bed is in service.

Watts Bar Nuclear Plant

Unit 1

System Operating Instruction

SOI-62.04

CVCS Purification System

Revision 0055

Quality Related

Level of Use: Continuous Use

Effective Date: 07-26-2010

Responsible Organization: OPS, Operations

Prepared By: Travis Uptegrove

Approved By: David Askins

Revision Log

Revision or Change Number	Effective Date	Affected Page Numbers	Description of Revision/Change
Rev 54	04/15/10	All	This procedure has been converted from Word 95 to Word 2002 (XP) using Rev 53 and revised to comply with the writers guide as part of the procedure upgrade project. The following changes were made to add clarification and improve work flow: Added note defining Greek symbol (ρ) as indicator for a step that directly affects reactivity. Added Caution to sect 5.1, 5.2 & 8.1 to monitor resin hopper level while adding new resin to prevent overflow. [PER 208981] Moved steps to borate mixed beds to separate sections. Combined multiple mixed bed flush to HUT sections into one section for each mixed bed. Made steps 5.5[18] and 5.6[18] Critical steps. Changed order and detail of steps to improve work flow. Added more detail to section titles to be more descriptive of purpose. Changed verification from IV to CV for performance steps and added IV of valve position at end of sections. [PCR 2915] Deleted notes in P&L and section concerning Cycle 7 specific information. Added option to use 45 GPM orifice during flushes (, PCR, 2914, 2943, 3358, 3426, 4178, 4206 & OPS Support Supt recommendation)
Rev 55	07/26/10	4, 6, 7, 41, 42, 46, 48, 52, 63, 68, 75,	Deleted checklists and replaced with external attachments. Added Precaution L (PER 161559) Added 4.3[2], 7.2[1], 7.2[2], and 7.3[2], RP notifications (PER 161559). Added CAUTION to 7.2 and 7.3 (PER 161559). Added WARNING to 7.5 and 8.4. (PER 161559) Changed High Radiation Spots to Hot Spots (PER 161559). Added steps for additional RP control or monitoring of radiation levels. (PER 161559)

Table of Contents

Table of Contents (continued)

ATTACHMENTS

Attachment 1V: CVCS Purification System Valve Checklist 62.04-1V

1.0 INTRODUCTION

1.1 Purpose

To provide instructions for operation of the Chemical and Volume Control System (CVCS) Purification System.

1.2 Scope

This Instruction includes operation of the following components:

A. Mixed Bed (MB) Demins.

B. Cation Bed (CB) Demin.

2.0 REFERENCES

2.1 Performance References

A. SOI-62.06, Boron Recycle System

B. SOI-62.02, Boron Concentration Control

C. SOI-77.03, Spent Resin Handling

D. 1-SI-0-10, Shutdown Margin

E. TI-59, Boron Tables

2.2 Developmental References

A. SOI-62.01, CVCS-Charging and Letdown

B. SOI-81.01, Primary Water Makeup System

C. Tech Specs

D. TVA Drawings:

1-47W809-1, -2, -3
1-47W819-1
1-47W830-1, -3, -4

E. T25 990813 975 Request for Evaluation of Equipment Placement (Form SPP-10.7-2 [02-12-1999])

3.0 PRECAUTIONS AND LIMITATIONS

A. Resin damage may occur if demin inlet temp exceeds 140°F.

B. Mixed Bed Demins must be borated before placing in service, or borated slowly while placing in service to avoid rapid reduction of Reactor Coolant System (RCS) boron concentration (C_B).[2] Where use of new resin is a part of a planned RCS boron concentration control evolution, work shall be controlled to ensure that adequate reactivity control systems are maintained operable at all times.

C. When resin addition is in progress, transfer line plugging can occur if a sufficient flow of water is not maintained.

D. Spent resin sluice line can be a source of considerable radiation exposure during resin transfer due to pipe routing and lack of shielding around pipe.[1]

E. When Reactor Coolant Filter is bypassed, flow though the demins should be Secured or Diverted to HUT to prevent potential Resin intrusion into RCS.

F. Demineralizer flow limits:

   1. MB Demins normal design flow is 20 to 120 gpm.

   2. Cation Demin design flow is ≤75 gpm.

G. When performing operations on demins, care should be exercised to maintain a letdown flow path at all times.

H. Work in Radiological Control Area (RCA) requires the use of existing RWPs and may require additional ALARA Preplans. Failure to follow posted Rad control requirements can cause unnecessary radiation exposure. Radiological Protection should be notified of work with potential to change radiological conditions.

I. Instrument Maintenance department should be notified to ensure required instruments will be in service, as necessary, to support system operation.

J. Demineralizers containing macroporous resin have the potential for particulate loading and subsequent release when flow is reestablished.

K. Steps that directly affect reactivity will be preceded with the Greek symbol (ρ).

L. Steps within this instruction may require venting, draining, or breaching radioactive components or systems to the atmosphere. Appropriate protection controls must be established to prevent the spread of contamination and avoid the generation of airborne radioactivity.

Date ________

4.0 PREREQUISITE ACTIONS

4.1 Preliminary Actions

NOTES

1) Signoffs/information in unused Sections may be left blank.
2) Throughout instruction where **IF/THEN** exists, the step is N/A if the stated condition does not exist.

[1] **INDICATE** Section to be performed, and reason for use:

5.0 Startup__________ 7.0 Shutdown___________

6.0 Normal Operation___N/A_____ 8.0 Infrequent Operations____________

Subsection/Reason/Remarks____________________________________
____
____
____

4.2 Field Preparations

[1] **ENSURE** letdown IN SERVICE per SOI-62.01. ________

[2] **ENSURE** Primary Water AVAILABLE per SOI-81.01. ________

4.3 Approvals and Notifications

[1] **COORDINATE** performance with SRO and MCR Operator. ________

[2] **COORDINATE** with Radiation Protection to identify potential radiological impacts and ensure appropriate radiation protection measures are in place prior to performing any part of this instruction. ________

Date ________

8.0 INFREQUENT OPERATIONS

NOTE
Radwaste Operator should be contacted before draining, rinsing, or flushing to ensure sufficient capacity to receive effluent.

8.1 Fill & Vent CB (Resin Fill)

NOTES

1) Letdown flowpath should be maintained at all times.
2) Cation Bed (CB) is placed in service to:
   - Control pH.
   - Remove Cesium, Molybdenum, Yttrium.
   - Reduce Lithium concentration.

[1] **CHECK** with Chemistry that proper resins are AVAILABLE. ________

[2] **NOTIFY** Radiological Protection to evaluate ALARA requirements and Radiological Protection coverage. ________

[3] **PERFORM** the following:

NOMENCLATURE	LOCATION	POSITION	UNID	PERF INITIAL	VERIFIER INITIAL
CVCS CATION DEMIN BED INLET	A3T/713	CLOSED	1-ISV-62-915		CV
CVCS CATION DEMIN BED OUTLET	A3T/713	CLOSED	1-ISV-62-916		CV
CVCS CATION DEMIN BED VENT	A3T/713	CLOSED	1-VTV-62-917		CV
CVCS CATION DEMIN BED RESIN FILL	A5U/737	CLOSED	1-ISV-62-918		CV
CVCS CATION DEMIN BED RESIN DISCH	A7U/713	CLOSED	1-ISV-62-919		CV
CVCS CATION BED FLUSH	A3T/713	CLOSED	1-FLV-62-921		CV

Date ________

8.1 Fill & Vent CB (Resin Fill) (continued)

[4] **INITIATE** WO to have MMG PERFORM the following, and **RECORD** WO number: ________

WO# ______________________

[4.1] **REMOVE** bolted flange from resin fill line at 1-ISV-62-918, CVCS CATION DEMIN RESIN FILL, [A5U/737.] ________

[4.2] **CONNECT** Resin Fill Tank, 0-TANK-62-117, to fill line. ________

[5] **OPEN** 1-DRV-62-920, CVCS CATION DEMIN BED DRAIN [A3T/713], and 1-VTV-62-917, CVCS CATION DEMIN BED VENT [A3T/713], and

DRAIN demin for 25-30 minutes. ________

[6] **NOTIFY** U.O. of anticipated DI water usage. ________

NOTE
The following parameters are applicable to Step 8.1[7]; 2-inch, Aluminum Schedule 40, ID=2.067 inches, OD=2.375 inches, wall=0.154 inches.

[7] **INSTALL** Ultrasonic Flow Monitoring Device in accordance with TI-31.022 on DI Water Line, just below 1-ISV-59-580, DI WATER SERVICE CONN ISOLATION [east side elevator, el 737] ________

[8] **CONNECT** temporary hose from 1-ISV-59-580, DI WATER SERVICE CONN ISOLATION, with temporary isolation valve on fill end of hose AND temporary hose from 1-ISV-33-670, SERVICE AIR CONN ISOL, [east side elevator, el 737] with both hoses route to area of new resin container(s). ________

Date ________

8.1 Fill & Vent CB (Resin Fill) (continued)

[9] **PERFORM** the following:

NOMENCLATURE	LOCATION	POSITION	UNID	PERF INITIALS	VERIFIER INITIAL
CVCS CATION BED DEMIN RESIN FILL	A5U/737	OPEN	1-ISV-62-918		CV
CVCS RESIN FILL TANK OUTLET	on portable tank	OPEN	0-ISV-62-924		CV
RESIN FILL TK PW SUP	on portable tank	OPEN	0-ISV-62-925		CV

CAUTION

The resin hopper will overflow if the line becomes clogged with resin and should be monitored by an extra operator while transferring new resin

NOTE

Maximum resin addition to CB is 20 ft^3

[10] **FILL** new resin container with DI water to completely cover resin, by OPENING and CLOSING 1-ISV-59-580, DI WATER SERVICE CONN ISOLATION, or temporary isolation valve at end of DI water fill hose. ________

[11] **OPEN** 1-ISV-33-670, SERVICE AIR CONN ISOL [E. Side of elevator 737 elev.],as required, to transfer resin from new resin container to 0-TANK-62-117, PORTABLE RESIN FILL TANK, using portable pump. ________

[12] **FLUSH** 0-TANK-62-117, PORTABLE RESIN FILL TANK, AND portable pump with DI water for 2 to 3 minutes after resin transfer, to clean resin fill lines. ________

Date ________

8.1 Fill & Vent CB (Resin Fill) (continued)

[13] **PERFORM** the following:

NOMENCLATURE	LOCATION	POSITION	UNID	PERF INITIAL	VERIFIER INITIAL
CVCS CATION DEMIN BED DRAIN	A3T/713	CLOSED	1-DRV-62-920		CV
RESIN FILL TK OUTLET	on portable tank	CLOSED	0-ISV-62-924		CV
SERVICE AIR CONN ISOL	E. side elevator 737	CLOSED	1-ISV-33-670		

[14] **ENSURE** temporary hose from 1-ISV-59-580, DI WATER SERVICE CONN ISOLATION, **CONNECTED** to 0-CKV-62-926, RESIN FILL TK PW SUP (on portable tank). ________

[15] **CHECK** 1-ISV-59-581, DI WATER SERVICE CONN ISOLATION [east side elevator, el 757], is CLOSED. ________

NOTE
The following three steps ensure that the vessel is filled and vented.

[16] **THROTTLE OPEN** 1-ISV-59-580, DI WATER SERVICE CONN ISOLATION, or temporary isolation valve at end of DI water fill hose, to attain ≤ 20 gpm flow rate as indicated by the Ultrasonic Flow Meter installed on the DI water line. ________

[17] **DETERMINE** and **RECORD** time required at flow rate indicated on Ultrasonic Flow Meter, to fill demin with approximately 250 gallons of water:

Time = 250 divided by DI Water Flow Rate (gpm).
Time = ______________ minutes. ________

[18] **WHEN** time determined has elapsed or the demin vessel is filled with water, **THEN**

CLOSE 1-VTV-62-917, CVCS CATION DEMIN BED VENT [A3T/713] ________

Date ________

8.1 Fill & Vent CB (Resin Fill) (continued)

[19] **OPEN** 1-DRV-62-920, CVCS CATION DEMIN BED DRAIN [A3T/713]
AND
OPEN 1-ISV-59-580, DI WATER SERVICE CONN ISOLATION, or temporary isolation valve at end of DI water fill hose, to attain ≤ 75 gpm flow rate as indicated by the Ultrasonic Flow Meter installed on the DI Water line. ________

[20] **DETERMINE** and **RECORD** time required at flow rate indicated on Ultrasonic Flow Meter, to rinse demin with approximately 180 gallons of water:

Time = 180 divided by DI Water Flow Rate (gpm).
Time = ____________ minutes. ________

[21] **WHEN** time determined has elapsed, **THEN**

CLOSE 1-DRV-62-920, CVCS CATION DEMIN BED DRAIN [A3T/713] ________

[22] **OPEN** 1-VTV-62-917, CVCS CATION DEMIN BED VENT [A3T/713]. ________

[23] **DETERMINE** and **RECORD** time required at flow rate indicated on Ultrasonic Flow Meter, to fill demin with approximately 250 gallons of water:

Time = 250 divided by DI Water Flow Rate (gpm).
Time = ____________ minutes. ________

[24] **WHEN** time determined has elapsed or the demin vessel is filled with water, **THEN**

CLOSE 1-VTV-62-917, CVCS CATION DEMIN BED VENT [A3T/713] ________

[25] **CLOSE** 1-ISV-59-580, DI WATER SERVICE CONN ISOLATION. ________

[26] **CLOSE** temporary isolation valve at end of DI water fill hose ________

[27] **CLOSE** 0-ISV-62-925, CVCS RESIN FILL TANK PRI WTR SUPPLY [on the portable tank]. ________

Date ________

8.1 Fill & Vent CB (Resin Fill) (continued)

[28] **CLOSE** 1-ISV-62-918, CVCS CATION DEMIN RESIN FILL, [A5U/737.] ________

[29] **REMOVE** Ultrasonic Flow Monitoring Device from DI Water Line, just below 1-ISV-59-580, DI WATER SERVICE CONN ISOLATION [east side elevator, el 737] ________

[30] **RECORD** the following on Attachment 1, RESIN STATUS SHEET: ________

- NAME of Demin ☐
- Resin TYPE ☐
- LOT Number (s) ☐
- QUANTITY Added ☐
- DATE Added ☐
- Bed filled and vented ☐

[31] **NOTIFY** MMG to replace flange removed in Step 8.1[4], remove temporary hoses connected in Step 8.1[8] and return the Portable Resin Fill Tank, 0-TANK-62-117, to its storage location on South Wall Aux Bldg about A-10 line and securely restrain the Tank. ________

[32] **RECORD** CB present C_B on Attachment 1, RESIN STATUS SHEET. ________

[33] **VERIFY** the following:

NOMENCLATURE	LOCATION	POSITION	UNID	VERIFIER INITIAL
CVCS CATION DEMIN BED VENT	A3T/713	CLOSED	1-VTV-62-917	IV
CVCS CATION DEMIN BED RESIN FILL	A5U/737	CLOSED	1-ISV-62-918	IV
CVCS CATION DEMIN BED DRAIN	A3T/713	CLOSED	1-DRV-62-920	IV

[34] Section 8.1,Fill & Vent CB (Resin Fill), COMPLETE. ________

Date ________

8.2 Place Cation Bed in Service

[1] **ENSURE** CB FILLED and VENTED per Section 8.1. ________

[2] **PERFORM** the following:

NOMENCLATURE	LOCATION	POSITION	UNID	PERF INITIAL	VERIFIER INITIAL
CVCS CATION DEMIN BED INLET	A3T/713	CLOSED	1-ISV-62-915		CV
CVCS CATION DEMIN BED OUTLET	A3T/713	CLOSED	1-ISV-62-916		CV
CVCS CATION DEMIN BED VENT	A3T/713	CLOSED	1-VTV-62-917		CV
CVCS CATION DEMIN BED RESIN FILL	A5U/737	CLOSED	1-ISV-62-918		CV
CVCS CATION DEMIN BED RESIN DISCH	A7U/713	CLOSED	1-ISV-62-919		CV
CVCS CATION DEMIN BED DRAIN	A3T/713	CLOSED	1-DRV-62-920		CV
CVCS CATION BED FLUSH	A3T/713	CLOSED	1-FLV-62-921		CV

[3] **ENSURE** 1-ISV-62-922, CVCS MIXED BED DEMIN OUTLET [A3T/713], is OPEN. ________

[4] **REVIEW** Attachment 1, Resin Status Sheet to ensure CB is FILLED and BORATED. ________

________ CV

[5] **NOTIFY** SRO of intent to place CB in service, and its current boron concentration as recorded on Attachment 1, Resin Status Sheet. ________

CAUTION

Cation Bed may need to be flushed to minimize reactivity effects if cation bed boron concentration varies more than 20 ppm from that of the RCS boron concentration or if a new cation bed is being placed in service.

[6] **OPEN** 1-ISV-62-915, CVCS CATION DEMIN BED INLET. ________

________ CV

Date ________

8.2 Place Cation Bed in Service (continued)

[7] **IF** flush is desired for cation bed, **THEN**

GO TO Section 8.7, Flushing Cation Bed to Adjust Boron Prior to Use. ________

CAUTION

Maximum Cation Bed flow is 75 gpm. May be read locally at 1-FI-62-113 (Panel 1-L-57 at A3T/713).

[8] **(ρ) Slowly OPEN** 1-ISV-62-916, CVCS CATION DEMIN BED OUTLET. ________

________ CV

[9] **Slowly THROTTLE** CLOSE 1-ISV-62-922, CVCS MIXED BED DEMIN OUTLET, until desired cation bed flow rate achieved. ________

________ CV

[10] **RECORD** Time, Date, and Flowrate when CB was placed in service on Attachment 1, Resin Status Sheet. ________

[11] **NOTIFY** Chemistry of Time, Date, and Flowrate when CB was placed in service. ________

[12] Section 8.2, Place Cation Bed in Service, COMPLETE. ________

SPARE B.1.h
Swap Seal Injection Filters

WATTS BAR NUCLEAR PLANT
JOB PERFORMANCE MEASURE
SPARE B.1.h
06-2011 NRC Exam
EVALUATION SHEET

Task: Swap Seal Injection Filters.

Alternate Path: n/a

Facility JPM #: 3-OT-JPMA116

Safety Function: 4P **Title:** Heat Removal from Reactor Core

K/A 003 A4.01 Ability to manually operate and/or monitor in the control room: Seal injection

Rating(s): 3.3/3.2 **CFR:** 41.7 / 45.5 to 45.8

Evaluation Method: Simulator ________ In-Plant ____________ **Classroom** X

References: SOI-62.01, CVCS - CHARGING AND LETDOWN, Rev. 61.

Task Number: AUO-062-SOI-62.1-014 **Title:** Swap Seal Injection Filters.

Task Standard: Seal Injection Filters have been swapped with "A" in service, "B" out of service in accordance with SOI-62.01 Section 8.9.2

Validation Time: 15 minutes **Time Critical:** Yes _____ No X

==

Applicant: ____________________________ ________________ Time Start: ________
NAME Docket No. Time Finish: ________

Performance Rating: SAT ____ UNSAT ____ Performance Time ___

Examiner: ____________________________ ____________________________/__________
NAME SIGNATURE DATE

==

COMMENTS

____

____

____

____

____

____

Tools/Equipment/Procedures Needed:

Hard-hat,
Safety Glasses,
Hearing Protection
Plant Approved Shoes
Gloves
ALARA considerations
Note: Have a copy of SOI-62.01 to give to the performer.
Note: START THIS JPM IN THE MCR

READ TO APPLICANT

DIRECTION TO APPLICANT:

I will explain the initial conditions, and state the task to be performed. All control room steps shall be performed for this JPM, including any required communications. I will provide initiating cues and reports on other actions when directed by you. Ensure you indicate to me when you understand your assigned task. To indicate that you have completed your assigned task return the cue sheet I provided you.

INITIAL CONDITIONS:

1. **Unit 1 is at 90% power.**
2. **Seal injection filter B is in service and Window 101-D RCP SEAL INJ FILTER A/B ΔP HI is in alarm.**
3. **You are an AUO on shift.**

INITIATING CUES:

1. **The Unit Operator has directed you to swap seal injection filters per SOI-62.01, Section 8.9.**
2. **You are to place A seal injection filter in service and remove B seal injection filter from service.**
3. **You are to notify the Unit Operator when the seal injection filter swap is complete.**

STEP/STANDARD	SAT/UNSAT

START TIME: _______

STEP 1: Obtain a copy of the procedure. STANDARD: Applicant obtains a copy of SOI-62.01, "CVCS - Charging and Letdown section 8.9.2. **Cue:** **After the performer has demonstrated the method of obtaining the correct instruction, the evaluator can provide a copy of the instruction.** COMMENTS:	___ SAT ___ UNSAT

NOTE

Opening valves slowly when placing the seal water injection filters in service allows the pressure to equalize across filter and prevents filter cartridge failure. Slow operation also minimizes the potential for torque storage in the cable coupling between the reach rod and the handwheel, which may result in unwanted rapid opening of the valve and loss of seal injection flow.

STEP 2: [1] **CHECK** 1-PDIS-62-96, CVCS SEAL WTR INJECTION FILTER B DIFF PRESS [A5T/713], indicates ΔP greater than 20 psid.(**N/A** if filter changed at discretion of Unit SRO) STANDARD: Applicant locates 1-PDIS-62-96, CVCS SEAL WTR INJECTION FILTER B DIFF PRESS and checks indicated differential pressure. **Cue:** **After located and checked, indicate a value of 22 psid.** COMMENTS:	___ SAT ___ UNSAT

STEP/STANDARD	SAT/UNSAT
STEP 3: [2] **ENSURE** RCP standpipe levels NORMAL (HI/LO alarm clear). STANDARD: Applicant contacts the Operator-at-the-Controls (OAC) and requests status of the RCP Standpipe level alarms. **Cue: After OAC is contacted, state that there are NO alarms or other indication of abnormal stand pipe level.** COMMENTS:	___ SAT ___ UNSAT
STEP 4: [3] **SLOWLY OPEN** 1-ISV-62-548, CVCS SEAL WTR INJ FLTR A IN ISOL [A5T/713]. STANDARD: Applicant locates 1-ISV-62-548, CVCS SEAL WTR INJ FLTR A IN ISOL and demonstrates how to open the valve (rotating hand wheel in the counter clockwise direction.) **Cue: After hand wheel is rotated CCW, state that the hand wheel turns several rotations and gets snug.** **Step is critical to proper alignment of flow path.** COMMENTS:	**CRITICAL STEP** ___ SAT ___ UNSAT

STEP/STANDARD	SAT/UNSAT
STEP 5: [4] **SLOWLY OPEN** 1-ISV-62-550, CVCS SEAL WTR INJ FILTER A OUT ISOL [A5T/713]. STANDARD: Applicant locates 1-ISV-62-550, CVCS SEAL WTR INJ FILTER A OUT ISOL and demonstrates how to open the valve (rotating hand wheel in the counter clockwise direction.). **Cue:** **After hand wheel is rotated CCW, state that the hand wheel turns several rotations and gets snug.** **Step is critical to proper alignment of flow path.** COMMENTS:	**CRITICAL STEP** ___ SAT ___ UNSAT
STEP 6: [5] **ENSURE** RCP seal injection flow between 8 and 13 gpm. STANDARD: Applicant contacts the Operator-at-the-Controls (OAC) and requests that RCP seal injection flows be checked between 8 and 13 gpm. **Cue:** **After MCR called, state the seal flow is 9 gpm per pump.** COMMENTS:	___ SAT ___ UNSAT

STEP/STANDARD	SAT/UNSAT
STEP 7: [6] **CHECK** ΔP rose on A filter prior to isolating B filter. STANDARD: Applicant locates 1-PDIS-62-97, CVCS SEAL WTR INJECTION FILTER A DIFF PRESS and checks for a rise in pressure prior to isolating B filter. **Cue:** **When 1-PDIS-62-97, CVCS SEAL WTR INJECTION FILTER A DIFF PRESS is checked indicate on gage a value of 6 psid** COMMENTS:	___ SAT ___ UNSAT
STEP 8: [7] **CLOSE** 1-ISV-62-549, CVCS SEAL WTR INJ FILTER B OUT ISOL [A5T/713]. STANDARD: Applicant locates 1-ISV-62-549, CVCS SEAL WTR INJ FILTER B OUT ISOL and demonstrates how to close the valve (rotating hand wheel in the clockwise direction.) **Cue:** **After hand wheel is rotated CW, state that the hand wheel turns several rotations and gets snug.** **Step is critical to proper alignment of flow path.** COMMENTS:	**CRITICAL STEP** ___ SAT ___ UNSAT

STEP/STANDARD	SAT/UNSAT
STEP 9: [8] **CLOSE** 1-ISV-62-547, CVCS SEAL WTR INJ FLTR B IN ISOL [A5T/713]. STANDARD: Applicant locates 1-ISV-62-547, CVCS SEAL WTR INJ FLTR B IN ISOL and demonstrates how to close the valve (rotating hand wheel in the clockwise direction.) **Cue: After hand wheel is rotated CW, state that the hand wheel turns several rotations and gets snug.** **Step is critical to proper alignment of flow path.** COMMENTS:	**CRITICAL STEP** ___ SAT ___ UNSAT
STEP 10: [9] **ENSURE** 1-PDIS-62-97, CVCS SEAL WTR INJECTION FILTER A DIFF PRESS [A5T/713], indicates ΔP less than 20 psid. STANDARD: Applicant locates 1-PDIS-62-97, CVCS SEAL WTR INJECTION FILTER A DIFF PRESS and Filter A's ΔP is checked to be <20 psid on 1-PDIS-62-96. **Cue: After ΔP check, indicate value of 12 psid on the gage.** COMMENTS:	___ SAT ___ UNSAT

STEP/STANDARD	SAT/UNSAT
STEP 11: [10] **INITIATE** WO to replace clogged filter, and NOTIFY UO to record WO number. (**N/A** if open WO available for filter replacement) STANDARD: Applicant indicates that a Work Order (WO) must be initiated, and that the Unit Operator must be informed of WO number. **Cue:** **When notified, state that another operator will initiate the Work Order and inform the UO of the WO number.** Applicant informs the EXAMINER that the task is complete. **Cue:** **When notified, repeat back the information provided by the applicant.** COMMENTS: **END OF TASK**	___ SAT ___ UNSAT

STOP TIME ________

APPLICANT CUE SHEET

(RETURN TO EXAMINER UPON COMPLETION OF TASK)

INITIAL CONDITIONS:

1. Unit 1 is at 90% power.

2. Seal injection filter B is in service and Window 101-D RCP SEAL INJ FILTER A/B ΔP HI is in alarm.

3. You are an AUO on shift.

INITIATING CUES:

1. The Unit Operator has directed you to swap seal injection filters per SOI-62.01, Section 8.9.

2. You are to place A seal injection filter in service and remove B seal injection filter from service.

3. You are to notify the Unit Operator when the seal injection filter swap is complete.

Watts Bar Nuclear Plant

Unit 1

System Operating Instruction

SOI-62.01

CVCS-Charging and Letdown

Revision 0061

Quality Related

Level of Use: Continuous Use

Effective Date: 01-04-2011

Responsible Organization: OPS, Operations

Prepared By: Travis Uptegrove

Approved By: Brian McIlnay

Revision Log

Revision or Change Number	Effective Date	Affected Page Numbers	Description of Revision/Change
59	05/06/10	2, 8, 11, 12, 13, 20, 21, 23, 28, 29, 31, 33, 35, 41, 43, 44, 46, 48, 51, 55, 56-58, 61, 62, 66, 69, 73, 74, 76, 78, 79, 81, 83-87, 108, 118	Non intent. Added note to notify chemistry when bypassing Demin (PER 202910 and PCR 4214) Enhanced step to return 1-HS-62-118 to VC TK position(PCR4205) Added Greek symbol (ρ) for steps that have a direct affect on reactivity. Added new numbering format for commitments.
60	07/14/10	4, 6, 7, 11, 13, 18, 19, 20, 30, 31, 39, 46, 52, 85	Added requirements to check closing springs charged when starting or shutting down CCPs. Added Precaution FF.(PER 161559) Added 4.3[4], RP Notification. (PER 161559) Added WARNING to section 6.3 and 8.18. (PER 161559) Added RP Notification steps 6.3[1], 8.7[6], and 8.18[1]. (PER 161559) Corrected Note 3 for External Attachment 1V.(PCR 4190) Changed Excess Letdown and CCS temp. in section 8.3 to be consistent with normal range of section 6.1and below alarm setpoint. (PCR 2733) Changed to reflect the split of 1-SI-63-10-A into 1-SI-63-10.1-A and 1-SI-10.2-A.(PER 161741)
61	01/04/11	2, 10, 14, 21 ,24, 30, 33, 35, 37, 43, 45, 46, 48, 50, 53, 57, 59, 60, 64, 68, 71, 76, 78, 80, 81, 83, 85, 86-89	Minor/Editorial Change to remove blank step 10 from Section 6.2 [SR 301667][PCR 4651] [PCR 4761]. Corrected nomenclature of 1-HS-62-79A from DMNRLZR to DEMIN [PCR 4494] and corrected configuration position to P-Auto due to spring return from DEMIN position. Changed Rad Con to Radiation Protection and WO to SR/ WO. Added End of Section statements.

Table of Contents

Table of Contents (continued)

1.0 INTRODUCTION

1.1 Purpose

To provide the instructions for operation of the Chemical and Volume Control System (CVCS).

1.2 Scope

This Instruction includes operation of the following CVCS subsystems:

A. Charging

B. Letdown

C. RCP Seal Injection

D. Chemical Addition

2.0 REFERENCES

2.1 Performance References

A. 0-PI-OPS-17.0, 18 Month Locked Valve Verification

B. 0-PI-OPS-17.1, 18 Month Locked Breaker Verification

C. 1-SI-63-10.1-A, ECCS Pump and Discharge Pipe Venting-Train A Inside Containment

D. 1-SI-63-10-B, ECCS Pumps Venting-Train B

E. 1-SI-68-33, Measurement of Controlled Leakage of the Reactor Coolant Pump Seals

F. 1-TRI-62-901, ASME Section XI Inservice System Pressure Test CVCS Inside Containment

G. GOI-7, Generic Equipment Operating Guidelines

H. SOI-62.02, Boron Concentration Control

I. SOI-62.04, CVCS Purification Systems

J. SOI-70.01, Component Cooling System (CCS)

K. SOI-74.01, Residual Heat Removal System (RHR)

L. SOI-77.01, Liquid Waste Disposal

M. SOI-77.02, Waste Gas Disposal

N. SOI-77.04, Auxiliary Building Nitrogen System

O. SOI-77.09, Auxiliary Building Hydrogen System

P. SOI-81.01, Primary Makeup Water System

Q. SOI-90.01, Radiation Monitoring System

R. SOI-235.01, 120V AC Vital Power System 1-I

S. SOI-235.03, 120V AC Vital Power System 1-III

T. SOI-235.04, 120V AC Vital Power System 1-IV

U. SOI-236.01, 125V DC Vital Battery Board I

2.1 Performance References (continued)

V. SOI-236.02, 125V DC Vital Battery Board II

W. CM-6.24, Sampling CVCS Mixed Bed Demineralizers

X. CM-5.09, Shutdown Primary Chemistry Control

Y. TI-4, Part II, Plant Curve Book, Tank Curves, Turbine Curves

Z. TI-59, Boron Tables

AA. 1-SI-63-10.2-A, ECCS Pump and Discharge Pipe Venting-Train A Outside Containment

2.2 Developmental References

A. GO-1, Plant Startup from Cold Shutdown to Hot Standby

B. GO-2, Plant Startup from Hot Standby to Minimum Load

C. GO-3, Plant Shutdown from Minimum Load to Cold Shutdown

D. 1-SI-0-8, Monitoring Component Cyclic or Transient Limits

E. N3-62-4001, Chemical and Volume Control System

F. SOI-68.01, Reactor Coolant System

G. TVA Drawings:

1. 1-45N600-62 Series
2. 45N706-1, -3
3. 45W751-1, -7
4. 45N760-62 Series
5. 45N1645-1, -2
6. 47B601-62
7. 47W809-1
8. 47W809-2
9. 47W809-9 -3, -6
10. 47W859-2

3.0 PRECAUTIONS AND LIMITATIONS

> **NOTE**
>
> During power changes, letdown should be maximized when possible to reduce Crud Induced Power Shift, also know as, Axial Offset Anomaly.

A. Maximum letdown flow is 120 gpm.

B. If Letdown Heat Exchanger (LDHX) outlet temperature reaches 140°F, demineralizer resin damage could occur.

C. During summer months, the lowest achievable letdown heat exchanger outlet temperature is limited by the CCS temperature, which in turn is limited by river temperature (via ERCW cooling to the CCS heat exchanger). The lowest achievable letdown heat exchanger outlet temperature is approximately 6 degrees higher than the river temperature. Attempting to operate with a letdown temperature less than 6 degrees higher than the river temperature will force 1-TCV-70-192 full open rendering 1-HIC-62-78A ineffective. Letdown temperature will then vary slightly as river temperature varies throughout the day. This causes slight changes in reactor power as boron affinity changes in the demin beds as the letdown temperature changes. Therefore, 1-HIC-62-78A, LETDOWN HX OUTLET TEMP TCV-70-192 CNTL should not be allowed to control 1-TCV-70-192 at its full open position.

D. If Reactor Coolant (RC) filter is bypassed, flow through demins should be secured or diverted to the HUT to prevent resin entering RCS if the demin resin screen fails.[C.2]

E. Charging and Letdown are in service together. If Letdown isolates or Charging is lost, the other must be isolated (see exception below). If Charging is lost and Letdown remains in service, flashing or lifting of the letdown relief could occur. If Letdown is lost and Charging remains in service, thermal shock or a positive reactivity insertion could result from cold water entering RCS.
EXCEPTION: If all the following conditions exist:

1. Any RCP Thermal Barrier Out Of Service
2. In service Charging Pump trips
3. RCP seal flow is required.
Then the Operator may immediately start an available charging pump.

F. RCP seal damage can occur if VCT press is below 15 psig with RCPs running.

3.0 PRECAUTIONS AND LIMITATIONS (continued)

G. A pneumatic relay, added to panel L-112 to limit the signal to 1-FCV-62-93, ensures 32 to 35 gpm RCP seal injection flow in the event of an Appendix R fire, by preventing valve closure. This pneumatic relay has a bypass valve on panel L-112 to allow effective flow control at low RCS pressures (i.e., heatup and cooldown).

H. Operating CCPs on miniflow for extended periods could cause pump damage due to the small amount of water being recirculated at high pressure.

I. H_2 concentration should be maintained 25 to 50 cc/kg (STP) of water when plant is at power.

J. Safety practices are required when handling hazardous chemicals. Face shields, rubber gloves, and protective clothing must be worn in preparation, handling, and sampling operations.

K. Lithium Hydroxide is a strong caustic and a strong irritant to the eyes, skin and membranes. It is also toxic by ingestion and inhalation. Precautions must be taken to prevent direct contact with or ingestion or inhalation of this chemical.

L. After each start of a CCP, ensure ACB closing spring recharges.

M. Explosive mixtures of hydrogen and oxygen in the VCT and the HUTs must be avoided at all times. The oxygen content in the tanks must **NOT** exceed 2% by volume when hydrogen concentration in the tanks exceeds 4% by volume. Nitrogen gas may be used for purging.

N. Concurrent closure of 1-ISV-62-953 and 2-ISV-62-953 is prohibited to ensure a discharge path for the VCT and BIT relief valves.

O. When operating at a minimum charging flow rate, check that the letdown flow is being cooled below 380°F. If **NOT**, raise charging and/or reduce letdown flow to lower letdown temperature.

P. After significant change in letdown and charging flow, RCP seal injection flows require checking, and adjusting if necessary.

Q. Alternating between the Alternate and Normal Charging paths should be done at cold shutdown when possible to avoid charging line transients.

R. Pressure downstream of the letdown orifices must remain high enough to preclude flashing.

S. Pressure drop across #1 seals should be checked to ensure seal injection flow is adequate and labyrinth pressure drop is normal before RCS pressure exceeds approximately 380 psig.

3.0 PRECAUTIONS AND LIMITATIONS (continued)

T. During Cold Shutdown (Mode 5), auxiliary spray is used to provide a rapid means of cooling down the pressurizer near the end of plant cooldown. During this mode of operation, charging flowrate shall be controlled to a maximum of 232 gpm to ensure auxiliary spray flowrate does **NOT** exceed 200 gpm.

U. A minimum charging flow of 15 gpm through the regenerative HX should be maintained at all times.

V. When water Solid with letdown from RHR, FCV-62-83 RHR letdown should be full **OPEN**, and RCS press controlled by PCV-62-81, LETDOWN PRESS CONTROL. The normal letdown system including all orifices must remain in service.

W. Early notification of Instrument Maintenance will ensure instruments are available to support system operations.

X. Instrument Maintenance Department should be notified to ensure required instrumentation is placed in service to support system operation.

Y. Work in Radiologically Controlled Areas (RCAs) requires the use of existing Radiation Work Permits (RWPs) and may require additional ALARA Preplans. Failure to follow posted Rad control requirements can cause unnecessary radiation exposure. Radiation Protection should be notified of work having the potential to change radiological conditions.

Z. When isolating any boron injection flow path to the core, care must be taken to ensure that the remaining available boron injection flowpaths are sufficient to meet the requirements of TR3.1.1 (Modes 4, 5, & 6), and TR3.1.2 (Modes 1, 2, & 3).[C.8]

AA. If hydrogen peroxide is to be added prior to refueling, the RCS should be borated to the refueling boron concentration as soon as possible to achieve acidic conditions by at least 400°F.

BB. If the primary system is to be opened, then Hydrazine must **NOT** be added to the RCS during any phase of unit cooldown or shutdown.

CC. Before starting idle CCPs, possible reactivity effects from dilution or boration due to water trapped in local piping must be considered, e.g., different CB at last pump run.

3.0 PRECAUTIONS AND LIMITATIONS (continued)

DD. VCT Hydrogen and Nitrogen supply pressure limit of 15-20 psi is established to provide margin associated with APP R manual operator actions. The analysis assumes this pressure range while at the low end of VCT level range (~20% level). It is anticipated that pressure may increase above 20 psi when evolutions that cause the VCT level to increase are in progress (ie. burping the VCT or during boration/dilution evolutions) as a result of the raising VCT liquid level compressing the gas volume.

EE. Steps that directly affect reactivity will be preceded with the Greek symbol (ρ).

FF. Steps within this instruction may require venting, draining or breaching radioactive components or systems to the atmosphere. Appropriate radiation protection controls must be established to prevent the spread of contamination and avoid the generation of airborne radioactivity.

Date ________ INITIALS

4.0 PREREQUISITE ACTIONS

4.1 Preliminary Actions

NOTES
1) Throughout instruction where an **IF/THEN** statement occurs, the step is **N/A** if the stated condition does **NOT** exist.
2) Signoffs/information in unused Sections may be left blank.

[1] **INDICATE Section to be performed, and reason for use.**

5.0	Startup	________	7.0	Shutdown	________
6.0	Normal Operation	________	8.0	Infrequent Operations	________

Subsection/Reason/Remarks ______________________________

____

____

4.2 Field Preparations

[1] **REVIEW** Plant procedures, processes, and programs in progress to ensure accurate configuration of components necessary for system operation. ________

[2] **ENSURE** VCT Makeup available per SOI-62.02. ________

[3] **ENSURE** N_2 available to VCT per SOI-77.04. ________

[4] **ENSURE** H_2 available to VCT per SOI-77.09. ________

[5] **ENSURE** Waste Gas Vent Header in service (or available) per SOI-77.02. ________

[6] **ENSURE** Liquid Waste System in service (or available) per SOI-77.01. ________

[7] **ENSURE** CCS in service (or available) per SOI-70.01. ________

Date ________ INITIALS

8.9.2 Replacing Filter B with Filter A

NOTE

Opening valves slowly when placing the seal water injection filters in service allows the pressure to equalize across filter and prevents filter cartridge failure. Slow operation also minimizes the potential for torque storage in the cable coupling between the reach rod and the handwheel, which may result in unwanted rapid opening of the valve and loss of seal injection flow.[C.10]

[1] **CHECK** 1-PDIS-62-96, CVCS SEAL WTR INJECTION FILTER B DIFF PRESS [A5T/713], indicates ΔP greater than 20 psid.(**N/A** if filter changed at discretion of Unit SRO) ________

[2] **ENSURE** RCP standpipe levels NORMAL (HI/LO alarm clear). ________

[3] **SLOWLY OPEN** 1-ISV-62-548, CVCS SEAL WTR INJ FLTR A IN ISOL [A5T/713]. ________

[4] **SLOWLY OPEN** 1-ISV-62-550, CVCS SEAL WTR INJ FILTER A OUT ISOL [A5T/713]. ________

[5] **ENSURE** RCP seal injection flow between 8 and 13 gpm. ________

[6] **CHECK** ΔP rose on A filter prior to isolating B filter. ________

[7] **CLOSE** 1-ISV-62-549, CVCS SEAL WTR INJ FILTER B OUT ISOL [A5T/713]. ________

[8] **CLOSE** 1-ISV-62-547, CVCS SEAL WTR INJ FLTR B IN ISOL [A5T/713]. ________

[9] **ENSURE** 1-PDIS-62-97, CVCS SEAL WTR INJECTION FILTER A DIFF PRESS [A5T/713], indicates ΔP less than 20 psid. ________

[10] **INITIATE** WO to replace clogged filter, and NOTIFY UO to record WO number.
(**N/A** if open WO available for filter replacement) ________

End of Section

SPARE B.1.i
Local Control of Motor Driven AFWP LCV for SG 1 Level.

WATTS BAR NUCLEAR PLANT
JOB PERFORMANCE MEASURE
SPARE B.1.i
06-2011 NRC Exam

EVALUATION SHEET

Task: Local Control Motor Driven AFWP LCV For SG 1 Level

Alternate Path: n/a

Facility JPM #: 3-OT-JPMA087

Safety Function: 4S **Title:** Heat Removal From Reactor Core – Secondary System

K/A 054 AA1.01 Ability to operate and / or monitor the following as they apply to the Loss of Main Feedwater (MFW): AFW controls, including the use of alternate AFW.

Rating(s): 4.5/4.4 **CFR:** 41.7 / 45.5 / 45.6

Evaluation Method: Simulator ________ In-Plant ____________ **Classroom** X

References: SOI-3.02, "Auxiliary Feedwater System," Rev. 46.

Task Number: AUO-003-SOI-30.2-001 **Title:** Control the motor drive AFW pump level control valves manually

Task Standard: Establish communications with the Control Room Operator and assume local control of #1 S/G level using 1A-A Motor-Driven AFWP LCV.

Validation Time: minutes **Time Critical:** Yes _____ No X

===

Applicant: ____________________________ ____________________ Time Start: ________

NAME Docket No. Time Finish: ________

Performance Rating: SAT ____ UNSAT ____ Performance Time ___

Examiner: ____________________________ ____________________________/________

NAME SIGNATURE DATE

===

COMMENTS

Tools/Equipment/Procedures Needed:

Hard Hat, Safety Glasses, Hearing Protection, Gloves and Plant Approved Shoes
Copy of SOI-3.02, "Auxiliary Feedwater System", Section 8.5.marked NRC EXAM MATERIAL FOR TRAINING ONLY.

SAFETY CONSIDERATIONS:

Hot pipes, high noise, and heat.
Radiation levels.
Ladder use to reach valve handwheels

READ TO APPLICANT

DIRECTION TO APPLICANT:

I will explain the initial conditions, and state the task to be performed. All control room steps shall be performed for this JPM, including any required communications. I will provide initiating cues and reports on other actions when directed by you. Ensure you indicate to me when you understand your assigned task. To indicate that you have completed your assigned task return the cue sheet I provided you.

INITIAL CONDITIONS:

1. **The Unit is in Mode 3 with the RCS at 557°F and 2235 psig.**
2. **The TD AFW Pump is tagged for maintenance.**
3. **The Control Room Operator has been experiencing increasing difficulty in maintaining #1 S/G level.**
4. **You are the Auxiliary Building AUO and you have already checked out a radio.**

INITIATING CUES:

The Unit Supervisor has directed you to establish radio communications with the MCR and then take local control of SG 1 level via 1A-A MD AFWP, per SOI-3.02 Section 8.5.

STEP/STANDARD	SAT/UNSAT

START TIME: _______

STEP 1: Obtain a copy of the procedure. STANDARD: The applicant obtains a copy of SOI-3.02 Section 8.5. **Cue: After the performer has demonstrated the method of obtaining the correct instruction, the evaluator can provide a copy of the instruction.** COMMENTS:	___ SAT ___ UNSAT
NOTE Direct radio communication with UO is required to perform this section.	
STEP 2: Radio communications is established with the Main Control Room STANDARD: Applicant describes how to establish radio communications with the Main Control Room. **CUE: When contacted role play as the MCR / UO to simulate radio communications.** COMMENTS:	___ SAT ___ UNSAT

STEP/STANDARD	SAT/UNSAT
STEP 3: [1] **ENSURE** AFW Pump A-A running. STANDARD: Applicant determines that the 1A-A MD AFWP is running by observation or MCR information. **CUE:** **If asked, the MCR informs the applicant that the 1A-A MD AFWP is in service.** **CUE:** **If local indications checked, applicant can hear/feel normal pump running sound/vibration, discharge pressure 1150 psig** COMMENTS:	___ SAT ___ UNSAT

STEP/STANDARD	SAT/UNSAT
STEP 4: [2] **PERFORM** the following to fail CLOSED 1-PCV-3-122, AUX FEEDWATER PMP 1A-A DISCHARGE PRESS CONTROL [A3S/713]: [2.1] **CLOSE** 0-ISV-32-460, ESSENT CNTL AIR ISOL VALVE TO 1-PCV-3-122. [2.2] **DEPRESSURIZE** air from regulator on 1-PCV-3-122. STANDARD: ___Applicant locates and describes how to close 0-ISV-32-460, by rotating the handwheel in the clockwise direction. **CUE: After performer describes how to close valve, state valve handle rotates clockwise until it is snug.** **Step is critical to allow isolation of air to fail valve closed.** ___Applicant locates the petcock on local pressure regulator on 1-PCV-3-122 located and describes how to manually open to de-pressurize regulator. **CUE: After drain valve is opened, state that air is heard and felt coming from the drain, which then slows down and stops completely.** **IF ASKED about 1-PCV-3-122 response, state that as air was bled off, 1-PCV-3-122 stem moved down and is now completely down indicating closed** **Step is critical to allow bleed of air to fail valve closed.** COMMENTS:	**CRITICAL STEP** ___ SAT ___ UNSAT

STEP/STANDARD	SAT/UNSAT
STEP 5: [3] **IF** MANUAL control of SG 1 level is necessary, **THEN PERFORM** the following to fail OPEN 1-LCV-3-164, MD AFW PUMP 1A-A SG 1 LEVEL CONTROL [A3T/737 West Wall]: [3.1] **CLOSE** 1-ISV-32-3765, ESSENT CONTROL AIR ISOL VALVE TO 1-LCV-3-164. [3.2] **DEPRESSURIZE** air from regulator on 1-LCV-3-164. STANDARD: ___Applicant locates and describes how to close 0-ISV-32-3765, by rotating the handwheel in the clockwise direction. **CUE: After performer describes how to close valve, state valve handle rotates clockwise until it is snug.** **Step is critical to allow isolation of air, to fail valve open.** ___Applicant locates the petcock on local pressure regulator on 1-PCV-3-164 located and describes how to manually open to de-pressurize regulator. **CUE: After drain valve is opened, state that air is heard and felt coming from the drain, which then slows down and stops completely.** **IF ASKED about 1-PCV-3-164 response, state that as air was bled off, 1-PCV-3-164 stem moved down and is now completely down indicating closed.** **Step is critical to allow bleed of air, to fail valve closed.** COMMENTS:	**CRITICAL STEP** ___ SAT ___ UNSAT

STEP/STANDARD	SAT/UNSAT
STEP 6: [4] **IF** MANUAL control of SG 2 level is necessary, **THEN PERFORM** the following to fail OPEN 1-LCV-3-156, MD AFW PUMP 1A-A SG 2 LEVEL CONTROL [A3T/737 West Wall]: [4.1] **CLOSE** 1-ISV-32-3761, ESSENT CONTROL AIR ISOL VALVE TO 1-LCV-3-156. [4.2] **DEPRESSURIZE** air from regulator on 1-LCV-3-156. STANDARD: Applicant determines from the IINITIATING CUES that SG 2 manual level control is NOT REQUIRED. Applicant enters "N/A" for the step. **CUE: If control room contacted, state that manual level control of SG 2 is not required.** COMMENTS:	___ SAT ___ UNSAT

STEP/STANDARD	SAT/UNSAT

NOTE

Manual Handwheel on top of 1-PCV-3-122 must be turned CLOCKWISE to OPEN.

STEP 7: [5] **ADJUST** 1-PCV-3-122, AUX FEEDWATER PMP 1A-A DISCHARGE PRESS CONTROL to establish approx 1200 psid between 1-PI-3-117, AUX FEEDWATER PMP1A-A SUCTION PRESS, and 1-PI-3-122B, AUX FEEDWATER PMP 1A-A DISCHARGE PRESS [A3S/713]. STANDARD: Applicant describes how to manually adjust the hand wheel for 1-PCV-3-122 (clockwise to open) to establish approximately 1200 psid between 1-PI-3-117 and 1-PI-3-122B. **CUE: After adjustment of 1-PCV-3-122, indicate that 1-PI-3-117 reads 20 psig and 1-PI-3-122B reads 1200 psig** **Step is critical to establish sufficient pressure to establish flow to SG 1.** COMMENTS:	**CRITICAL STEP** ___ SAT ___ UNSAT

STEP/STANDARD	SAT/UNSAT
STEP 8: [6] **IF** SG 1 level to be controlled, **THEN UNLOCK** and **THROTTLE** 1-ISV-3-828, MD AFW PUMP 1A-A SG 1 LEVEL CONTROL ISOL, per UO instruction [A3T/737 West Wall]. STANDARD: Applicant locates 1-ISV-3-828 and describes how to unlock and manually throttle the valve (clockwise to open) ≈ 50%. **CUE:** **Inform the performer that the lock, if present, is a breakaway type lock.** **CUE:** **Respond as control room and request 1-ISV-3-828 be throttled to 50% open position.** **CUE:** **After valve is throttled, then respond as control room and state that the Rad Waste AUO will be contacted if additional adjustments are needed.** **Step is critical to control flow path to SG 1.** COMMENTS: **END OF TASK**	**CRITICAL STEP** ___ SAT ___ UNSAT

STOP TIME ________

APPLICANT CUE SHEET

(RETURN TO EXAMINER UPON COMPLETION OF TASK)

INITIAL CONDITIONS:

1. The Unit is in Mode 3 with the RCS at 557°F and 2235 psig.

2. The TD AFW Pump is tagged for maintenance.

3. The Control Room Operator has been experiencing increasing difficulty in maintaining #1 S/G level.

4. You are the Auxiliary Building AUO and you have already checked out a radio.

INITIATING CUES:

The Unit Supervisor has directed you to establish radio communications with the MCR and then take local control of SG 1 level via 1A-A MD AFWP, per SOI-3.02 Section 8.5.

TVA

Watts Bar Nuclear Plant

Unit 1

System Operating Instruction

SOI-3.02

Auxiliary Feedwater System

Revision 0046

Quality Related

Level of Use: Continuous Use

Effective Date: 09-19-2008

Responsible Organization: OPS, Operations

Prepared By: Patrick Salkeld

Approved By: Patrick Salkeld

Revision Log

Revision or Change Number	Effective Date	Affected Page Numbers	Description of Revision/Change
UC-1	06/03/06	2, 49	Added place-keeping bars to enhance human performance.
43	06/28/06	2	Incorporated UC-1.
44	09/28/06	All 9 22, 24, 61	This procedure has been converted from Word 95 to Word 2002(XP) using Rev 43 by the Watts Bar Conversion Team. Revised to remove a precaution pertaining to AFW operable status when placing SGBD in service during normal power operation with any AFW pump running. DCN 51937A (PER 77514) modified the SGBD Isolation/AFW Start logic to ensure automatic SGBD isolation upon receiving another AFW start signal with any AFW pump(s) running. DCN 51724. Deleted references to S/G Wet Layup Pumps. Specified long cycle deaeration vs forward flush for transferring from Aux. to Main feedwater.
45	05/24/07	22,24,27	Added 8.1.1[3], 8.1.2[3].8.1.3[3] to start AFWPs while maintaining SGBD in service. DCN 51937
46	09/19/08	2, 7, 49, 64, 77	PER Action 139538, Corrected a reference to 0-PI-OPS-17.0 for the position of 1-VTV-3-850 to CLOSED and CAPPED to be consistent with design drawings. Changed RadCon to Radiation Protection. Added a note prior to step 8.10[4] clarifying the following step. Corrected a typo in the UNID in step 8.6[2.8.4], adding the missing unit number.

Table of Contents

Table of Contents (continued)

1.0 INTRODUCTION

1.1 Purpose

To provide instructions for Operation of the Auxiliary Feedwater (AFW) System.

1.2 Scope

This Instruction includes startup and shutdown of the following equipment:

A. Motor-Driven Auxiliary Feedwater Pumps

B. Turbine-Driven Auxiliary Feedwater Pump

2.0 REFERENCES

2.1 Performance References

A. TI-4, Part III, "Plant Curve Book-Pump Curves"

B. Chemistry Manual

C. 0-PI-OPS-17.0, "18 Month Locked Valve Verification"

2.2 Developmental References

A. 1-SI-3-80, "18 Month Channel Calibration Of Auxiliary Feedwater Pump 1A-A Differential Pressure Loops 1-LPP-3-122C and 1-LPP-3-122A"

B. 1-SI-3-81, "18 Month Channel Calibration Of Auxiliary Feedwater Pump 1B-B Differential Pressure Loops 1-LPP-3-132C and 1-LPP-3-132A"

C. AOI-7 series, "Maximum Probable Flood"

D. FSAR 10.4.9, "Auxiliary Feedwater System"

E. GOI-7, Section 5.16, "Pump Pre-Startup and Post Startup Guidelines"

F. WBN-VTM-DR04-0240 "Vendor Technical Manual for Dresser-Rand (formerly Ingersoll-Rand, Turbine Driven Auxiliary Feedwater Pumps)"

G. WBN-VTM-I075-0070 "Vendor Technical Manual for Ingersoll-Rand Motor Driven Auxiliary Feedwater Pumps"

H. TI-57.002, "Verification of Normal Position for Nor-Aux Switches"

I. Tech Specs

J. TVA Drawings:
1-45N600-3-1, -2, -3, -4, -11
1-45N706-1, -2, -3, -4
1-45W600-46-6
1-45W703-5, -6, -7, -8
1-45W760-3-1, -2, -3, -4, -5
1-47W600-221, -221C
1-47W610-3-3
1-47W803-2, -3
1-47W804-1

3.0 PRECAUTIONS AND LIMITATIONS

A. Work in Radiologically Controlled Areas (RCAs) requires the use of existing Radiation Work Permits (RWPs) and may require additional ALARA Preplans. Failure to follow posted radiological control requirements can cause unnecessary radiation exposure. Radiation Protection should be notified of work having the potential to change radiological conditions.

B. Instrument maintenance department should be notified to ensure required instrumentation is placed in service to support system operation.

C. Pump recirculation valves must remain LOCKED-OPEN.

D. If Motor-Driven AFW Pump's suction pressure falls below 1.2 psig (A Train) or 2.0 psig (B Train) for 10 seconds, the suction will shift to ERCW supply. The Turbine-Driven AFW Pump suction ERCW supply will shift at the same time the associated trains MDAFW Pump suction shifts.

E. AFWT rated speed is 3950 rpm; minimum speed is 2076 rpm.

1. Electrical Overspeed TRIP at 4345 rpm (110%)

2. Mechanical Overspeed TRIP at 4937.5 rpm (125%).

F. A visual check is required to verify Trip and Throttle (T&T) valve motor operator is latched to the valve stem after resetting is to ensure the valve will OPEN on an automatic pump start signal. [3,5,8]

G. When charging a cold steam line to AFWT, the valve should be locally throttled to warm the line slowly to avoid water hammer.

H. Tech Spec LCOs require all AFW Pumps OPERABLE in MODES 1, 2, and 3, and only 1 MD AFW Pump required OPERABLE in MODE 4.

I. Main Steam must be at or above 125 psig for T-D Pump to be OPERABLE.

J. The following computer points indicate backleakage in each loop supply piping:

Loop 1 - log T-2425 (variable)	Loop 3 - log T-2427 (190°F)
Loop 2 - log T-2426 (190°F)	Loop 4 - log T-2428 (variable)

Backleakage may cause steam binding of AFW Pump(s) or water/steam hammer on pump start. If loop piping exceeds the computer high temp alarm limit, total flow rate to affected loop should be minimized until temp is below the high limit, unless a valid emergency start condition exists. Consideration should be given to periodic operation of appropriate AFW Pump(s) to maintain cooling for affected piping. (Memo T28 950512 912)

3.0 PRECAUTIONS AND LIMITATIONS (continued)

K. After each AFWP start, 6.9kV ACB closing spring must be checked to ensure it is charged.[10]

L. An operator with no other duties will be assigned to initiate AFW any time the auto initiation circuits are inoperable. Engineering or Maintenance personnel must notify the Shift Manager (SM) if this condition exists.[8]

M. Excessive RCS cooldown is possible when using AFW System.

N. Any time Turbine Driven or Motor Driven AFW Pumps are running, oil level and temperature should be checked frequently. Pumps must be TRIPPED if pump bearing oil temperature exceeds 165°F and cause of overheating determined, and corrected prior to pump resuming operation.

O. Turbine Bearing Oil pressure should be above 15 psig, and Turbine Bearing Oil temperature below 180°F. TD AFW Pump should be TRIPPED if Turbine Bearing Oil Temperature exceeds 200°F.

P. When SGs are above 212°F, backleakage to the AFW system can lead to pump steam binding. AUO rounds require periodic checking of the pumps for this condition. Venting is required until the cause is found and corrected whenever this condition occurs. [1, 2, 4, 6, 7]

Q. 4" LCVs from M-D AFWPs auto close when Feedwater header pressure drops below 500 psig to prevent cavitation damage to LCV.

R. Low flow operation of both motor and turbine driven AFW pumps must be minimized to prevent possible degradation of pump impeller. Main Feedwater System should be utilized for low flow conditions if available.

S. The minimum pressure that the backup nitrogen supply bottles can reach and still supply the required volume to cycle one train of LCVs five times, is 1085 psig. Bottles should be changed out when pressure lowers to 1200 psig or below.

T. With the additional recirculation line in service, use of the Motor-driven pump(s) (if available), is preferred over the use of the Turbine-driven pump during low flow conditions when the AFW demand is within the capability of the Motor-driven pump(s).

U. SGBD isolation will initially raise indicated Calorimetric Power associated with the resulting feedwater flow transient. It may take several minutes for Calorimetric Power and Feedwater Flow to stabilize at their new lower values.[11]

V. The turbine lube oil level in the sight glass is expected to drop out of the marked fill band while the turbine is operating, but oil level should remain visible in the sight glass at all times.

3.0 PRECAUTIONS AND LIMITATIONS (continued)

W. When the NOR-AUX transfer switches for the AFW controllers are in the NOR position, the master level controller for each SG at the local station (T-D pump) and in the Aux Control room (M-D pump) can be operated in MANUAL if the corresponding MCR controllers are selected to AUTO. Placing the master controller(s) in MANUAL will override the MCR controllers (if they are in AUTO) & allow control from the master controller if necessary; likewise, placing the MCR controllers in MANUAL will override the master controllers & allow manual control from the MCR controller if necessary, even if the master controller is also in MANUAL. Green lights on the controllers indicate AUTO mode on that controller, red lights indicate MANUAL mode on that controller, and the left amber light on the MCR controllers indicate that the MCR controller is in control. The right amber lights on the MCR controllers indicate that the master controller is in control. Master controller amber lights are **NOT** operable.

X. Loss of power to the control circuits for the MDAFW LCVs or TDAFW LCVs or master flow controller will result in the controller swapping to MAN after power is restored. Operator action will be required to **GO TO** the master controller (Aux. Control Rm. for MD AFW, local control station on El. 692 for TD AFW), match the setpoint and controller output, and place controller back in AUTO. Checking MCR controllers after placing master controllers in AUTO is also recommended for the affected AFW controllers, to ensure they are also in AUTO.

Date________ **Initials**

4.0 PREREQUISITE ACTIONS

NOTES

1) Signoffs/information in unused sections may be left blank.
2) Throughout this instruction where **IF/THEN** exists, the step is **N/A** if the condition does **NOT** exist.
3) Throughout this instruction, Concurrent Verification (CV) may be marked **N/A** for breaker or fuse steps where no manipulation is performed.

4.1 Preliminary Actions

[1] **INDICATE** Section to be used, and the reason.

5.0	Standby Alignment	________	7.0	Shutdown	N/A
6.0	Normal Operation	N/A	8.0	Infrequent Operations	________

SubSection/ Reason/ Remarks: ____________________

____

____

4.2 Field Preparations

[1] **REVIEW** Plant procedures, processes, and programs in progress to ensure accurate configuration of components necessary for System operation. ________

[2] **ENSURE** AFWT Room sump pumps are in service. ________

[3] **ENSURE** CST meets chemical requirements of destination per Chemistry Manual. ________

[4] **ENSURE** ERCW valves to AFW Pumps CLOSED. ________

4.3 Approvals and Notifications

[1] **COORDINATE** system operations/manipulations with Unit Operator (UO). ________

Date________ **Initials**

5.0 STANDBY ALIGNMENT

CAUTION
Consideration should be given to the radiological condition of CST water if a known SG tube leak exists.

[1] **IF** AFW System **NOT** FILLED and VENTED, **THEN**

PERFORM the following:

[1.1] **CHECK** 1-ISV-2-504, AUX FEEDWATER PUMP CST A SUP HDR ISOL, LOCKED OPEN [T15N/718]. ________

[1.2] **THROTTLE OPEN** 1-ISV-3-800, CONDENSATE SUPPLY ISOL TO AUX FEEDWATER [A15Q/713]. ________

[1.3] **PERFORM** the following to vent AFWP Suction Header:

[1.3.1] **REMOVE** cap and **OPEN** 1-VTV-3-908, AUX FEEDWATER PUMP SUCTION VENT [A15Q/713]. ________

[1.3.2] **WHEN** a solid stream of water exists, **THEN**

CLOSE 1-VTV-3-908 and **REPLACE** cap. ________

________ IV

[1.3.3] **REMOVE** cap and **OPEN** 1-VTV-3-909, AUX FEEDWATER PUMP SUCTION VENT [A3S/713]. ________

[1.3.4] **WHEN** a solid steam of water exists, **THEN**

CLOSE 1-VTV-3-909 and **REPLACE** cap. ________

________ IV

[1.4] **VENT** AFW PUMP 1A-A per Section 8.7. ________

[1.5] **VENT** AFW PUMP 1B-B per Section 8.7. ________

[1.6] **VENT** TD AFW PUMP per Section 8.7. ________

Date________ Initials

5.0 STANDBY ALIGNMENT (continued)

[1.7] **LOCK OPEN** 1-ISV-3-800, CONDENSATE SUPPLY ISOL TO AUX FEEDWATER [A15Q/713]. ________

____
2nd

CAUTION

Use of the trap bypass valves (high & low press traps) should be restricted to initial warming of the steam lines. At low steam press conditions (500 psi or less), traps bypass should be restricted to 20 min. At high steam pressure conditions (above 500 psi) traps bypass should be restricted to 5 min. (e.g. when the system is being prepared for operability or in specific corrective maintenance actions).

[2] **OPEN** 1-BYV-3-949, TD AUX FW PMP DR TANK OUT DR TRAPS A/B BYPASS, [A2T/692]. ________

NOTE

Trap bypass valves are controlled to prevent excessive steam buildup in TDAFP Room.

[3] **OPEN** the following:

NOMENCLATURE	LOCATION	POSITION	UNID	PERF INITIAL
TD AUX FEEDWATER PUMP MS DRAIN TRAP DRAIN	A2T/692	OPEN	1-DRV-3-919	
TD AUX FEEDWATER PUMP MS DRAIN TRAP DRAIN	A2T/692	OPEN	1-DRV-3-918	

[4] **WHEN** steam lines are warm, **THEN**

CLOSE the following:

NOMENCLATURE	LOCATION	POSITION	UNID	PERF INITIAL	VERIF INITIAL
TD AUX FEEDWATER PUMP MS DRAIN TRAP DRAIN	A2T/692	CLOSED	1-DRV-3-919		IV
TD AUX FEEDWATER PUMP MS DRAIN TRAP DRAIN	A2T/692	CLOSED	1-DRV-3-918		IV

Date________ Initials

5.0 STANDBY ALIGNMENT (continued)

[5] **WHEN** steam lines are warm, **THEN**

CLOSE 1-BYV-3-949, TD AUX FW PMP DR TANK OUT DR TRAPS A/B BYPASS, [A2T/692]. ________ ________ IV

[6] **ENSURE** the following:

NOMENCLATURE	LOCATION	POSITION	UNID	PERF INITIAL	VERIF INITIAL
TD AFW PMP CONTROLS TRANSFER SWITCH	A2T/692, Behind CCS seal tank	NORMAL	1-XS-46-57		IV
TD AFW PMP AC MANUAL TRANSFER SWITCH	A2T/692, Behind 1-L-381	NORMAL	1-XSW-46-AC		IV
TD AFW PMP DC MANUAL TRANSFER SWITCH	A2T/692, Behind CCS seal tank	NORMAL	1-XSW-46-DC		IV
TD AFW PMP FW DISCH FLOW IND CNTLR XFER SW	A2T/692 W. of 1-L-381	NORMAL	1-XS-46-57A		IV

CAUTION

Setpoints on the controllers in Steps 5.0[7] and 5.0[8] are adjusted by MIG. If controller setpoints are **NOT** within the range specified, MIG should be notified.

[7] **CHECK** 1-FIC-46-57B, TD AFW PMP FW DISCH FLOW IND CNTLR, in **AUTO** and set for 850 gpm [1-L-381]. ________ ________ IV

Date________ Initials

5.0 STANDBY ALIGNMENT (continued)

[8] **CHECK** the following Level Controllers in AUTO AND set between 37% and 39% [1-L-381]:

[8.1] 1-LIC-3-172B, TD AFW PUMP SG 3 LVL CNTL ________ ________ IV

[8.2] 1-LIC-3-173B, TD AFW PUMP SG 2 LVL CNTL ________ ________ IV

[8.3] 1-LIC-3-174B, TD AFW PUMP SG 1 LVL CNTL ________ ________ IV

[8.4] 1-LIC-3-175B, TD AFW PUMP SG 4 LVL CNTL ________ ________ IV

[9] **ENSURE** 1-XC-46-54, TD AFW PMP POT SPEED CONTROL, set at 0 [Full Counterclockwise (CCW) Position] [1-L-381]. ________ ________ IV

[10] **ENSURE** Mechanical Overspeed Trip Device LATCHED and 1-FCV-1-51 Motor Drive LATCHED to valve stem. (Refer to Section 8.3)[3,5,8] ________ ________ IV

NOTE
1-PDIC-3-122C & 132C thumb wheels are set IAW 1-SI-3-80 & 81

[11] **ENSURE** Auxiliary Control Room Switches and Controllers set as follows:

[11.1] 1-PDIC-3-122C, AFW PMP 1A-A DISCH PRESS CNTL, in **AUTO** (1-SI-3-80) ________ ________ IV

Date________ Initials

5.0 STANDBY ALIGNMENT (continued)

[11.2] 1-PDIC-3-132C, AFW PMP 1B-B DISCH PRESS CNTL, in AUTO (1-SI-3-81) ________ ________ IV

[12] **ENSURE** Normal-Aux switches in NORMAL [1-L-11A]:

[12.1] 1-XS-3-122, AFW PMP A-A DISCH PCV CONTROLLER ________ ________ IV

[12.2] 1-XS-3-156, AFW TO SG 2 FROM PMP A-A ________ ________ IV

[12.3] 1-XS-3-164, AFW TO SG 1 FROM PMP A-A ________ ________ IV

[12.4] 1-XS-3-172, AFW TO SG 3 FROM T-D PMP ________ ________ IV

[12.5] 1-XS-3-175, AFW TO SG 4 FROM T-D PMP ________ ________ IV

[12.6] 1-XS-3-164A, AFW TO SG 1 ________ ________ IV

[12.7] 1-XS-3-172A, AFW TO SG 3 ________ ________ IV

[12.8] 1-XS-3-175A, AFW TO SG 4 ________ ________ IV

[12.9] 1-XS-3-156A, AFW TO SG 2 ________ ________ IV

Date________ Initials

5.0 STANDBY ALIGNMENT (continued)

[13] **ENSURE** Normal-Aux switches in NORMAL [1-L-11B]: ________ ________ IV

[13.1] 1-XS-3-132, AFW PMP B-B DISCH PCV CONTROLLER ________ ________ IV

[13.2] 1-XS-3-148, AFW TO SG 3 FROM PMP B-B ________ ________ IV

[13.3] 1-XS-3-171, AFW TO SG 4 FROM PMP B-B ________ ________ IV

[13.4] 1-XS-3-173, AFW TO SG 2 FROM T-D PMP ________ ________ IV

[13.5] 1-XS-3-174, AFW TO SG 1 FROM T-D PMP ________ ________ IV

[13.6] 1-XS-3-171A, AFW TO SG 4 ________ ________ IV

[13.7] 1-XS-3-173A, AFW TO SG 2 ________ ________ IV

[13.8] 1-XS-3-174A, AFW TO SG 1 ________ ________ IV

[13.9] 1-XS-3-148A, AFW TO SG 3 ________ ________ IV

Date________ **Initials**

5.0 STANDBY ALIGNMENT (continued)

CAUTION

Setpoints on the controllers in Step 5.0[14] are adjusted by MIG. If controller setpoints are **NOT** within the range specified, MIG should be notified.

[14] **CHECK** the following Level Controllers in AUTO **AND** set between 37% and 39% [AUX Control Room]:

[14.1] 1-LIC-3-156B, AFW TO SG 2 FROM PMP A-A [Panel 1-L-11A] ________ ________ IV

[14.2] 1-LIC-3-164B, AFW TO SG 1 FROM PMP A-A [Panel 1-L-11A] ________ ________ IV

[14.3] 1-LIC-3-148B, AFW TO SG 3 FROM PMP B-B [Panel 1-L-11B] ________ ________ IV

[14.4] 1-LIC-3-171B, AFW TO SG 4 FROM PMP B-B [Panel 1-L-11B] ________ ________ IV

CAUTION

Steam Generator Level Control Valves may leak by if **NOT** electrically closed prior to placing in AUTO.

[15] **ENSURE** Main Control Room (MCR) switches and controllers set as follows:

[15.1] 1-HS-3-118A, AFW PMP A-A, in **A-P AUTO** ________ ________ IV

[15.2] 1-HS-3-128A, AFW PMP B-B, in **A-P AUTO** ________ ________ IV

Date________ **Initials**

5.0 STANDBY ALIGNMENT (continued)

NOTES

1) 1-PDIC-3-122A & 132A thumb wheels are set IAW 1-SI-3-80 & 81.

[15.3] 1-PDIC-3-122A, AFW PMP A-A DISCH PRESS CONTROL, in **AUTO.** ________ ________ IV

[15.4] 1-PDIC-3-132A, AFW PMP B-B DISCH PRESS CONTROL, in **AUTO.** ________ ________ IV

[15.5] 1-HS-46-57-S, T-D AFWP CONTROL, in **AUTO.** (1-XI-46-57 should slowly **GO TO** 100% if **NOT** already at 100%) [M-4] ________ ________ IV

[15.6] 1-HS-1-15A, SG 1 STEAM SUPPLY TO T-D AFW PMP, **OPEN** in **P AUTO** ________ ________ IV

[15.7] 1-HS-1-16A, SG 4 STEAM SUPPLY TO T-D AFW PMP, **CLOSED** in **P AUTO** ________ ________ IV

[15.8] 1-HS-1-17A, STEAM HDR TO T-D AFW PMP, **OPEN** in **PULL P AUTO** ________ ________ IV

[15.9] 1-HS-1-18A, STEAM HDR TO T-D AFW PMP, **OPEN** in **PULL P AUTO** ________ ________ IV

[15.10] 1-HS-3-355, M-D AFWP 1A RECIRC VALVE, in **CLOSED.** ________ ________ IV

Date________ Initials

5.0 STANDBY ALIGNMENT (continued)

[15.11] 1-HS-3-359, M-D AFWP 1B RECIRC VALVE, in **CLOSED.** ________

________ IV

[16] **VERIFY** CST Level at or above 200,000 gal. ________

NOTE

Step 5.0[17] may be marked **N/A** when RCS is less than 330°F. (Ref GO-1)

[17] **PERFORM** the following:

NOMENCLATURE	LOCA TION	POSITION	UNID	PERF INITIALS	VERF INITIALS
480V REACTOR MOV BOARD 1A2-A					
ERCW HDR A AFW PMP 1A-A SUCTION (1-FCV-3-116A)	C/2A	ON	1-BKR-3-116A		IV
ERCW HDR A AFW PMP 1A-A SUCTION (1-FCV-3-116B)	C/2B	ON	1-BKR-3-116B		IV
ERCW HDR A TD AFW PMP SUCTION (1-FCV-3-136A)	C/3A	ON	1-BKR-3-136A		IV
ERCW HDR A TD AFW PMP SUCTION (1-FCV-3-136B)	C/3B	ON	1-BKR-3-136B		IV
480V REACTOR MOV BOARD 1B2-B					
ERCW HDR B AFW PMP 1B-B SUCTION (1-FCV-3-126A)	C/2A	ON	1-BKR-3-126A		IV
ERCW HDR B AFW PMP 1B-B SUCTION (1-FCV-3-126B)	C/2B	ON	1-BKR-3-126B		IV
ERCW HDR B TD AFW PMP SUCTION (1-FCV-3-179A)	C/3A	ON	1-BKR-3-179A		IV
ERCW HDR B TD AFW PMP SUCTION (1-FCV-3-179B)	C/3B	ON	1-BKR-3-179B		IV

6.0 NORMAL OPERATION

AFW provides a RCS heat sink during cooldown and when the Main Feedwater (MFW) System is unavailable. AFW is normally in "STANDBY" subject to the following AUTO-STARTS:

MOTOR-DRIVEN PUMPS		TURBINE-DRIVEN PUMP	
1	Loss of both MFW Pumps	1	Loss of both MFW Pumps
2	Lo-Lo Level in any SG	2	Lo-Lo Level in 2/4 SGs
3	Safety Injection	3	Safety Injection
4	Blackout	4	Blackout
5	.AMSAC	5	AMSAC

After starting, the respective Level Control Valves (LCVs) automatically maintain SG levels at 38%. 200,000 gal in the CST will maintain the unit at HOT STANDBY for 2 hours, followed by a 4 hour cooldown to 350°F, while dumping steam to atmosphere concurrent with total loss of offsite power. If an additional supply to AFW is needed, ERCW discharge headers can be aligned to AFW Pumps suction automatically on low suction pressure or manually by the operator.

With the additional recirculation line in service, use of the Motor-driven pump(s) (if available), is preferred over the use of the Turbine-driven pump during low flow conditions when the AFW demand is within the capability of the Motor-driven pump(s).

Applicable checklists are performed at discretion of operations Superintendent or designee. Checklists will normally be performed for system alignment verification in Mode 5 or when alignment verifications needed.

SGBD isolation will initially raise indicated Calorimetric Power associated with the resulting feedwater flow transient. It may take several minutes for Calorimetric Power and Feedwater Flow to stabilize at their new lower values.

7.0 SHUTDOWN

AFW System remains in STANDBY alignment.

Date________ **Initials**

8.0 INFREQUENT OPERATIONS

8.1 Manual Operation from Standby

8.1.1 Manual Startup of AFW Pump A-A

NOTES

1) Pump pre/post starting guidelines are in GOI-7.
2) AFW PMP A-A is capable of supplying 410 gpm to SGs 1 and 2.

[1] **PLACE** the following Level Indicating Controllers in MANUAL:

[1.1] 1-LIC-3-156A, SG 2 SUPPLY FRM PMP A-A ________

[1.2] 1-LIC-3-164A, SG 1 SUPPLY FRM PMP A-A ________

[2] **ENSURE** the following valves **CLOSED:** ________

[2.1] LCV-3-156, SG 2 SUPPLY LCV-3-156 CNTL ________

[2.2] LCV-3-164, SG 1 SUPPLY LCV-3-164 CNTL ________

NOTE

SGBD isolation will initially raise indicated Power Calorimetric associated with the resulting feedwater flow transient. It may take several minutes for Calorimetric Power and Feedwater Flow to stabilize at their new lower values.

[3] **IF** it is desired to maintain Steam Generator Blowdown, **THEN** **HOLD** the following handswitches in OPEN while starting AFW PMP A-A:

NOMENCLATURE	LOCATION	POSITION	UNID	PERF INITIAL
SG 2 BLOWDOWN VLVS	1-M-4	OPEN	1-HS-1-14/182	
SG 4 BLOWDOWN VLVS	1-M-4	OPEN	1-HS-1-32/184	

[4] **PLACE** 1-HS-3-118A, AFW PMP A-A, in START. ________

Date________ **Initials**

8.1.1 Manual Startup of AFW Pump A-A (continued)

[5] **MANUALLY** control LCVs with the following Level Indicating Controllers until levels and flows stabilize:

[5.1] 1-LIC-3-156A, SG 2 SUPPLY FRM PMP A-A ________

[5.2] 1-LIC-3-164A, SG 1 SUPPLY FRM PMP A-A ________

[6] **IF** desired **THEN,**

PLACE in AUTO:

[6.1] 1-LIC-3-156A, SG 2 SUPPLY FRM PMP A-A ________

[6.2] 1-LIC-3-164A, SG 1 SUPPLY FRM PMP A-A ________

[7] **CHECK** AFW Pump A-A for proper operation.

[8] **IF** required **THEN,**

REESTABLISH S/G Blowdown per SOI-15.01 ________

Date________ Initials

8.1.2 Manual Startup of AFW Pump B-B

NOTES

1) Pump pre/post starting guidelines are in GOI-7.

2) AFW PMP B-B is capable of supplying 410 gpm to SGs 3 and 4.

[1] **PLACE** the following Level Indicating Controllers in **MANUAL**:

[1.1] 1-LIC-3-148A, SG 3 SUPPLY FRM PMP B-B ________

[1.2] 1-LIC-3-171A, SG 4 SUPPLY FRM PMP B-B ________

[2] **ENSURE** the following valves **CLOSED**

[2.1] LCV-3-148, SG 3 SUPPLY LCV-3-148 CNTL ________

[2.2] LCV-3-171, SG 4 SUPPLY LCV-3-171 CNTL ________

NOTE

SGBD isolation will initially raise indicated Power Calorimetric associated with the resulting feedwater flow transient. It may take several minutes for Calorimetric Power and Feedwater Flow to stabilize at their new lower values.

[3] **IF** it is desired to maintain Steam Generator Blowdown, **THEN** **HOLD** the following handswitches in OPEN while starting AFW PMP B-B:

NOMENCLATURE	LOCATION	POSITION	UNID	PERF INITIAL
SG 1 BLOWDOWN VLVS	1-M-4	OPEN	1-HS-1-7/181	
SG 3 BLOWDOWN VLVS	1-M-4	OPEN	1-HS-1-25/183	

[4] **PLACE** 1-HS-3-128A, AFW PMP B-B, in START. ________

[5] **MANUALLY** control LCVs with the following Level Indicating Controllers until levels and flows stabilize:

[5.1] 1-LIC-3-148A, SG 3 SUPPLY FRM PMP B-B ________

[5.2] 1-LIC-3-171A, SG 4 SUPPLY FRM PMP B-B ________

Date________ **Initials**

8.1.2 Manual Startup of AFW Pump B-B (continued)

[6] **IF** desired, **THEN**,

PLACE in **AUTO:**

[6.1] 1-LIC-3-148A, SG 3 SUPPLY FRM PMP B-B ________

[6.2] 1-LIC-3-171A, SG 4 SUPPLY FRM PMP B-B ________

[7] **CHECK** AFW Pump B-B for proper operation. ________

[8] **IF** required **THEN**,

RESTABLISH S/G Blowdown per SOI-15.01 ________

Date________ **Initials**

8.1.3 Manual Startup of Turbine Driven AFW Pump

NOTES
1) With the additional recirculation line in service, use of the Motor-driven pump(s) (if available), is preferred over the use of the Turbine-driven pump during low flow conditions when the AFW demand is within the capability of the Motor-driven pump(s).
2) Pump pre/post starting guidelines are in GOI-7.
3) TD AFW PMP is capable of supplying 720 gpm to any or all SGs

[1] **PLACE** the following Level Indicating Controllers in **MANUAL:**

[1.1] 1-LIC-3-172A, SG 3 SUPPLY FRM T-D PMP

[1.2] 1-LIC-3-173A, SG 2 SUPPLY FRM T-D PMP

[1.3] 1-LIC-3-174A, SG 1 SUPPLY FRM T-D PMP

[1.4] 1-LIC-3-175A, SG 4 SUPPLY FRM T-D PMP ________

[2] **ENSURE** the following valves **CLOSED:**

[2.1] LCV-3-172, SG 3 SUPPLY LCV-3-172 CNTL

[2.2] LCV-3-173, SG 2 SUPPLY LCV-3-173 CNTL

[2.3] LCV-3-174, SG 1 SUPPLY LCV-3-174 CNTL

[2.4] LCV-3-175, SG 4 SUPPLY LCV-3-175 CNTL ________

Date________ **Initials**

8.1.3 Manual Startup of Turbine Driven AFW Pump (continued)

NOTE

SGBD isolation will initially raise indicated Power Calorimetric associated with the resulting feedwater flow transient. It may take several minutes for Calorimetric Power and Feedwater Flow to stabilize at their new lower values.

[3] **IF** it is desired to maintain Steam Generator Blowdown, **THEN**

HOLD the following handswitches in OPEN while starting the TDAFW pump:

NOMENCLATURE	LOCATION	POSITION	UNID	PERF INITIAL
SG 1 BLOWDOWN VLVS	1-M-4	OPEN	1-HS-1-7/181	
SG 2 BLOWDOWN VLVS	1-M-4	OPEN	1-HS-1-14/182	
SG 3 BLOWDOWN VLVS	1-M-4	OPEN	1-HS-1-25/183	
SG 4 BLOWDOWN VLVS	1-M-4	OPEN	1-HS-1-32/184	

[4] **PLACE** 1-HS-46-56A-S, T-D AFWP T&T VLV, in **OPEN, AND**

ENSURE AFWT comes to operating speed of 3900 to 4000 rpm (1-SI-46-56A-S). ________

Date________ Initials

8.1.3 **Manual Startup of Turbine Driven AFW Pump (continued)**

[5] **MANUALLY** control LCVs with the following Level Indicating Controllers until levels and flows stabilize:

[5.1] 1-LIC-3-172A, SG 3 SUPPLY FRM T-D PMP ________

[5.2] 1-LIC-3-173A, SG 2 SUPPLY FRM T-D PMP ________

[5.3] 1-LIC-3-174A, SG 1 SUPPLY FRM T-D PMP ________

[5.4] 1-LIC-3-175A, SG 4 SUPPLY FRM T-D PMP ________

[6] **IF** desired **THEN,**

PLACE in **AUTO:**

[6.1] 1-LIC-3-172A, SG 3 SUPPLY FRM T-D PMP ________

[6.2] 1-LIC-3-173A, SG 2 SUPPLY FRM T-D PMP ________

[6.3] 1-LIC-3-174A, SG 1 SUPPLY FRM T-D PMP ________

[6.4] 1-LIC-3-175A, SG 4 SUPPLY FRM T-D PMP ________

[7] **CHECK** Turbine Driven AFW Pump for proper operation. ________

[8] **IF** required **THEN,**

RESTABLISH S/G Blowdown per SOI-15.01 ________

Date________ Initials

8.1.4 Manual Shutdown of AFW Pump A-A

[1] **ENSURE** NO Auto Start Signal present (**REFER TO** Section 6.0). ________

[2] **PLACE** 1-HS-3-118A, AFW PMP A-A, in STOP. ________

[3] **IF** 1-FCV-3-355, AUX FEEDWATER PMP 1A-A RECIRC FLOW valve is OPEN, **THEN**

CLOSE 1-FCV-3-355. ________

________ IV

[4] **ENSURE** the following Level Indicating Controllers **CLOSED** and in **AUTO:**

[4.1] 1-LIC-3-156A, SG 2 SUPPLY FRM PMP A-A ________

________ IV

[4.2] 1-LIC-3-164A, SG 1 SUPPLY FRM PMP A-A ________

________ IV

[5] **WHEN** AFW Pump A-A has been shutdown for approximately 30 minutes**, THEN**

CHECK casing and discharge piping temperature less than or equal to 150°F to ensure proper seating of discharge check valves.[6] ________

Date________ Initials

8.1.5 Manual Shutdown of AFW Pump B-B

[1] **ENSURE** NO Auto Start Signal present (**REFER TO** Section 6.0). ________

[2] **PLACE** 1-HS-3-128A, AFW PMP B-B, in **STOP.** ________

[3] **IF** 1-FCV-3-359, AUX FEEDWATER PMP 1B-B RECIRC FLOW valve is OPEN**, THEN**

CLOSE 1-FCV-3-359. ________

________ IV

[4] **ENSURE** the following Level Indicating Controllers **CLOSED** and in **AUTO:**

[4.1] 1-LIC-3-148A, SG 3 SUPPLY FRM PMP B-B ________

________ IV

[4.2] 1-LIC-3-171A. SG 4 SUPPLY FRM PMP B-B ________

________ IV

[5] **WHEN** AFW Pump B-B has been shutdown for approximately 30 minutes, **THEN**

CHECK casing and discharge piping temperature less than or equal to 150°F to ensure proper seating of discharge check valves.[6] ________

Date________ **Initials**

8.1.6 Manual Shutdown of Turbine Driven AFW Pump

[1] **ENSURE** NO Auto Start Signal present (**REFER TO** Section 6.0). ________

[2] **PLACE** 1-HS-46-56A-S, T-D AFWP T&T VLV, in CLOSE. ________

[3] **WHEN** turbine speed is zero (1-SI-46-56A-S), **THEN**

ENSURE 1-FCV-1-51, TD AUX FEEDWATER PMP TRIP & THROTTLE VALVE is RESET. (**REFER TO** Section 8.3) ________

[4] **IF** AFWP casing or discharge piping temperature above 150°F, **THEN**

VENT pump casing every 4 hours until condition no longer exists [7] (**REFER TO** Section 8.7). ________

[5] **ENSURE** the following Level Indicating Controllers **CLOSED** and in **AUTO:**

[5.1] 1-LIC-3-172A, SG 3 SUPPLY FRM T-D PMP ________ ________ IV

[5.2] 1-LIC-3-173A, SG 2 SUPPLY FRM T-D PMP ________ ________ IV

[5.3] 1-LIC-3-174A, SG 1 SUPPLY FRM T-D PMP ________ ________ IV

[5.4] 1-LIC-3-175A, SG 4 SUPPLY FRM T-D PMP ________ ________ IV

Date________ Initials

8.2 Changing AFW Suction from Normal to Emergency

CAUTION

The Unit SRO should be notified before the following is initiated. Efforts should be made to provide DI water to the CST by makeup from DI plants, Hotwell, or use of temporary hoses connected to DI Water sources.

NOTE

This mode is used if CST (or other source of DI Water) is unavailable.

8.2.1 TD AFW PMP

NOTE

There are two supplies, one from each ERCW Discharge Header.

[1] **DETERMINE** which header to use.

[2] **ALIGN** as follows:

[2.1] Header A:

[2.1.1] **OPEN** 1-FCV-3-136A and 1-FCV-3-136B, ERCW TO T-D AFWP SUCT FRM HDR A with 1-HS-3-136A/A (1-M-3). ________

[2.1.2] **CLOSE** 1-TTV-3-811, TD AUX FEEDWATER PUMP ERCW TELLTALE DRAIN. ________

[2.2] Header B:

[2.2.1] **OPEN** 1-FCV-3-179A and 1-FCV-3-179B, ERCW TO T-D AFWP SUCT FRM HDR B with 1-HS-3-179A/A (1-M-3). ________

[2.2.2] **CLOSE** 1-TTV-3-812, TD AUX FEEDWATER PUMP ERCW TELLTALE DRAIN. ________

[3] **MONITOR** TD AFW Pump operation. ________

Date________ Initials

8.2.2 AFW PMP A-A (Header A)

[1] **OPEN** 1-FCV-3-116A and 1-FCV-3-116B, ERCW TO AFWP A-A SUCT HDR A with 1-HS-3-116A/A (1-M-3). ________

[2] **CLOSE** 1-TTV-3-807, AUX FEEDWATER PMP 1A-A SUCTION TELLTALE DRAIN. ________

[3] **MONITOR** AFW Pump A-A operation ________

8.2.3 AFW PMP B-B (Header B)

[1] **OPEN** 1-FCV-3-126A and 1-FCV-3-126B, ERCW TO AFWP B-B SUCT HDR B with 1-HS-3-126A/A (1-M-3). ________

[2] **CLOSE** 1-TTV-3-808, AUX FEEDWATER PMP 1B-B SUCTION TELLTALE DRAIN. ________

[3] **MONITOR** AFW Pump B-B operation. ________

8.2.4 Aligning HPFP System to Discharge

Provisions are made for installing a spool piece to align HPFP to the discharge of each motor-driven pump upstream of the SG LCVs. Control function will remain normal; however, ability to inject water in this mode is limited to 120-130 psig, i.e., limit of the HPFP system. This will be done only with SM approval. Operation in this mode is described in AOI-7 series instructions.

Date________ **Initials**

8.3 Resetting AFWT Overspeed Trip [3,5,8]

Source Note 3, 5, 8 applies to this section

NOTES

1) Following an Overspeed Trip, the 1-HS-46-56B, TD AFW PMP TRIP/THV 1-FCV-1-51 POS CNTL, local limit lights will show valve CLOSED.

2) FIGURE 1 provides additional information for local operation.

[1] **IF** a Mechanical Overspeed Trip occurred**, THEN**

RELATCH the Mechanical Overspeed Trip Device locally. ________

____
IV

CAUTION

If AFWP start signal is present when motor drive is latched to valve stem, pump could start unexpectedly when latching is complete.

[2] **IF** in the MCR, **THEN**

PLACE 1-HS-46-56A-S, T-D AFWP T&T VLV**,** in **CLOSE,** and

HOLD for 30 seconds to latch 1-FCV-1-51 motor drive to the valve stem. ________

Date________ **Initials**

8.3 Resetting AFWT Overspeed Trip [3,5,8] (continued)

[3] **IF** local [A3T/692], **THEN**

[3.1] **PLACE** 1-XS-46-57, TD AFW PMP CONTROLS TRANSFER SWITCH to AUX. [behind CCS seal leakage tank] ________

[3.2] **DEPRESS** 1-HS-46-56B, TD AFW PMP and TRIP/THV 1-FCV-1-51 POS CNTL, to CLOSE, **AND**

HOLD for 30 seconds to latch 1-FCV-1-51 motor drive to the valve stem. ________

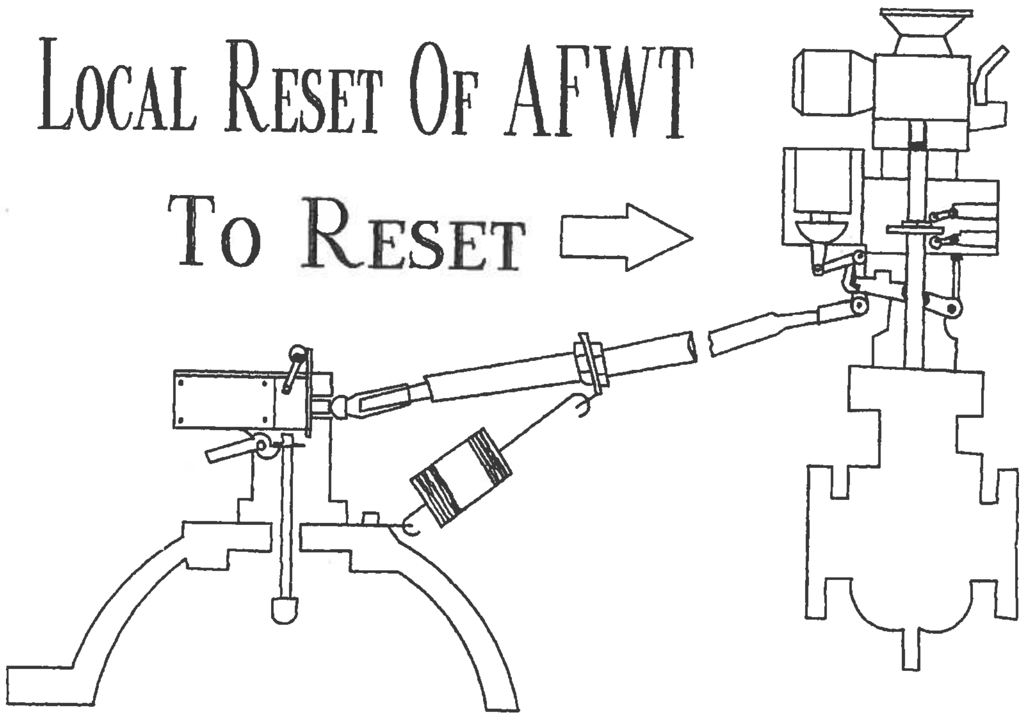
[4] **IF** Turbine will **NOT** be restarted immediately, **THEN**

ENSURE motor drive is latched to valve stem (locally). ________

____
IV

8.3 Resetting AFWT Overspeed Trip [3,5,8] (continued)

Figure 1



NOTE
This Figure is posted in the AFWT Pump room. The local placard must be revised and re-posted if the content of this page is revised. Changes to revision level or page number do **NOT** require re-posting, unless the figure content changes.

Date________ Initials

8.3 Resetting AFWT Overspeed Trip [3,5,8] (continued)

[5] **IF** the overspeed trip occurred due to 1-FIC-46-57A, T-D AFWP FLOW CONTROLLER, failing to control automatically, **THEN**

[5.1] **PLACE** 1-HS-46-57-S, T-D AFWP CONTROL, for 1-FIC-46-57A-S [M-4], in RESET. ________

[5.2] **PLACE** 1-FIC-46-57A-S, T-D AFWP FLOW CONTROLLER, in MANUAL. ________

[5.3] **ENSURE** controller is at minimum speed. ________

[6] **IF** TD AFW PMP to be restarted from MCR, **THEN**

PLACE 1-XS-46-57 TD AFW PMP CONTROLS TRANSFER SWITCH to NORMAL. [behind CCS seal leakage tank] **AND** ________

________ IV

GO TO Section 8.1.3. ________

[7] **IF** TD AFW PMP to be restarted locally, **THEN**

GO TO Section 8.4 ________

Date________ Initials

8.4 Local Operation of Turbine Driven AFW Pump

CAUTION

Large gauges at top of Panel 1-L-381 are Wide Range instruments. The Narrow Range gauges, which provide a more accurate SG Level indication, are on the Level Indicating Controllers.

NOTE

This section normally is **NOT** necessary for performance unless MCR is inaccessible. This section may be used for troubleshooting or other testing.

8.4.1 Startup

[1] **PERFORM** the following:

[1.1] **PLACE** 1-XS-46-57, TD AFW PMP CONTROLS TRANSFER SWITCH to AUX. [behind CCS seal leakage tank] ________

[1.2] **PLACE** 1-XS-46-57A, TD AFW PMP FW DISCH FLOW IND CNTLR XFER SW to AUX. [Behind Panel 1-L-381 on outside corner wall of pump room] ________

[2] **ENSURE** 1-FCV-1-51, TD AUX FEEDWATER PMP TRIP & THROTTLE VALVE is RESET. (**REFER TO** Section 8.3) ________

[3] **OPEN** 1-FCV-1-51 using 1-HS-46-56B, TD AFW PMP TRIP/THV 1-FCV-1-51 POS CNTL (On Wall N. of Pump). ________

[4] **VERIFY** pump comes to operating speed of 3900 to 4000 rpm. ________

[5] **NOTIFY** Unit Operator that pump is in service. ________

Date________

Initials

8.4.1 Startup (continued)

NOTE

The Terry turbine master level controller for each SG can be operated in MANUAL or AUTO. The controllers should be left in AUTO if they are functioning properly (SG levels controlling @ 38% on the narrow range gauges on the controllers). The thumbwheel on the side of the controller changes the actual level setpoint in AUTO. To change the level in MANUAL, the MAN pushbutton must be pushed (MANUAL control will be indicated by the red light), then the slide bar may be operated to raise or lower flow to control level.

[6] **ENSURE** SG levels are controlled from Panel 1-L-381. ________

[7] **IF** an alternate mode of SG Level Control is required, **THEN**

GO TO Section 8.5. ________

Date________

Initials

8.5 Local Control of SG Levels (Failing of Air to LCVs)

NOTE
Direct radio communication with UO required to perform this section.

8.5.1 SG 1 & 2 Level Control Via AFW Pump A-A

[1] **ENSURE** AFW Pump A-A running. ________

[2] **PERFORM** the following to fail CLOSED 1-PCV-3-122, AUX FEEDWATER PMP 1A-A DISCHARGE PRESS CONTROL [A3S/713]:

[2.1] **CLOSE** 0-ISV-32-460, ESSENT CNTL AIR ISOL VALVE TO 1-PCV-3-122. ________

[2.2] **DEPRESSURIZE** air from regulator on 1-PCV-3-122. ________

[3] **IF** MANUAL control of SG 1 level is necessary, **THEN**

PERFORM the following to fail OPEN 1-LCV-3-164, MD AFW PUMP 1A-A SG 1 LEVEL CONTROL [A3T/737 West Wall]:

[3.1] **CLOSE** 1-ISV-32-3765, ESSENT CONTROL AIR ISOL VALVE TO 1-LCV-3-164. ________

[3.2] **DEPRESSURIZE** air from regulator on 1-LCV-3-164. ________

[4] **IF** MANUAL control of SG 2 level is necessary, **THEN**

PERFORM the following to fail OPEN 1-LCV-3-156, MD AFW PUMP 1A-A SG 2 LEVEL CONTROL [A3T/737 West Wall]:

[4.1] **CLOSE** 1-ISV-32-3761, ESSENT CONTROL AIR ISOL VALVE TO 1-LCV-3-156. ________

[4.2] **DEPRESSURIZE** air from regulator on 1-LCV-3-156. ________

Date________ **Initials**

8.5.1 SG 1 & 2 Level Control Via AFW Pump A-A (continued)

NOTE

Manual Handwheel on top of 1-PCV-3-122 must be turned CLOCKWISE to OPEN.

[5] **ADJUST** 1-PCV-3-122, AUX FEEDWATER PMP 1A-A DISCHARGE PRESS CONTROL to establish approx 1200 psid between 1-PI-3-117, AUX FEEDWATER PMP1A-A SUCTION PRESS, and 1-PI-3-122B, AUX FEEDWATER PMP 1A-A DISCHARGE PRESS [A3S/713]. ________

[6] **IF** SG 1 level to be controlled, **THEN**

UNLOCK and **THROTTLE** 1-ISV-3-828, MD AFW PUMP 1A-A SG 1 LEVEL CONTROL ISOL, per UO instruction [A3T/737 West Wall]. ________

[7] **IF** SG 2 level to be controlled, **THEN**

UNLOCK and **THROTTLE** 1-ISV-3-827, MD AFW PUMP 1A-A SG 1 LEVEL CONTROL ISOL, per UO instruction [A3T/737 West Wall]. ________

Date________ **Initials**

8.5.1 SG 1 & 2 Level Control Via AFW Pump A-A (continued)

[8] **WHEN** local SG Level Control operation is complete, **THEN**

ENSURE the following to return to Standby Alignment:
(Components **NOT** manipulated may be **NA**'d)

NOMENCLATURE	LOCATION	POSITION	UNID	PERF INITIAL	VERIFIER INITIAL
ESSENT CONTROL AIR ISOL VALVE TO 1-LCV-3-164	A3T/737	OPEN	1-ISV-32-3765		IV
MD AFW PUMP 1A-A SG 1 LEVEL CONTROL	A3T/737	CLOSED	1-LCV-3-164		IV
MD AFW PUMP 1A-A SG 1 LEVEL CONTROL ISOL	A3T/737	LOCKED OPEN	1-ISV-3-828		CV
ESSENT CONTROL AIR ISOL VALVE TO 1-LCV-3-156	A3T/737	OPEN	1-ISV-32-3761		IV
MD AFW PUMP 1A-A SG 2 LEVEL CONTROL	A3T/737	CLOSED	1-LCV-3-156		IV
MD AFW PUMP 1A-A SG 2 LEVEL CONTROL ISOL	A3T/737	LOCKED OPEN	1-ISV-3-827		CV
ESSENT CNTL AIR ISOL VALVE TO 1-PCV-3-122	A3S/713	OPEN	0-ISV-32-460		IV
AUX FEEDWATER PMP 1A-A DISCHARGE PRESS CONTROL	A3S/713	OPEN	1-PCV-3-122		IV
MANUAL HANDWHEEL 1-PVC-3-122	A3S/713	FULLY COUNTER CLOCK-WISE	1-PCV-3-122		IV

Date________ Initials

NOTE
Direct radio communication with UO required to perform this section.

8.5.2 SG 3 & 4 Level Control Via AFW Pump B-B

[1] **ENSURE** AFW Pump B-B running. ________

[2] **PERFORM** the following to fail CLOSED 1-PCV-3-132, AUX FEEDWATER PMP 1B-B DISCHARGE PRESS CONTROL [A3S/713]:

[2.1] **CLOSE** 0-ISV-32-450, ESSENT CNTL AIR ISOL VALVE TO 1-PCV-3-132. ________

[2.2] **DEPRESSURIZE** air from regulator on 1-PCV-3-132. ________

[3] **IF** MANUAL control of SG 3 level is necessary, **THEN**

PERFORM the following to fail OPEN 1-LCV-3-148, MD AFW PUMP 1B-B SG 3 LEVEL CONTROL [A3S/737 West Wall]:

[3.1] **CLOSE** 1-ISV-32-3745, ESSENT CONTROL AIR ISOL VALVE TO 1-LCV-3-148. ________

[3.2] **DEPRESSURIZE** air from regulator on 1-LCV-3-148. ________

[4] **IF** MANUAL control of SG 4 level is necessary, **THEN**

PERFORM the following to fail OPEN 1-LCV-3-171, MD AFW PUMP 1B-B SG 4 LEVEL CONTROL [A3S/737 West Wall]: ________

[4.1] **CLOSE** 1-ISV-32-3747, ESSENT CONTROL AIR ISOL VALVE TO 1-LCV-3-171. ________

[4.2] **DEPRESSURIZE** air from regulator on 1-LCV-3-171. ________

Date________

Initials

8.5.2 **SG 3 & 4 Level Control Via AFW Pump B-B (continued)**

> **NOTE**
> Manual Handwheel on top of 1-PCV-3-132 must be turned CLOCKWISE to **OPEN.**

[5] **ADJUST** 1-PCV-3-132, AUX FEEDWATER PMP 1B-B DISCHARGE PRESS CONTROL to establish approx 1200 psid between 1-PI-3-127, AUX FEEDWATER PMP1B-B SUCTION PRESS, and 1-PI-3-132B, AUX FEEDWATER PMP 1B-B DISCHARGE PRESS [A3S/713]. ________

[6] **IF** SG 3 level to be controlled, **THEN**

UNLOCK and **THROTTLE** 1-ISV-3-826, MD AFW PUMP 1B-B SG 3 LEVEL CONTROL ISOL, per UO instruction [A3S/737 West Wall]. ________

[7] **IF** SG 4 level to be controlled, **THEN**

UNLOCK and **THROTTLE** 1-ISV-3-829, MD AFW PUMP 1B-B SG 4 LEVEL CONTROL ISOL, per UO instruction [A3S/737 West Wall]. ________

[8] **WHEN** local SG Level Control operation is complete, **THEN**

ENSURE the following to return to Standby Alignment: (Components **NOT** manipulated may be **NA'd)**

NOMENCLATURE	LOCATION	POSITION	UNID	PERF INITIAL	VERIF INITIAL
ESSENT CONTROL AIR ISOL VALVE TO 1-LCV-3-148	A3S/737	OPEN	1-ISV-32-3745		IV
MD AFW PUMP 1B-B SG 3 LEVEL CONTROL	A3S/737	CLOSED	1-LCV-3-148		IV
MD AFW PUMP 1B-B SG 3 LEVEL CONTROL ISOL	A3S/737	LOCKED OPEN	1-ISV-3-826		CV
ESSENT CONTROL AIR ISOL VALVE TO 1-LCV-3-171	A3S/737	OPEN	1-ISV-32-3747		IV
MD AFW PUMP 1B-B SG 4 LEVEL CONTROL	A3S/737	CLOSED	1-LCV-3-171		IV
MD AFW PUMP 1B-B SG 4 LEVEL CONTROL ISOL	A3S/737	LOCKED OPEN	1-ISV-3-829		CV
ESSENT CNTL AIR ISOL VALVE TO 1-PCV-3-132	A3S/713	OPEN	0-ISV-32-450		IV
AUX FEEDWATER PMP 1B-B DISCHARGE PRESS CONTROL	A3S/713	OPEN	1-PCV-3-132		IV
MANUAL HANDWHEEL 1-PCV-3-132	A3S/713	FULLY COUNTER CLOCK-WISE	1-PCV-3-132		IV

Date________ **Initials**

NOTE
Direct radio communication with UO required to perform this section.

8.5.3 SG 1 - 4 Level Control Via TD AFW Pump

[1] **ENSURE** TD AFW PUMP A-S running. ________

[2] **IF** MANUAL control of SG 1 level is necessary, **THEN**

PERFORM the following to fail CLOSED 1-LCV-3-174, TD AFW PUMP SG 1 LEVEL CONTROL [S. Vlv Rm]:

[2.1] **CLOSE** 1-ISV-32-3736, ESSENT CONTROL AIR ISOL VALVE TO 1-LCV-3-174. ________

[2.2] **DEPRESSURIZE** air from regulator on 1-LCV-3-174. ________

[3] **MODULATE** flow with handwheel on top of 1-LCV-3-174 (CLOCKWISE to OPEN) per UO instruction. ________

[4] **IF** MANUAL control of SG 2 level is necessary, **THEN**

PERFORM the following to fail CLOSED 1-LCV-3-173, TD AFW PUMP SG 2 LEVEL CONTROL [A3U/737 Pen. Rm]:

[4.1] **CLOSE** 1-ISV-32-3735, ESSENT CONTROL AIR ISOL VALVE TO 1-LCV-3-173. ________

[4.2] **DEPRESSURIZE** air from regulator on 1-LCV-3-173. ________

[5] **MODULATE** flow with handwheel on top of 1-LCV-3-173 (CLOCKWISE to **OPEN**) per UO instruction. ________

Date________ Initials

8.5.3 **SG 1 - 4 Level Control Via TD AFW Pump (continued)**

[6] **IF** MANUAL control of SG 3 level is necessary, **THEN**

PERFORM the following to fail CLOSED 1-LCV-3-172, TD AFW PUMP SG 3 LEVEL CONTROL [A3U/737 Pen. Rm]:

[6.1] **CLOSE** 1-ISV-32-3770, ESSENT CONTROL AIR ISOL VALVE TO 1-LCV-3-172. ________

[6.2] **DEPRESSURIZE** air from regulator on 1-LCV-3-172. ________

[7] **MODULATE** flow with handwheel on top of 1-LCV-3-172 (CLOCKWISE to OPEN) per UO instruction. ________

[8] **IF** MANUAL control of SG 4 level is necessary, **THEN**

PERFORM the following to fail CLOSED 1-LCV-3-175, TD AFW PUMP SG 4 LEVEL CONTROL [S. Vlv Rm]: ________

[8.1] **CLOSE** 1-ISV-32-3769, ESSENT CONTROL AIR ISOL VALVE TO 1-LCV-3-175. ________

[8.2] **DEPRESSURIZE** air from regulator on 1-LCV-3-175. ________

[9] **MODULATE** flow with handwheel on top of 1-LCV-3-175 (CLOCKWISE to **OPEN**) per UO instruction. ________

Date________ Initials

8.5.3 SG 1 - 4 Level Control Via TD AFW Pump (continued)

[10] **WHEN** local SG Level Control operation is complete, **THEN**

ENSURE the following to return to Standby Alignment:
(Components **NOT** manipulated may be **NA**'d)

NOMENCLATURE	LOCATION	POSITION	UNID	PERF INITIAL	VERIF INITIAL
TD AFW PUMP SG 1 LEVEL CONTROL	S. Vlv Rm	CLOSED	1-LCV-3-174		IV
ESSENT CONTROL AIR ISOL VALVE TO 1-LCV-3-174	S. Vlv Rm	OPEN	1-ISV-32-3736		IV
TD AFW PUMP SG 2 LEVEL CONTROL	A3U/737	CLOSED	1-LCV-3-173		IV
ESSENT CONTROL AIR ISOL VALVE TO 1-LCV-3-173	A3U/737	OPEN	1-ISV-32-3735		IV
TD AFW PUMP SG 3 LEVEL CONTROL	A3U/737	CLOSED	1-LCV-3-172		IV
ESSENT CONTROL AIR ISOL VALVE TO 1-LCV-3-172	A3U/737	OPEN	1-ISV-32-3770		IV
TD AFW PUMP SG 4 LEVEL CONTROL	S. Vlv Rm	CLOSED	1-LCV-3-175		IV
ESSENT CONTROL AIR ISOL VALVE TO 1-LCV-3-175	S. Vlv Rm	OPEN	1-ISV-32-3769		IV
MANUAL HANDWHELL S/G #1	A3U/737	FULLY COUNTER CLOCKWISE	1-LCV-3-174		IV
MANUAL HANDWHELL S/G #2	A3U/737	FULLY COUNTER CLOCKWISE	1-LCV-3-173		IV
MANUAL HANDWHELL S/G #3	A3U/737	FULLY COUNTER CLOCKWISE	1-LCV-3-172		IV
MANUAL HANDWHELL S/G #4	A3U/737	FULLY COUNTER CLOCKWISE	1-LCV-3-175		IV

Date________ **Initials**

8.6 Nitrogen Alignments to TD AFW Pump SG LCVs

Source Note 9 applies to this entire section

CAUTIONS

1) Radio use in this area may affect SG 1 & 4 Main Steam Line Rad Monitors (1-RM-90-421B & 424B).

2) Press regulators (1-PREG-3-172C, 173C, 174C, and 175C) are preset, and do **NOT** require adjustment for operation. Inadvertent adjustment of these regulators may damage the LCV's diaphragm.

NOTE

Coordination with MCR Operator, the AUO at the TD AFWP, the AUO(s) operating the SG PORV(s), and TD AFW LCVs at the N^2 Station(s) may be required to control plant cooldown.

[1] **ENSURE** communications with UO established BEFORE local AFW LCV manipulation. ________

[2] **IF** using SG 1 & 2 LCVs, **THEN**

PERFORM the following [AB el 737, Outside SVR]:

NOTE

Only ONE N_2 cylinder should be valved into service at a time.

[2.1] **ENSURE** ONE of the following N_2 cylinder valves **OPEN** **(N/A** cylinder/valve **NOT** used**):**

- valve (no UNID) on 1-TANK-3-400A ________
- valve (no UNID) on 1-TANK-3-400B ________

Date________ Initials

8.6 **Nitrogen Alignments to TD AFW Pump SG LCVs (continued)**

[2.2] **VERIFY** cylinder pressure greater than 1650 psig for N_2 cylinder used in Step 8.6[2.1]:

1-PI-3-400A (1-TANK-3-400A)

OR

1-PI-3-400B (1-TANK-3-400B). ________

[2.3] **CLOSE** the following Vent isolation valves:

[2.3.1] 1-VTIV-3-174D for SG 1 (1-LCV-3-174) ________

[2.3.2] 1-VTIV-3-173D for SG 2 (1-LCV-3-173) ________

[2.4] **OPEN** N_2 supply valve for N_2 cylinder used in Step 8.6[2.1]]:

1-ISIV-3-400A (1-TANK-3-400A)

OR

1-ISIV-3-400B (1-TANK-3-400B). ________

[2.5] **ENSURE** 1-SPV-3-400, Pressure Regulator bottom selector knob, is pointing to N_2 cylinder selected in Step 8.6[2.1] ________

[2.6] **ENSURE,** 1-PREG-3-400, Pressure Regulator top selector knob is set to provide 85 to 95 psig on 1-PI-3-400D. ________

[2.7] **ENSURE** adjustment screw on top of 1-PREG-3-173B and 1-PREG-3-174B has zero spring tension (finger tight). ________

[2.8] **OPEN** the following N_2 supply isol valves:

[2.8.1] 1-ISIV-3-400F1 for SG 1 (1-LCV-3-174) ________

[2.8.2] 1-ISIV-3-400EI for SG 2 (1-LCV-3-173) ________

[2.8.3] 1-ISIV-3-400F2 for SG 1 (1-LCV-3-174) ________

[2.8.4] 1-ISIV-3-400E2 for SG 2 (1-LCV-3-173) ________

Date________ Initials

8.6 Nitrogen Alignments to TD AFW Pump SG LCVs (continued)

> **NOTE**
> LCVs may be manipulated locally by turning PREG adjustment screw. Clockwise raises N_2 pressure to **OPEN** the LCV. Counter-clockwise (CCW) lowers N_2 pressure to **CLOSE** the LCV.

[2.9] **ADJUST** the following PREGs as required to position selected AFW LCVs per Unit Operator's instruction:

- 1-PREG-3-174B, for SG 1 (1-LCV-3-174), (observe 1-PI-3-174). ________
- 1-PREG-3-173B, for SG 2 (1-LCV-3-173), (observe 1-PI-3-173). ________

[3] **IF** using SG 3 & 4 LCVs, **THEN**

PERFORM the following [AB el 737, Outside SVR]:

> **NOTE**
> Only ONE N_2 cylinder should be valved into service at a time.

[3.1] **ENSURE** ONE of the following N_2 cylinder valves **OPEN** (**N/A** cylinder/valve **NOT** used):

- valve (no UNID) on 1-TANK-3-401A ________
- valve (no UNID) on 1-TANK-3-401B ________

[3.2] **VERIFY** cylinder pressure greater than 1650 psig for N_2 cylinder used in Step 8.6[3.1]

1-PI-3-401A (1-TANK-3-401A)

OR

1-PI-3-401B (1-TANK-3-401B). ________

[3.3] **CLOSE** the following Vent isol valves:

[3.3.1] 1-VTIV-3-172D for SG 3 (1-LCV-3-172) ________

[3.3.2] 1-VTIV-3-175D for SG 4 (1-LCV-3-175) ________

Date________

Initials

8.6 Nitrogen Alignments to TD AFW Pump SG LCVs (continued)

[3.4] **OPEN** N_2 supply valve for N_2 cylinder used in Step 8.6[3.1]:

ISIV-3-401A (1-TANK-3-401A),

OR

1-ISIV-3-401B (1-TANK-3-401B). ________

[3.5] **ENSURE** 1-SPV-3-401, Pressure Regulator bottom selector knob, is pointing to N_2 cylinder selected in Step 8.6[3.1]. ________

[3.6] **ENSURE,** 1-PREG-3-401, Pressure Regulator top knob is set to provide 85 to 95 psig on 1-PI-3-401D. ________

[3.7] **ENSURE** adjustment screw on top of 1-PREG-3-172B and 1-PREG-3-175B has zero spring tension (finger tight). ________

[3.8] **OPEN** the following N2 supply isol valves:

[3.8.1] 1-ISIV-3-401EI for SG 3 (1-LCV-3-172) ________

[3.8.2] 1-ISIV-3-401F1 for SG 4 (1-LCV-3-175) ________

[3.8.3] 1-ISIV-3-401E2 for SG 3 (1-LCV-3-172) ________

[3.8.4] 1-ISIV-3-401F2 for SG 4 (1-LCV-3-175) ________

NOTE

LCVs may be manipulated locally by turning PREG adjustment screw. Clockwise raises N_2 pressure to OPEN the LCV. Counter-clockwise (CCW) lowers N_2 pressure to CLOSE the LCV.

[3.9] **ADJUST** the following PREGs as required to position selected AFW LCVs per Unit Operator's instruction:

- 1-PREG-3-172B for SG 3 (1-LCV-3-172), (observe 1-PI-3-172). ________
- 1-PREG-3-175B for SG 4 (1-LCV-3-175) (observe 1-PI-3-175). ________

Date________ Initials

8.6 Nitrogen Alignments to TD AFW Pump SG LCVs (continued)

[4] **IF** in-service N_2 Cylinder pressure fails LOW, **THEN**

PERFORM Appendix A to place a spare cylinder in service. ________

[5] **WHEN** use of N_2 for local AFW LCV control is complete, **THEN**

[5.1] **ENSURE** the following valves are **CLOSED:**

- 1-ISIV-3-400A ________ ________ IV
- 1-ISIV-3-400B ________ ________ IV
- 1-ISIV-3-401A ________ ________ IV
- 1-ISIV-3-401B ________ ________ IV

[5.2] **VERIFY** the following Nitrogen cylinder valves **CLOSED:**

- valve (no UNID) on 1-TANK-3-400A ________ ________ IV
- valve (no UNID) on 1-TANK-3-400B ________ ________ IV
- valve (no UNID) on 1-TANK-3-401A ________ ________ IV
- valve (no UNID) on 1-TANK-3-401B ________ ________ IV

Date________ Initials

8.6 Nitrogen Alignments to TD AFW Pump SG LCVs (continued)

[5.3] **ENSURE** N_2 supply isolation valves are **CLOSED:**
(Unused portion may be **N/A**'d)

- 1-ISIV-3-400E1 ________ ________ IV
- 1-ISIV-3-400F1 ________ ________ IV
- 1-ISIV-3-401E1 ________ ________ IV
- 1-ISIV-3-401F1 ________ ________ IV
- 1-ISIV-3-400E2 ________ ________ IV
- 1-ISIV-3-400F2 ________ ________ IV
- 1-ISIV-3-401E2 ________ ________ IV
- 1-ISIV-3-401F2 ________ ________ IV

Date________

Initials

8.6 **Nitrogen Alignments to TD AFW Pump SG LCVs (continued)**

[5.4] **BLEED** pressure off line of associated LCV(s) by turning adjustment screw CCW, and using regulator petcock to VENT N_2:

- 1-PREG-3-174B for SG 1 (1-LCV-3-174), (observe 1-PI-3-174) ________
- 1-PREG-3-173B for SG 2 (1-LCV-3-173), (observe 1-PI-3-173) ________
- 1-PREG-3-172B for SG 3 (1-LCV-3-172), (observe 1-PI-3-172). ________
- 1-PREG-3-175B for SG 4 (1-LCV-3-175), (observe 1-PI-3-175). ________

[5.5] **OPEN** LCV N_2 vent(s) Closed in Steps 8.6[2] **or** 8.6[3]:

- 1-VTIV-3-174D, SG 1 LCV N_2 Vent ________ ________ IV
- 1-VTIV-3-173D, SG 2 LCV N_2 Vent ________ ________ IV
- 1-VTIV-3-172D, SG 3 LCV N_2 Vent ________ ________ IV
- 1-VTIV-3-175D, SG 4 LCV N_2 Vent ________ ________ IV

[5.6] **NOTIFY** UO when complete. ________

[5.7] **IF** cylinder pressure is below 1650 psig, **THEN**

INITIATE WO to fill used N_2 cylinder. ________

Date________

Initials

8.7 Venting of AFW Pumps

Source Notes 1,2,4,6,7 applies to this section.

WARNINGS

1) The AFW pumps may start at any time, without warning.
2) Keep clear of the pumps' shafts and other moving parts while venting the pumps.
3) Water will spray from the vent line if the pump starts while venting.
4) Be prepared to close the vent valve at all times during the venting process.

CAUTION

Radioactive steam may be present when venting AFW pumps.

NOTE

IF venting due to vapor binding, it may also be necessary to vent AFW Pump Discharge Header to ensure system is returned to Standby condition. Unused portions of this section may be **N/A'd.**

[1] **NOTIFY** RADCON of possible radiological hazards. ________

[2] **PERFORM** the following to vent AFW PUMP 1A-A [A3S/713]:

[2.1] **NOTIFY** UO of intention to vent AFW PUMP 1A-A. ________

[2.2] **OPEN** 1-VTV-3-931, AUX FEEDWATER PMP 1A-A CASING VENT. ________

[2.3] **WHEN** solid stream of water exists, **THEN**

CLOSE 1-VTV-3-931, AUX FEEDWATER PMP 1A-A CASING VENT. ________ ________ IV

[2.4] **NOTIFY** UO that AFW PUMP 1A-A vented. ________

[3] **PERFORM** the following to vent AFW PUMP 1B-B [A3S/713]:

[3.1] **NOTIFY** UO of intention to vent AFW PUMP 1B-B. ________

[3.2] **OPEN** 1-VTV-3-932, AUX FEEDWATER PMP 1B-B CASING VENT. ________

Date________

Initials

8.7 Venting of AFW Pumps (continued)

[3.3] **WHEN** solid stream of water exists, **THEN**

CLOSE 1-VTV-3-932, AUX FEEDWATER PMP 1B-B CASING VENT. ________ ________ IV

[3.4] **NOTIFY** UO that AFW PUMP 1B-B vented. ________

Date________

Initials

8.7 Venting of AFW Pumps (continued)

[4] **PERFORM** the following to vent TD AFW PUMP [A3T/692}:

[4.1] **NOTIFY** UO of intention to vent TD AFW PUMP. ________

[4.2] **OPEN** 1-VTV-3-930, T.D. AUX FEEDWATER PUMP CASING VENT. ________

[4.3] **WHEN** solid stream of water exists, THEN CLOSE 1-VTV-3-930, T.D. AUX FEEDWATER PUMP CASING VENT. ________ ________ IV

[4.4] **NOTIFY** UO that TD AFW PUMP vented. ________

NOTE

All vent valves have caps which must be removed and then replaced following the venting procedure which should include opening vent to expel air and vapor, and then closing vent.

[5] **VENT** AFW Discharge Piping with the following: (Unused portions may be **N/A'**d)

NOMENCLATURE	LOCATION	UNID	PERF INITIAL
AUX FEEDWATER PMP 1B-B SG 3 SUPPLY VENT	A3U/737	1-VTV-3-896	
TD AUX FEEDWATER PUMP SG 3 SUPPLY VENT	A3V/737	1-VTV-3-897	
AUX FEEDWATER PMP 1A-A SG 2 SUPPLY VENT	A3V/737	1-VTV-3-900	
TD AUX FEEDWATER PUMP SG 2 SUPPLY VENT	A3V/737	1-VTV-3-901	
AUX FEEDWATER PMP 1A-A SG 1 SUPPLY VENT	S. Vlv Rm	1-VTV-3-903	
TD AUX FEEDWATER PUMP SG 1 SUPPLY VENT	S. Vlv Rm	1-VTV-3-904	
AUX FEEDWATER PMP 1B-B SG 4 SUPPLY VENT	S. Vlv Rm	1-VTV-3-906	
TD AUX FEEDWATER PUMP SG 4 SUPPLY VENT	S. Vlv Rm	1-VTV-3-907	

Date________

Initials

8.7 Venting of AFW Pumps (continued)

[6] **LOCK CLOSED** the following valves if used for venting in Step 8.7[5] above: (Unused portions may be **N/A**'d)

NOMENCLATURE	LOCATION	UNID	PERF INITIAL	VERIF INITIAL
AUX FEEDWATER PMP 1A-A SG SUPPLY VENT	S. Vlv Rm	1-VTV-3-903		CV
TD AUX FEEDWATER PUMP SG 1 SUPPLY VENT	S. Vlv Rm	1-VTV-3-904		CV
AUX FEEDWATER PMP 1B-B SG 4 SUPPLY VENT	S. Vlv Rm	1-VTV-3-906		CV
TD AUX FEEDWATER PUMP SG 4 SUPPLY VENT	S. Vlv Rm	1-VTV-3-907		CV

[7] **CLOSE** and **CAP** the following valves if used for venting in Step 8.7[5] above: (Unused portions may be **N/A**'d)

NOMENCLATURE	LOCATION	UNID	PERF INITIAL	VERIF INITIAL
AUX FEEDWATER PMP 1B-B SG 3 SUPPLY VENT	A3U/737	1-VTV-3-896		IV
TD AIX FEEDWATER PUMP SG 3 SUPPLY VENT	A3V/737	1-VTV-3-897		IV
AUX FEEDWATER PMP 1A-A SG 2SUPPLY VENT	A3V/737	1-VTV-3-900		IV
TD AUX FEEDWATER PUMP SG 2 SUPPLY VENT	A3V/737	1-VTV-3-901		IV

Date________ Initials

8.8 Manual Control of TDAFW Pump with Auto Start Signal Present

NOTES

1) TDAFW Pump speed should **NOT** be reduced if the pump has NO forward flow to the Steam Generators and is on full recirc. When speed control is used, minimum detectable forward flow should be maintained.

2) Section 8.9 Motor Driven AFW pump recirc at low flows, may be used concurrent with this Section for total AFW flow control.

[1] **CHECK** TDAFW Pump running in **AUTO.** ________

CAUTION

AUTO START signals will be blocked until all existing AUTO START signals have been cleared.

[2] **PLACE** 1-HS-46-57-S to RESET. ________

[3] **DEPRESS** manual pushbutton on 1-FIC-46-57A-S and

OBSERVE red light ON and green light **OFF**. ________

NOTE

- The following indicators may be used to observe speed and flow while performing step 8.8[4]:
- 1-SI-46-56A-S
- 1-FI-3-142A

[4] **CONTROL** speed as required (Max 3950 rpm, Min 2076 rpm) using 1-FIC-46-57A-S. ________

Date________

Initials

8.8 Manual Control of TDAFW Pump with Auto Start Signal Present (continued)

[5] **IF** a return to AUTO control is desired, **THEN**

PERFORM the following:

[5.1] **DEPRESS** AUTO pushbutton on 1-FIC-46-57A-S. ________

[5.2] **OBSERVE** green light ON and red light OFF. ________

[5.3] **MONITOR** TDAFWP speed response ________

[6] **IF** shutdown of TDAFW Pump is desired, **THEN**

GO TO Section 8.1.6. ________

Date________ Initials

8.9 Motor Driven AFW Pump Recirc at Low Flows

NOTE

The 2-inch recirculation line has a capacity of 170 gpm. This section may be implemented anytime the MDAFW pumps are running and low flow demand is experienced.

[1] **EVALUATE** the MDAFP demand. ________

NOTE

With 1-XS-3-118-A in AUX position [6.9kV SD BD 1A-A], 1-FCV-3-355 can **NOT** be operated electrically. Air can be directed to the operator for 1-FCV-3-355 locally using 1-HCV-3-355.

[2] **IF** low flow conditions exist on 1A-A MDAFWP **AND** AFW demand on 1A-A MDAFWP is low, **THEN**

OPEN 1-FCV-3-355, AUX FEEDWATER PMP 1A-A RECIRC FLOW ________

NOTE

With 1-XS-3-128-B in AUX position [6.9kV SD BD 1B-B], 1-FCV-3-359 can **NOT** be operated electrically. Air can be directed to the operator for 1-FCV-3-359 locally using 1-HCV-3-359

[3] **IF** low flow conditions exist on 1B-B MDAFWP **AND** AFW demand on 1B-B MDAFWP is low, **THEN**

OPEN 1-FCV-3-359, AUX FEEDWATER PMP 1B-B RECIRC FLOW ________

[4] **MONITOR** the following parameters:

- MDAFWP amps ________
- AFW flow and LCV position ________

Date________ **Initials**

8.9 Motor Driven AFW Pump Recirc at Low Flows (continued)

[5] **IF** any of the parameters are abnormal (e.g. amps above expected, or low AFW flow as compared with LCV position), **OR** the low flow condition does **NOT** exist (e.g. higher demand for AFW), **THEN**

CLOSE the associated pump/trains recirc valve

- 1-FCV-3-355, AUX FEEDWATER PMP 1A-A RECIRC FLOW ________
- 1-FCV-3-359, AUX FEEDWATER PMP 1B-B RECIRC FLOW ________

Date________ Initials

8.10 Transfer SG Level Control from Auxiliary to Main Feedwater

[1] **ENSURE** Main Feedwater is aligned **AND** appropriate number of pumps running to maintain SG levels for long cycle deaeration/recirc operation at present SG pressure. ________

[2] **PLACE** the following Aux Feedwater SG LCVs controls in AUTO as needed: (**NA** valves **NOT** needed) [1-M-4] ________

MOTOR-DRIVEN PUMP LCVs	√	TURBINE-DRIVEN PUMP LCVs	√
1-LIC-3-164A, SG 1 SUPPLY FRM PMP A-A		1-LIC-3-174A, SG 1 SUPPLY FRM T-D PMP	
1-LIC-3-156A, SG 2 SUPPLY FRM PMP A-A		1-LIC-3-173A, SG 2 SUPPLY FRM T-D PMP	
1-LIC-3-148A, SG 3 SUPPLY FRM PMP B-B		1-LIC-3-172A, SG 3 SUPPLY FRM T-D PMP	
1-LIC-3-171A, SG 4 SUPPLY FRM PMP B-B		1-LIC-3-175A, SG 4 SUPPLY FRM T-D PMP	

NOTES

1) One SG level LCV / Bypass Reg Valve control should be transferred at a time. SG level should be stable BEFORE proceeding to the next SG.

2) Actions taken in Step 8.10[3] should coordinated with expected responses in Step 8.10[4].

[3] **PLACE** Bypass Reg Valves in MANUAL and **OPEN** slowly (**NA** valves **NOT** needed) [1-M-3]

[3.1] 1-LIC-3-35A, SG 1 MFW BYPASS REG CONTROL ________

[3.2] 1-LIC-3-48A, SG 2 MFW BYPASS REG CONTROL ________

[3.3] 1-LIC-3-90A, SG 3 MFW BYPASS REG CONTROL ________

[3.4] 1-LIC-3-103A, SG 4 MFW BYPASS REG CONTROL ________

NOTE

Aux Feedwater SG LCVs may be placed in MANUAL prior to 8.10[5] if required to maintain SG levels on program

Date________ Initials

8.10 Transfer SG Level Control from Auxiliary to Main Feedwater (continued)

[4] **ENSURE** the following Aux Feedwater SG LCVs closing as required to maintain SG levels on program: **(N/A** valves **NOT** needed) [1-M-4] ________

MOTOR-DRIVEN PUMP LCVs	√	TURBINE-DRIVEN PUMP LCVs	√
1-LIC-3-164A, SG 1 SUPPLY FRM PMP A-A		1-LIC-3-174A, SG 1 SUPPLY FRM T-D PMP	
1-LIC-3-156A, SG 2 SUPPLY FRM PMP A-A		1-LIC-3-173A, SG 2 SUPPLY FRM T-D PMP	
1-LIC-3-148A, SG 3 SUPPLY FRM PMP B-B		1-LIC-3-172A, SG 3 SUPPLY FRM T-D PMP	
1-LIC-3-171A, SG 4 SUPPLY FRM PMP B-B		1-LIC-3-175A, SG 4 SUPPLY FRM T-D PMP	

[5] **WHEN** AFW LCV is approx 5% open, **THEN PLACE** controller in **MANUAL** and **CLOSE** the following, as needed: **(NA** valves **NOT** needed**)** [1-M-4] ________

MOTOR-DRIVEN PUMP LCVs	√	TURBINE-DRIVEN PUMP LCVs	√
1-LIC-3-164A, SG 1 SUPPLY FRM PMP A-A		1-LIC-3-174A, SG 1 SUPPLY FRM T-D PMP	
1-LIC-3-156A, SG 2 SUPPLY FRM PMP A-A		1-LIC-3-173A, SG 2 SUPPLY FRM T-D PMP	
1-LIC-3-148A, SG 3 SUPPLY FRM PMP B-B		1-LIC-3-172A, SG 3 SUPPLY FRM T-D PMP	
1-LIC-3-171A, SG 4 SUPPLY FRM PMP B-B		1-LIC-3-175A, SG 4 SUPPLY FRM T-D PMP	

Date________ Initials

8.10 Transfer SG Level Control from Auxiliary to Main Feedwater (continued)

[6] **WHEN** SG level stable **AND** on Program, **THEN** **PLACE** Bypass Reg Controller in AUTO. **(NA** valves **NOT** needed) [1-M-3]

[6.1] 1-LIC-3-35A, SG 1MFW BYPSS REG CONTROL ________

[6.2] 1-LIC-3-48A, SG 2 MFW BYPSS REG CONTROL ________

[6.3] 1-LIC-3-90A, SG 3 MFW BYPSS REG CONTROL ________

[6.4] 1-LIC-3-103A, SG 4 MFW BYPSS REG CONTROL ________

Date________ Initials

8.10 Transfer SG Level Control from Auxiliary to Main Feedwater (continued)

[7] **PERFORM** the following, as required, to return AFW to STANDBY alignment:

[7.1] **GO TO** Section 8.1.4 for MD AFWP A-A. ________

[7.2] **GO TO** Section 8.1.5 for MD AFWP B-B. ________

[7.3] **GO TO** Section 8.1.6 for TD AFWP. ________

Date________ Initials

8.11 Transfer SG Level Control from Main to Auxiliary Feedwater

[1] **ENSURE** Aux Feedwater is aligned **AND** appropriate AFW pumps running to maintain SG levels. ________

[2] **PLACE** the following Bypass Reg valve controls in **AUTO** as needed: (**NA** valves **NOT** needed) [1-M-3]

[2.1] 1-LIC-3-35A, SG 1MFW BYPASS REG CONTROL ________

[2.2] 1-LIC-3-48A, SG 2 MFW BYPASS REG CONTROL ________

[2.3] 1-LIC-3-90A, SG 3MFW BYPASS REG CONTROL ________

[2.4] 1-LIC-3-103A, SG 4MFW BYPASS REG CONTROL ________

NOTES

1) One SG level LCV / Bypass Reg Valve control should be transferred at a time. SG level should be stable BEFORE proceeding to the next SG.

2) Annunciation for low flow associated with the running MFW pump may occur during performance of Step 8.11[3].

3) Actions taken in Step 8.11[3]should coordinated with expected responses in Step 8.11[4].

[3] **PLACE** the following Aux Feedwater SG LCV Controllers in **MANUAL** and **OPEN** slowly:
(**NA** valves **NOT** needed) ________

MOTOR-DRIVEN PUMP LCVs	√	TURBINE-DRIVEN PUMP LCVs	√
1-LIC-3-164A, SG 1 SUPPLY FRM PMP A-A		1-LIC-3-174A, SG 1 SUPPLY FRM T-D PMP	
1-LIC-3-156A, SG 2 SUPPLY FRM PMP A-A		1-LIC-3-173A, SG 2 SUPPLY FRM T-D PMP	
1-LIC-3-148A, SG 3 SUPPLY FRM PMP B-B		1-LIC-3-172A, SG 3 SUPPLY FRM T-D PMP	
1-LIC-3-171A, SG 4 SUPPLY FRM PMP B-B		1-LIC-3-175A, SG 4 SUPPLY FRM T-D PMP	

Date________ Initials

8.11 Transfer SG Level Control from Main to Auxiliary Feedwater (continued)

[4] **ENSURE** Bypass Reg Valves closing as required to maintain SG levels on program
(NA valves **NOT** needed) [1-M-3]

[4.1] 1-LIC-3-35A, SG 1 MFW BYPASS REG CONTROL ________

[4.2] 1-LIC-3-48A, SG 2 MFW BYPASS REG CONTROL ________

[4.3] 1-LIC-3-90A, SG 3 MFW BYPASS REG CONTROL ________

[4.4] 1-LIC-3-103A, SG 4 MFW BYPASS REG CONTROL ________

[5] **WHEN** Bypass Reg Controller is approx 5%open, **THEN**

PLACE controller in **MANUAL** and **CLOSE:**
(NA valves **NOT** needed) [1-M-4]

[5.1] 1-LIC-3-35A, SG 1 MFW BYPASS REG CONTROL ________

[5.2] 1-LIC-3-48A, SG 2 MFW BYPASS REG CONTROL ________

[5.3] 1-LIC-3-90A, SG 3 MFW BYPASS REG CONTROL ________

[5.4] 1-LIC-3-103A, SG 4 MFW BYPASS REG CONTROL ________

[6] **WHEN** SG level stable **AND** on Program, **THEN**

PLACE the following Aux Feedwater SG LCVs control in AUTO:
(NA valves **NOT** needed) [1-M-4]

MOTOR-DRIVEN PUMP LCVs	√	TURBINE-DRIVEN PUMP LCVs	√
1-LIC-3-164A, SG 1 SUPPLY FRM PMP A-A		1-LIC-3-174A, SG 1 SUPPLY FRM T-D PMP	
1-LIC-3-156A, SG 2 SUPPLY FRM PMP A-A		1-LIC-3-173A, SG 2 SUPPLY FRM T-D PMP	
1-LIC-3-148A, SG 3 SUPPLY FRM PMP B-B		1-LIC-3-172A, SG 3 SUPPLY FRM T-D PMP	
1-LIC-3-171A, SG 4 SUPPLY FRM PMP B-B		1-LIC-3-175A, SG 4 SUPPLY FRM T-D PMP	

9.0 RECORDS

9.1 QA Records

The following documents are QA records and handled in accordance with the Document Control and Records Management (DCRM) program:

Completed Data Packages

9.2 Non-QA Records

None

Appendix A
(Page 1 of 2)

Swapping To Spare Nitrogen Cylinder While Nitrogen System Is In Service

1.0 SWAPPING TO SPARE NITROGEN CYLINDER WHILE NITROGEN SYSTEM IS IN SERVICE.

[1] **OPEN** spare N_2 cylinder valve (**N/A** cylinder/valves **NOT** used):

- valve (no UNID) on 1-TANK-3-400A ________
- valve (no UNID) on 1-TANK-3-400B ________
- valve (no UNID) on 1-TANK-3-401A ________
- valve (no UNID) on 1-TANK-3-401B ________

[2] **VERIFY** cylinder pressure greater than 1550 psig for spare N_2 cylinder opened in Step 1.0[1].

(N/A pressure indicators **NOT** used**):**

- 1-PI-3-400A, (1-TANK-3-400A) ________
- 1-PI-3-400B, (1-TANK-3-400B) ________
- 1-PI-3-401A, (1-TANK-3-401A) ________
- 1-PI-3-401B, (1-TANK-3-401B) ________

[3] **OPEN** N_2 supply valve for N_2 cylinder selected in Step 1.0[1] **(N/A** valves **NOT** used**):**

- 1-ISIV-3-400A (1-TANK-3-400A) ________
- 1-ISIV-3-400B (1-TANK-3-400B) ________
- 1-ISIV-3-401A (1-TANK-3-401A) ________
- 1-ISIV-3-401B (1-TANK-3-401B) ________

Appendix A
(Page 2 of 2)

Date________ Initials

1.0 **SWAPPING TO SPARE NITROGEN CYLINDER WHILE NITROGEN SYSTEM IS IN SERVICE. (continued)**

[4] **ROTATE** Pressure Regulator bottom selector knob to point to N_2 cylinder selected in Step1.0[1] (**N/A** regulator **NOT** used):

- 1-SPV-3-400 ________
- 1-SPV-3-401 ________

[5] **CLOSE** N_2 cylinder valve for used cylinder being removed from service **(N/A** cylinder/valves **NOT** used**):**

- valve (no UNID) on 1-TANK-3-400A ________
- valve (no UNID) on 1-TANK-3-400B ________
- valve (no UNID) on 1-TANK-3-401A ________
- valve (no UNID) on 1-TANK-3-401B ________

[6] **CLOSE** N_2 supply valve for used N_2 cylinder being removed from service **(N/A** valves **NOT** used**):**

- 1-ISIV-3-400A (1-TANK-3-400A) ________
- 1-ISIV-3-400B (1-TANK-3-400B) ________
- 1-ISIV-3-401A (1-TANK-3-401A) ________
- 1-ISIV-3-401B (1-TANK-3-401B) ________

[7] **INITIATE** WO to FILL used N_2 cylinder. ________

WO # ________

Checklist 1
(Page 1 of 1)

AFW Handswitch Alignment Verification

Date Complete ____________

NOMENCLATURE	LOCATION	POSITION	UNID	PERF INITIAL	VERIF INITIAL
MAIN CONTROL ROOM					
T-D AFWP T&T VLV	1-M-4	MID POSITION	1-HS-46-56A-S		IV
AFW PMP A-A	1-M-4	PULL TO LOCK	1-HS-3-118A		IV
AFW PMP B-B	1-M-4	PULL TO LOCK	1-HS-3-128A		IV
SG 3 SUPPLY LCV 3-148 CNTL	1-M-4	AUTO	1-HS-3-148A		IV
SG 2 SUPPLY LCV-3-156 CNTL	1-M-4	AUTO	1-HS-3-156A		IV
SG 1 SUPPLYLCV 3-164 CNTL	1-M-4	AUTO	1-HS-3-164A		IV
SG 4 SUPPLY LCV-3-171 CNTL	1-M-4	AUTO	1-HS-3-171A		IV
SG 3 SUPPLY LCV-3-172 CNTL	1-M-4	AUTO	1-HS-3-172A		IV
SG 2 SUPPLY LCV-3-173 CNTL	1-M-4	AUTO	1-HS-3-173A		IV
SG 1 SUPPLY LCV-3-174 CNTL	1-M-4	AUTO	1-HS-3-174A		IV
SG 4 SUPPLY LCV-3-175 CNTL	1-M-4	AUTO	1-HS-3-175A		IV
ERCW TO AFWP A-A SUCT FRM HDR A - FCV-3-116A & B	1-M-3	P AUTO	1-HS-3-116A/A		IV
ERCW TO AFWP B-B SUCT FRM HDR B - FCV-3-126A & B	1-M-3	P AUTO	1-HS-3-126A/A		IV
ERCW TO T-D AFWP SUCT FRM HDR A - FCV-3-136A & B	1-M-3	P AUTO	1-HS-3-136A/A		IV
ERCW TO T-D AFWP SUCT FRM HDR B - FCV-3-179A & B	1-M-3	P AUTO	1-HS-3-179A/A		IV

Checklist 2
(Page 1 of 2)

AFW Power Alignment Verification

Date Complete ____________

NOMENCLATURE	LOCATION	POSITION	UNID	PERF INITIALS	VERF INIT
6.9 KV SD BD 1A-A					
AFW PUMP 1A-A (1-PMP-3-118)	C/10	RACKED UP & OPERABLE	1-BKR-3-118		IV
6.9KV SD BD 1B-B					
AFW PUMP 1B-B (1-PMP-3-128)	C/10	RACKED UP & OPERABLE	1-BKR-3-128		IV
120V VITAL INSTRUMENT POWER BOARD 1-I					
AFW PMP 1A-A DIFF PRESS CNTL (1-PDIC-3-122A)	BKR 42	ON	1-BKR-3-122A		IV
120V VITAL INSTRUMENT POWER BOARD 1-II					
AFW PMP 1B-B DIFF PRESS CNTL (1-PDIC-3-132A)	BKR 43	ON	1-BKR-3-132A		IV
120V VITAL INSTRUMENT POWER BOARD 1-III					
NORM FDR FOR TD AFW PMP FL CNTLR (1-FIC-46-57B)	BKR 40	ON	1-BKR-46-57/B		IV
120V VITAL INSTRUMENT POWER BOARD 1-IV					
ALT FDR FOR TD AFW PMP FL CNTLR (1-FIC-46-57B)	BKR 40	ON	1-BKR-46-57		IV

Checklist 2
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AFW Power Alignment Verification

Date Complete ____________

NOMENCLATURE	LOCATION	POSITION	UNID	PERF INITIAL	VERF INITIAL
480V REACTOR MOV BOARD 1A1-A					
AFW PMP 1A-A LUBE OIL PMP (1-PMP-3-118D)	C/ 4E	ON	1-BKR-3-118D		IV
480V REACTOR MOV BOARD 1A2-A					
ERCW HDR A AFW PMP 1A-A SUCTION (1-FCV-3-116A)	C/2A	OFF	1-BKR-3-116A		IV
ERCW HDR A AFW PMP 1A-A SUCTION (1-FCV-3-116B)	C/2B	OFF	1-BKR-3-116B		IV
ERCW HDR A TD AFW PMP SUCTION (1-FCV-3-136A)	C/3A	OFF	1-BKR-3-136A		IV
ERCW HDR A TD AFW PMP SUCTION (1-FCV-3-136B)	C/3B	OFF	1-BKR-3-136B		IV
480V REACTOR MOV BOARD 1B1-B					
AFW PMP 1B LUBE OIL PMP (1-PMP-3-128D)	C/17D	ON	1-BKR-3-128D		IV
480V REACTOR MOV BOARD 1B2-B					
ERCW HDR B AFW PMP 1B-B SUCTION (1-FCV-3-126A)	C/2A	OFF	1-BKR-3-126A		IV
ERCW HDR B AFW PMP 1B-B SUCTION (1-FCV-3-126B)	C/2B	OFF	1-BKR-3-126B		IV
ERCW HDR B TD AFW PMP SUCTION (1-FCV-3-179A)	C/3A	OFF	1-BKR-3-179A		IV
ERCW HDR B TD AFW PMP SUCTION (1-FCV-3-179B)	C/3B	OFF	1-BKR-3-179B		IV

Checklist 3
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AFW Valve Alignment Verification

Date Complete ____________

NOMENCLATURE	LOCATION	POSITION	UNID	PERF INITIAL	VERIF INITIAL
el 737 Aux Building					
HPFP TO AFP A-ADISCHARGE	A3S/737	INSTALLED	Blind Flange		IV
HPFP TO AFP B-B DISCHARGE	A3S/737	INSTALLED	Blind Flange		IV
MD AFW PUMP 1B-B SG 3 LEVEL CONTROL	A3S/737	CLOSED	1-LCV-3-148		IV
ESSENT CONTROL AIR ISOL VALVE TO 1-LCV-3-148	A3S/737	OPEN	1-ISV-32-3745		IV
SG 3 AUX FEEDWATER 1-LCV-3-148 BYPASS	A3S/737	CLOSED	1-LCV-3-148A		IV
ESSENT CONTROL AIR ISOL VALVE TO 1-LCV-3-148A	A3S/737	OPEN	1-ISV-32-3746		IV
MD AFW PUMP 1A-A SG 2 LEVEL CONTROL	A3T/737	CLOSED	1-LCV-3-156		IV
ESSENT CONTROL AIR ISOL VALVE TO 1-LCV-3-156	A3T/737	OPEN	1-ISV-32-3761		IV
SG 2 AUX FEEDWATER 1-LCV-3-156 BYPASS	A3T/737	CLOSED	1-LCV-3-156A		IV
ESSENT CONROL AIR ISOL VALVE TO 1-LCV-3-156A	A3T/737	OPEN	1-ISV-32-3762		IV
MD AFW PUMP 1A-A SG 1 LEVEL CONTROL	A3T/737	CLOSED	1-LCV-3-164		IV
ESSENT CONTROL AIR ISOL VALVE TO 1-LCV-3-164	A3T/737	OPEN	1-ISV-32-3765		IV
SG 1 AUX FEEDWATER 1-LCV-3-164 BYPASS	A3T/737	CLOSED	1-LCV-3-164A		IV
ESSENT CONTROL AIR ISOL VALVE TO 1-LCV-3-164A	A3T/737	OPEN	1-ISV-32-3766		IV
MD AFW PUMP 1B-B SG 4 LEVEL CONTROL	A3S/737	CLOSED	1-LCV-3-171		IV
ESSENT CONTROL AIR ISOL VALVE TO 1-LCV-3-171	A3S/737	OPEN	1-ISV-32-3747		IV

Checklist 3
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AFW Valve Alignment Verification

Date Complete ____________

NOMENCLATURE	LOCATION	POSITION	UNID	PERF INITIAL	VERIF INITIAL
el 737 Aux Building (cont.)					
SG 4 AUX FEEDWATER 1-LCV-3-171 BYPASS	A3S/737	CLOSED	1-LCV-3-171A		IV
ESSENT CONTROL AIR ISOL VALVE TO 1-LCV-3-171A	A3S/737	OPEN	1-ISV-32-3748		IV
TD AFW PUMP SG 3 LEVEL CONTROL	A3U/737	CLOSED	1-LCV-3-172		IV
ESSENT CONTROL AIR ISOL VALVE TO 1-LCV-3-172	A3U/737	OPEN	1-ISV-32-3770		IV
TD AFW PUMP SG 2 LEVEL CONTROL	A3U/737	CLOSED	1-LCV-3-173		IV
ESSENT CONTROL AIR ISOL VALVE TO 1-LCV-3-173	A3U/737	OPEN	1-ISV-32-3735		IV
1-PT-3-145 ROOT	A3S/737	OPEN	1-RTV-3-325A		IV
1-FT-3-147A/147B ROOT	A4W/737	OPEN	1-RTV-3-326A		IV
1-FT-3-147A/147B ROOT	A4W/737	OPEN	1-RTV-3-327A		IV
1-PT-3-153 ROOT	A3S/737	OPEN	1-RTV-3-328A		IV
1-FT-3-155A/155B ROOT	A4W/737	OPEN	1-RTV-3-329A		IV
1-FT-3-155A/155B ROOT	A4W/737	OPEN	1-RTV-3-330A		IV
1-PT-3-161 ROOT	A3S/737	OPEN	1-RTV-3-331A		IV
1-PT-3-168 ROOT	A3S/737	OPEN	1-RTV-3-334A		IV
1-PS-3-148 ROOT	A3S/737	OPEN	1-RTV-3-364A		IV
1-PS-3-156 ROOT	A3T/737	OPEN	1-RTV-3-365A		IV
1-PS-3-164 ROOT	A3T/737	OPEN	1-RTV-3-366A		IV
1-PS-3-171 ROOT	A3S/737	OPEN	1-RTV-3-367A		IV

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AFW Valve Alignment Verification

Date Complete ____________

NOMENCLATURE	LOCATION	POSITION	UNID	PERF INITIAL	VERIF INITIAL
el 737 Aux Building (cont.)					
MD AFW PUMP 1B-B SG 3 LEVEL CONTROL ISOL	A3S/737	0-PI-OPS-17.0	1-ISV-3-826		
MD AFW PUMP 1A-A SG 2 LEVEL CONTROL ISOL	A3T/737	0-PI-OPS-17.0	1-ISV-3-827		
MD AFW PUMP 1A-A SG 1 LEVEL CONTROL ISOL	A3T/737	0-PI-OPS-17.0	1-ISV-3-828		
MD AFW PUMP 1B-B SG 4 LEVEL CONTROL ISOL	A3S/737	0-PI-OPS-17.0	1-ISV-3-829		
MD AFW PUMP 1B-B SG 3 LEVEL CONTROL ISOL	A3U/737	0-PI-OPS-17.0	1-ISV-3-834		
MD AFW PUMP 1A-A SG 2 LEVEL CONTROL ISOL	A3U/737	0-PI-OPS-17.0	1-ISV-3-835		
AUX FEEDWATER PMP 1B-B 1-ISV-3-826 BYPASS	A3S/737	CLOSED	1-BYV-3-838		IV
AUX FEEDWATER PMP 1A-A 1-ISV-3-827 BYPASS	A3T/737	CLOSED	1-BYV-3-839		IV
AUX FEEDWATER PMP 1A-A 1-ISV-3-828 BYPASS	A3T/737	CLOSED	1-BYV-3-840		IV
AUX FEEDWATER PMP 1B-B 1-ISV-3-829 BYPASS	A3S/737	CLOSED	1-BYV-3-841		IV
AUX FEEDWATER PMP 1B-B 1-ISV-3-834 BYPASS	A3U/737	CLOSED	1-BYV-3-843		IV
AUX FEEDWATER PMP 1A-A 1-ISV-3-835 BYPASS	A3U/737	CLOSED	1-BYV-3-844		IV
AUX FEEDWATER PMP 1B-B SG 3 SUPPLY VENT	A3S/737	CLOSED & CAPPED	1-VTV-3-847		IV
AUX FEEDWATER PMP 1A-A SG 2 SUPPLY VENT	A3T/737	CLOSED & CAPPED	1-VTV-3-848		IV
AUX FEEDWATER PMP 1A-A SG 1 SUPPLY VENT	A3T/737	CLOSED & CAPPED	1-VTV-3-849		IV
AUX FEEDWATER PMP 1B-B SG 4 SUPPLY VENT	A3S/737	CLOSED & CAPPED	1-VTV-3-850		IV
AUX FEEDWATER PMP 1B-B SG 3 SUPPLY DRAIN	A3S/737	CLOSED	1-DRV-3-851		IV

Checklist 3
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AFW Valve Alignment Verification

Date Complete ____________

NOMENCLATURE	LOCATION	POSITION	UNID	PERF INITIAL	VERIF INITIAL
el 737 Aux Building (cont.)					
AUX FEEDWATER PMP 1A-A SG 2 SUPPLY DRAIN	A3T/737	CLOSED	1-DRV-3-852		IV
AUX FEEDWATER PMP 1A-A SG 1 SUPPLY DRAIN	A3T/737	0-PI-OPS-17.0	1-DRV-3-853		
AUX FEEDWATER PMP 1B-B SG 4 SUPPLY DRAIN	A3S/737	CLOSED	1-DRV-3-854		IV
AUX FEEDWATER PMP 1B-B SG 3 SUPPLY DRAIN	A3V/737	CLOSED	1-DRV-3-855		IV
AUX FEEDWATER PMP 1A-A SG 2 SUPPLY DRAIN	A3V/737	CLOSED	1-DRV-3-856		IV
TD AFW PUMP SG3 LEVEL CONTROL ISOL	A3U/737	0-PI-OPS-17.0	1-ISV-3-867		
TD AFW PUMP SG 2 LEVEL CONTROL ISOL	A3U/737	0-PI-OPS-17.0	1-ISV-3-868		
TD AFW PUMP SG 3 LEVEL CONTROL ISOL	A3V/737	0-PI-OPS-17.0	1-ISV-3-875		
TD AFW PUMP SG 2 LEVEL CONTROL ISOL	A3V/737	0-PI-OPS-17.0	1-ISV-3-876		
TD AUX FEEDWATER PUMP 1-ISV-3-867 BYPASS	A3U/737	CLOSED	1-BYV-3-879		IV
TD AUX FEEDWATER PUMP 1-ISV-3-868 BYPASS	A3U/737	CLOSED	1-BYV-3-880		IV
TD AUX FEEDWATER PUMP 1-ISV-3-875 BYPASS	A3U/737	CLOSED	1-BYV-3-883		IV
TD AUX FEEDWATER PUMP 1-ISV-3-876 BYPASS	A3U/737	CLOSED	1-BYV-3-884		IV
TD AUX FEEDWATER PUMP SG 3 SUPPLY DRAIN	A3U/737	CLOSED	1-DRV-3-887		IV
TD AUX FEEDWATER PUMP SG 2 SUPPLY DRAIN	A3U/737	CLOSED	1-DRV-3-888		IV
AUX FEEDWATER PMP 1B-B SG 3 SUPPLY VENT	A3U/737	CLOSED & CAPPED	1-VTV-3-896		IV
TD AUX FEEDWATER PUMP SG 3 SUPPLY VENT	A3U/737	CLOSED & CAPPED	1-VTV-3-897		IV

Checklist 3
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AFW Valve Alignment Verification

Date Complete ______________

NOMENCLATURE	LOCATION	POSITION	UNID	PERF INITIAL	VERIF INITIAL
el 737 Aux Building (cont.)					
TD AUX FEEDWATER PUMP SG 3 SUPPLY VENT	A3U/737	CLOSED& CAPPED	1-VTV-3-898		IV
AUX FEEDWATER PMP 1A-A SG 2 SUPPLY VENT	A3V/737	CLOSED& CAPPED	1-VTV-3-900		IV
TD AUX FEEDWATER PUMP SG 2 SUPPLY VENT	A3V/737	CLOSED& CAPPED	1-VTV-3-901		IV
TD AUX FEEDWATER PUMP SG 2 SUPPLY VENT	A3U/737	CLOSED& CAPPED	1-VTV-3-902		IV

Checklist 3
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AFW Valve Alignment Verification

Date Complete ____________

NOMENCLATURE	LOCATION	POSITION	UNID	PERF INITIAL	VERIF INITIAL
el 713 Aux Building					
ERCW HEADER A AFW PUMP 1A-A SUCTION	A3S/713	CLOSED	1-FCV-3-116A		IV
ERCW HEADER A AFW PUMP 1A-A SUCTION	A3S/713	CLOSED	1-FCV-3-116B		IV
AUX FEEDWATER PMP 1A-A DISCHARGE PRESS CONTROL	A3S/713	CLOSED	1-PCV-3-122		IV
ESSENT CNTL AIR ISOL VALVE TO 1-PCV-3-122	A3S/713	OPEN	0-ISV-32-460		IV
ERCW HEADER B AFW PUMP 1B-B SUCTION	A4S/713	CLOSED	1-FCV-3-126A		IV
ERCW HEADER B AFW PUMP 1B-B SUCTION	A4S/713	CLOSED	1-FCV-3-126B		IV
AUX FEEDWATER PMP 1B-B DISCHARGE PRESS CONTROL	A3S/713	CLOSED	1-PCV-3-132		IV
ESSENT CNTL AIR ISOL VALVE TO 1-PCV-3-132	A3S/713	OPEN	0-ISV-32-450		IV
1-PS-3-144A/144B/144D ROOT	A4S/713	OPEN	1-RTV-3-308A		IV
SPARE	A4S/713	CLOSED & CAPPED	1-RTV-3-309A		IV
SPARE	A4S/713	CLOSED & CAPPED	1-RTV-3-310A		IV
1-PS-3-139A/PS-3-139B/ PS-3-139D ROOT	A4S/713	OPEN	1-RTV-3-311A		IV
SPARE	A3S/713	CLOSED & CAPPED	1-RTV-3-312A		IV
SPARE	A3S/713	CLOSED & CAPPED	1-RTV-3-313A		IV
1-PI-3-127/PDT-3-132A/ PDT-3-132C ROOT	A3S/713	OPEN	1-RTV-3-314A		IV
1-PI-3-132B/PDT-3-132A/ PDT-3-132C ROOT	A4T/713	OPEN	1-RTV-3-315A		IV

Checklist 3
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AFW Valve Alignment Verification

Date Complete ____________

NOMENCLATURE	LOCATION	POSITION	UNID	PERF INITIAL	VERIF INITIAL
el 713 Aux Building (cont.)					
1-PI-3-117/PDT-3-122A/ PDT-3-122C ROOT	A3S/713	OPEN	1-RTV-3-316A		IV
1-PI-3-122B/PDT-3-122A/ PDT-3-122C ROOT	A3T/713	OPEN	1-RTV-3-317A		IV
1-FI-3-131 ROOT	A14R/724	CLOSED	1-RTV-3-368A		IV
1-FI-3-131 ROOT	A14R/724	CLOSED	1-RTV-3-369A		IV
CONDENSATE SUPPLY ISOL TO AUX FEEDWATER	A15Q/713	0-PI-OPS-1 7.0	1-ISV-3-800		
AUX FEEDWATER PMP 1A-A SUCTION DRAIN	A3S/713	CLOSED	1-DRV-3-801		IV
AUX FEEDWATER PMP 1B-B SUCTION DRAIN	A4S/713	CLOSED	1-DRV-3-802		IV
AUX FEEDWATER PMP 1A-A SUCTION ISOL	A3S/713	0-PI-OPS-1 7.0	1-ISV-3-803		
AUX FEEDWATER PMP 1B-B SUCTION ISOL	A4S/713	0-PI-OPS-1 7.0	1-ISV-3-804		
AUX FEEDWATER PMP 1A-A SUCTION TELLTALE DRAIN	A3S/713	OPEN [1]	1-TTV-3-807		IV
AUX FEEDWATER PMP 1B-B SUCTION TELLTALE DRAIN	A4S/713	OPEN 1	1-TTV-3-808		IV
AUX FEEDWATER PMP 1A-A RECIRC ISOL	A3S/713	0-PI-OPS-1 7.0	1-ISV-3-816		
AUX FEEDWATER PMP 1B-B RECIRC ISOL	A4S/713	0-PI-OPS-1 7.0	1-ISV-3-817		
AUX FEEDWATER PMP 1A-A DISCHARGE DRAIN	A3S/713	CLOSED	1-DRV-3-822		IV
AUX FEEDWATER PMP 1B-B DISCHARGE DRAIN	A4S/713	CLOSED	1-DRV-3-823		IV
AUX FEEDWATER PMP 1A-A DISCHARGE SAMPLE	A3S/713	CLOSED	1-SMV-3-824		IV
AUX FEEDWATER PMP 1B-B DISCHARGE SAMPLE	A4S/713	CLOSED	1-SMV-3-825		IV
AUX FEEDWATER PMP 1A-A BEARING DRAIN	A3S/713	CLOSED	1-DRV-3-894		IV

1 Telltale pipe cap restriction orifice installed

Checklist 3
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AFW Valve Alignment Verification

Date Complete ____________

NOMENCLATURE	LOCATION	POSITION	UNID	PERF INITIAL	VERIF INITIAL
el 713 Aux Building (cont.)					
AUX FEEDWATER PMP 1B-B BEARING DRAIN	A4S/713	CLOSED	1-DRV-3-895		IV
AUX FEEDWATER PUMP SUCTION VENT	A15Q/713	CLOSED &CAPPED	1-VTV-3-908		IV
AUX FEEDWATER PUMP SUCTION VENT	A4S/713	CLOSED &CAPPED	1-VTV-3-909		IV
TD AUX FEEDWATER PUMP RECIRC VENT	A9S/713	CLOSED	1-VTV-3-923		IV
AUX FEEDWATER PUMPS SUCTION DRAIN	A15S/713	CLOSED	1-DRV-3-924		IV
AUX FEEDWATER PMP 1A-A CASING VENT	A3S/713	CLOSED	1-VTV-3-931		IV
AUX FEEDWATER PMP 1B-B CASING VENT	A4S/713	CLOSED	1-VTV-3-932		IV
AUX FEEDWATER PMP 1A-A CASING DRAIN	A3S/713	CLOSED	1-DRV-3-933		IV
AUX FEEDWATER PMP 1B-B CASING DRAIN	A4S/713	CLOSED	1-DRV-3-934		IV
AUX FEEDWATER PMP 1A-A RECIRC ISOL	A4S/713	OPEN	1-ISV-3-961		IV
AUX FEEDWATER PMP 1A-A RECIRC ISOL	A4S/713	OPEN	1-ISV-3-962		IV
AUX FEEDWATER PMP 1B-B RECIRC ISOL	A4S/713	OPEN	1-ISV-3-963		IV
AUX FEEDWATER PMP 1B-B RECIRC ISOL	A4S/713	OPEN	1-ISV-3-964		IV
AUX FEEDWATER PMP 1A-A RECIRC VENT VALVE	A4S/713	CLOSED	1-VTV-3-356		IV
AUX FEEDWATER PMP 1B-B RECIRC VENT VALVE	A4S/713	CLOSED	1-VTV-3-360		IV
AUX FEEDWATER PMP 1A-A RECIRC FLOW	A4S/713	CLOSED	1-FCV-3-355		IV
CONTROL AIR ISOLATION VALVE TO 1-FCV-3-355	A4S/713	OPEN	1-ISV-32-9129		IV
CONTROL AIR BYPASS VALVE TO 1-FCV-3-355	A4S/713	0-PI-OPS -17.0	1-HCV-3-355		
AUX FEEDWATER PMP 1B-B RECIRC FLOW	A4S/713	CLOSED	1-FCV-3-359		IV
CONTROL AIR ISOLATION VALVE TO 1-FCV-3-359	A4S/713	OPEN	1-ISV-32-9130		IV
CONTROL AIR BYPASS VALVE TO 1-FCV-3-359	A4S/713	0-PI-OPS -17.0	1-HCV-3-359		

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AFW Valve Alignment Verification

Date Complete ______________

NOMENCLATURE	LOCATION	POSITION	UNID	PERF INITIAL	VERIF INITIAL
el 692 AFPT Room					
TD AUX FEEDWATER PUMP OIL CLR DRN	A2U/692	CLOSED	1-DRV-3-1		IV
ERCW HEADER A TD AFW PMP SUCT	A1T/692	CLOSED	1-FCV-3-136A		IV
ERCW HEADER A TD AFW PMP SUCT	A1T/692	CLOSED	1-FCV-3-136B		IV
ERCW HEADER B TD AFW PMP SUCT	A1T/692	CLOSED	1-FCV-3-179A		IV
ERCW HDR B TD AFW PMP SUCT	A1T/692	CLOSED	1-FCV-3-179B		IV
TD AUX FEEDWATER PUMP SEAL PRESS CONTROL	A2U/692	OPERABLE	1-PCV-3-183		IV
1-PS-3-121A ROOT	A2T/692	CLOSED	1-RTV-3-318A		IV
1-PS-3-121B ROOT	A2T/692	CLOSED	1-RTV-3-319A		IV
1-PS-3-121D ROOT	A2T/692	CLOSED	1-RTV-3-320A		IV
1-PI-3-137 ROOT	A1t/692	OPEN	1-RTV-3-321A		IV
1-PS-3-138A/PI-3-138/ PT-3-138 ROOT	A2T/692	OPEN	1-RTV-3-322A		IV
1-FT-3-142 ROOT	A2U/692	OPEN	1-RTV-3-323A		IV
1-FT-3-142 ROOT	A2U/692	OPEN	1-RTV-3-324A		IV
1-PI-3-184 ROOT	A2U/692	OPEN	1-RTV-3-345A		IV
1-PS-3-138B ROOT	A2T/692	OPEN	1-RTV-3-363A		IV
1-PS-3-125A ROOT	A2T/692	CLOSED	1-RTV-3-370A		IV
1-PS-3-125B ROOT	A2T/692	CLOSED	1-RTV-3-371A		IV
1-PS-3-125D ROOT	A2T/692	CLOSED	1-RTV-3-372A		IV

Checklist 3
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AFW Valve Alignment Verification

Date Complete ____________

NOMENCLATURE	LOCATION	POSITION	UNID	PERF INITIAL	VERIF INITIAL
el 692 AFPT Room (cont.)					
TD AUX FEEDWATER PUMP SUCTION ISOL	A2T/692	0-PI-OPS-17.0	1-ISV-3-809		
TD AUX FEEDWATER PUMP ERCW TELLTALE DRAIN	A1T/692	OPEN[1]	1-TTV-3-811		IV
TD AUX FEEDWATER PUMP ERCW TELLTALE DRAIN	A1T/692	OPEN[1]	1-TTV-3-812		IV
TD AUX FEEDWATER PUMP CASING DRAIN	A1T/692	CLOSED	1-DRV-3-813		IV
TD AUX FEEDWATER PUMP RECIRC ISOL	A2T/692	0-PI-OPS-17.0	1-ISV-3-819		
TD AUX FEEDWATER PMP DISCHARGE SAMPLE	A2T/692	CLOSED	1-SMV-3-865		IV
TD AUX FEEDWATER PUMP SEAL EJECTOR BLOWDOWN	A2U/692	CLOSED	1-DRV-3-893		IV
TD AUX FEEDWATER PUMP MS DRAIN TRAP ISOL	A2U/692	OPEN	1-IDV-3-914		IV
TD AUX FEEDWATER PUMP MS DRAIN TRAP ISOL	A2U/692	OPEN	1-IDV-3-915		IV
TD AUX FEEDWATER PUMP MS DRAIN TRAP ISOL	A2U/692	OPEN	1-IDV-3-916		IV
TD AUX FEEDWATER PUMP MS DRAIN TRAP ISOL	A2U/692	OPEN	1-IDV-3-917		IV
TD AUX FEEDWATER PUMP MS DRAIN TRAP DRAIN	A2U/692	CLOSED	1-DRV-3-918		IV
TD AUX FEEDWATER PUMP MS DRAIN TRAP DRAIN	A2U/692	CLOSED	1-DRV-3-919		IV

[1] Telltale pipe cap restriction orifice installed.

Checklist 3
(Page 11 of 17)

AFW Valve Alignment Verification

Date Complete ______________

NOMENCLATURE	LOCATION	POSITION	UNID	PERF INITIAL	VERIFIER INITIAL
el 692 AFPT Room (cont.)					
TD AUX FEEDWATER PUMP SEAL EJECTOR SUP ISOL	A2U/692	OPEN	1-IDV-3-920		IV
TD AUX FEEDWATER PUMP CASING VENT	A2T/692	CLOSED	1-VTV-3-930		IV
TD AUX FWP DR TANK OUT DRAIN ISOL	A2U/692	OPEN	1-IDV-3-935		IV
TD AUX FWP DR TANK OUT DRAIN ISOL	A2U/692	OPEN	1-IDV-3-936		IV
TD AUX FEEDWATER PUMP BEARING DRAIN	A2T/692	CLOSED	1-DRV-3-940		IV
TD AUX FW PMP DR TANK OUT DR TRAPS A/B BYPASS	A2T/692	CLOSED	1-BYV-3-949		IV
TD AUX FWP DR TANK OUT DR TRAP A ISOL	A2U/692	OPEN	1-ISV-3-950		IV
TD AUX FWP DR TANK OUT DR TRAP B ISOL	A2U/692	OPEN	1-ISV-3-951		IV
TD AUX FWP DR TANK OUT DR TRAPS A/B SPARE	A2U/692	CLOSED	1-BYV-3-952		IV
TD AUX FEEDWATER PMP RECIRC ISOL	A2U/692	CLOSED	1-ISV-3-960		IV
TD AUX FWP DR TANK OUT STN A BLOWOFF ISOL	A2U/692	CLOSED	1-ISV-3-1BA		IV
TD AUX FWP DR TANK OUT STN B BLOWOFF ISOL	A2U/692	CLOSED	1-ISV-3-1BB		IV
TD AUX FEEDWATER PUMP EQUALIZER DRAIN	A2U/692	CLOSED	1-DRV-3-999		IV

Checklist 3
(Page 12 of 17)

AFW Valve Alignment Verification

Date Complete ____________

NOMENCLATURE	LOCATION	POSITION	UNID	PERF INITIAL	VERIF INITIAL
SOUTH VALVE VAULT ROOM					
TD AFW PUMP SG 1 LEVEL CONTROL	S. Vlv Rm	CLOSED	1-LCV-3-174		IV
ESSENT CONTROL AIR ISOL VALVE TO 1-LCV-3-174	S. Vlv Rm	OPEN	1-ISV-32-3736		IV
TD AFW PUMP SG 4 LEVEL CONTROL	S. Vlv Rm	CLOSED	1-LCV-3-175		IV
ESSENT CONTROL AIR ISOL VALVE TO 1-LCV-3-175	S. Vlv Rm	OPEN	1-ISV-32-3769		IV
1-FT-3-163A ROOT	A2V/749 S Vlv Rm	OPEN	1-RTV-3-332A		IV
1-FT-3-163A ROOT	A2V/749 S Vlv Rm	OPEN	1-RTV-3-333A		IV
1-FT-3-170A ROOT	A3V/749 S Vlv Rm	OPEN	1-RTV-3-335A		IV
1-FT-3-170A ROOT	A3V/749 S Vlv Rm	OPEN	1-RTV-3-336A		IV
1-FT-3-163B ROOT	A2V/749 S Vlv Rm	OPEN	1-RTV-3-341A		IV
1-FT-3-163B ROOT	A2V/749 . Vlv Rm	OPEN	1-RTV-3-342A		IV
1-FT-3-170B ROOT	A3V/749 S Vlv Rm	OPEN	1-RTV-3-343A		IV
1-FT-3-170B ROOT	A3V/749 S Vlv Rm	OPEN	1-RTV-3-344A		IV
MD AFW PUMP 1A-A SG 1 LEVEL CONTROL ISOL	S. Vlv Rm	0-PI-OPS -17.0	1-ISV-3-836		
MD AFW PUMP 1B-B SG 4 LEVEL CONTROL ISOL	S. Vlv Rm	0-PI-OPS -17.0	1-ISV-3-837		
AUX FEEDWATER PMP 1A-A 1-ISV-3-836 BYPASS	S. Vlv Rm	CLOSED	1-BYV-3-845		IV
AUX FEEDWATER PMP 1B-B 1-ISV-3-837 BYPASS	S. Vlv Rm	CLOSED	1-BYV-3-846		IV
AUX FEEDWATER PMP 1A-A SG 1 SUPPLY DRAIN	S. Vlv Rm	0-PI-OPS -17.0	1-DRV-3-857		
AUX FEEDWATER PMP 1B-B SG 4 SUPPLY DRAIN	S. Vlv Rm	0-PI-OPS -17.0	1-DRV-3-858		

Checklist 3
(Page 13 of 17)

AFW Valve Alignment Verification

Date Complete ____________

NOMENCLATURE	LOCATION	POSITION	UNID	PERF INITIAL	VERIF INITIAL
SOUTH VALVE VAULT ROOM (cont)					
TD AUX FEEDWATER PMP DISCHARGE PRESSURE TEST	S. Vlv Rm	CLOSED	1-TV-3-866		IV
TD AFW PUMP SG 1 LEVEL CONTROL ISOL	S. Vlv Rm	0-PI-OPS-17.0	1-ISV-3-869		
TD AFW PMP SG 4 LEVEL CONTROL ISOL	S. Vlv Rm	0-PI-OPS-17.0	1-ISV-3-870		
TD AFW PUMP SG 1 LEVEL CONTROL ISOL	S. Vlv Rm	0-PI-OPS-17.0	1-ISV-3-877		
TD AFW PUMP SG 4 LEVEL CONTROL ISOL	S. Vlv Rm	0-PI-OPS-17.0	1-ISV-3-878		
TD AUX FEEDWATER PUMP 1-ISV-3-869 BYPASS	S. Vlv Rm	CLOSED	1-BYV-3-881		IV
TD AUX FEEDWATER PUMP 1-ISV-3-870 BYPASS	S. Vlv Rm	CLOSED	1-BYV-3-882		IV
TD AUX FEEDWATER PUMP 1-ISV-3-877 BYPASS	S. Vlv Rm	CLOSED	1-BYV-3-885		IV
TD AUX FEEDWATER PUMP 1-ISV-3-878 BYPASS	S. Vlv Rm	CLOSED	1-BYV-3-886		IV
TD AUX FEEDWATER PUMP SG 1 SUPPLY DRAIN	S. Vlv Rm	0-PI-OPS-17.0	1-DRV-3-889		
TD AUX FEEDWATER PUMP SG 4 SUPPLY DRAIN	S. Vlv Rm	0-PI-OPS-17.0	1-DRV-3-890		
AUX FEEDWATER PMP 1A-A SG 1 SUPPLY VENT	S. Vlv Rm	0-PI-OPS-17.0	1-VTV-3-903		
TD AUX FEEDWATER PUMP SG 1 SUPPLY VENT	S. Vlv Rm	0-PI-OPS-17.0	1-VTV-3-904		
TD AUX FEEDWATER PUMP SG 1 SUPPLY VENT	S. Vlv Rm	CLOSED& CAPPED	1-VTV-3-905		IV
AUX FEEDWATER PMP 1B-B SG 4 SUPPLY VENT	S. Vlv Rm	0-PI-OPS-17.0	1-VTV-3-906		
TD AUX FEEDWATER PUMP SG 4 SUPPLY VENT	S. Vlv Rm	0-PI-OPS-17.0	1-VTV-3-907		

Checklist 3
(Page 14 of 17)

AFW Valve Alignment Verification

Date Complete ____________

NOMENCLATURE	LOCATION	POSITION	UNID	PERF INITIAL	VERIF INITIAL
ANNULUS					
SG 3 AUX FEEDWATER SUPPLY VENT	El. 744 AZ 300°	0-PI-OPS-17.0	1-VTV-3-842		
SG 2 AUX FEEDWATER SUPPLY VENT	744 AZ 300°	0-PI-OPS-17.0	1-VTV-3-899		

Checklist 3
(Page 15 of 17)

AFW Valve Alignment Verification

Date Complete ____________

NOMENCLATURE	LOCATION	POSITION	UNID	PERF INITIAL	VERIFIER INITIAL
INSIDE CONTAINMENT					
AUX FEEDWATER PMP 1A-A SG 2 PRESSURE TEST	El 729 AZ 135°	CLOSED & CAPPED	1-TV-3-351A		IV
AUX FEEDWATER PMP 1B-B SG 3 PRESSURE TEST	El 729 AZ 215°	CLOSED	1-TV-3-352A		IV
AUX FEEDWATER PMP 1B-B SG 3 PRESSURE TEST	El 729 AZ 215°	CLOSED	1-TV-3-353A		IV
AUX FEEDWATER PMP 1A-A SG 2 PRESSURE TEST	El 724 AZ 135° #2 ACC RM	0-PI-OPS-17.0	1-TV-3-373A		
AUX FEEDWATER PMP 1A-A SG 2 PRESSURE TEST	El 729 AZ 135° #2 ACCRM	0-PI-OPS-17.0	1-TV-3-374A		
AUX FEEDWATER PMP 1B-B SG 3 PRESSURE TEST	El 729 AZ 215° #3 ACC RM	0-PI-OPS-17.0	1-TV-3-375A		
AUX FEEDWATER PMP 1B-B SG 3 PRESSURE TEST	El 729 AZ 215° #3 ACC RM	0-PI-OPS-17.0	1-TV-3-376A		
AUX FEEDWATER PMP 1A-A SG 2 SUPPLY DRAIN	El 729 AZ 135°	CLOSED	1-DRV-3-925		IV
AUX FEEDWATER PMP 1A-A SG 2 SUPPLY DRAIN	El 729 AZ 135°	CLOSED	1-DRV-3-926		IV
AUX FEEDWATER PMP 1B-B SG 3 SUPPLY DRAIN	El 729 AZ 215°	CLOSED	1-DRV-3-927		IV
AUX FEEDWATER PMP 1B-B SG 3 SUPPLY DRAIN	El 729 AZ 215°	CLOSED	1-DRV-3-928		IV

Checklist 3
(Page 16 of 17)

AFW Valve Alignment Verification

Date Complete ____________

DESCRIPTION	LOCATION	POSITION	UNID	PERF INITIAL	VERIF INITIAL
TDAFWP LCV N2 Control Station FOR SG 1 & 2 (el 737 Aux Building)					
N2 CYLINDER 1-TANK-3-400A ISOLATION VALVE	Outside SVR	CLOSED	NONE		IV
N2 CYLINDER 1-TANK-3-400B ISOLATION VALVE	Outside SVR	CLOSED	NONE		IV
N2 SUPPLY VALVE FOR 1-TANK-3-400A	Outside SVR	CLOSED	1-ISIV-3-400A		IV
N2 SUPPLY VALVE FOR 1-TANK-3-400B	Outside SVR	CLOSED	1-ISIV-3-400B		IV
ROOT VALVE FOR 1-PI-3-400D	Outside SVR	OPEN	1-ISIV-3-400C		IV
VENT ISOLATION	Outside SVR	CLOSED	1-VTIV-3-400D		IV
N2 SUPPLY ISOLATION FOR SG 2 (1-LCV-3-173)	Outside SVR	CLOSED	1-ISIV-3-400E1		IV
N2 SUPPLY ISOLATION FOR SG 2 (1-LCV-3-173)	Outside SVR	CLOSED	1-ISIV-3-400E2		IV
VENT ISOLATION VALVE FOR SG 2 (I-LCV-3-173)	Outside SVR	OPEN	1-VTIV-3-173D		IV
ROOT VALVE FOR 1-PI-3-173	Outside SVR	OPEN	1-ISIV-3-173C		IV
N2 SUPPLY ISOLATION FOR SG 1 (1-LCV-3-174)	Outside SVR	CLOSED	1-ISIV-3-400F1		IV
N2 SUPPLY ISOLATION FOR SG 1 (1-LCV-3-174)	Outside SVR	CLOSED	1-ISIV-3-400F2		IV
VENT ISOLATION VALVE FOR SG 1 (I-LCV-3-174)	Outside SVR	OPEN	1-VTIV-3-174D		IV
ROOT VALVE FOR 1-PI-3-174	Outside SVR	OPEN	1-ISIV-3-174C		IV

Checklist 3
(Page 17 of 17)

AFW Valve Alignment Verification

Date Complete ____________

DESCRIPTION	LOCATION	POSITION	UNID	PERF INITIAL	VERIF INITIAL
TDAFWP LCV N2 Control Station FOR SG 3 & 4 (el 737 Aux Building)					
N2 CYLINDER 1-TANK-3-401A ISOLATION VALVE	Outside SVR	CLOSED	NONE		IV
N2 CYLINDER 1-TANK-3-401B ISOLATION VALVE	Outside SVR	CLOSED	NONE		IV
N2 SUPPLY VALVE FOR 1-TANK-3-401A	Outside SVR	CLOSED	1-ISIV-3-401A		IV
N2 SUPPLY VALVE FOR 1-TANK-3-401B	Outside SVR	CLOSED	1-ISIV-3-401B		IV
ROOT VALVE FOR 1-PI-3-401D	Outside SVR	OPEN	1-ISIV-3-401C		IV
VENT ISOLATION	Outside SVR	CLOSED	1-VTIV-3-401D		IV
N2 SUPPLY ISOLATION FOR SG 3 (1-LCV-3-172)	Outside SVR	CLOSED	1-ISIV-3-401E1		IV
N2 SUPPLY ISOLATION FOR SG 3(1-LCV-3-172)	Outside SVR	CLOSED	1-ISIV-3-401E2		IV
VENT ISOLATION VALVE FOR SG 3 (I-LCV-3-172)	Outside SVR	OPEN	1-VTIV-3-172D		IV
ROOT VALVE FOR 1-PI-3-172	Outside SVR	OPEN	1-ISIV-3-172C		IV
N2 SUPPLY ISOLATION FOR SG 4 (1-LCV-3-175)	Outside SVR	CLOSED	1-ISIV-3-401F1		IV
N2 SUPPLY ISOLATION FOR SG 4 (1-LCV-3-175)	Outside SVR	CLOSED	1-ISIV-3-401F2		IV
VENT ISOLATION VALVE FOR SG 4 (I-LCV-3-175)	Outside SVR	OPEN	1-VTIV-3-175D		IV
ROOT VALVE FOR 1-PI-3-175	Outside SVR	OPEN	1-ISIV-3-175C		IV

Source Notes
(Page 1 of 1)

Requirements Statement	Source Document	Implementing Statement
AFW Pump Steam Binding	NRC IE Bulletin 85-001	1
AFW Pump Steam Binding	NCO880122003, Generic LTR 88-03	2
AFW Trip & Throttle Valve	NRC IE Notice 84-66	3
Steam Binding of AFW Pumps	NRC IE Notice 84-06	4
Reliability of PWR Auxiliary Feedwater	SOER 86-001 Recommendation 5	5
Auxiliary Feedwater Pumps Disabled By Backleakage	SOER 86-003 Recommendation 2	6
Auxiliary Feedwater Pumps Disabled By Backleakage	SOER 86-003 Recommendation 4	7
Reliability of PWR Auxiliary Feedwater	SOER 86-001 Recommendation 10	8
Compressed Nitrogen bottles for backup supply to LCVs during 4-hour SBO event.	NCO860244014	9
Breaker Closing Springs	SOER 82-16 Recommendation 2	10
Add caution on pump starts on calorimetric change due to S/G blowdown isolation.	WBPER960853	11

o

SPARE - B.1.a
Withdraw Shutdown Banks

EVALUATION SHEET

Task: Withdraw Shutdown Banks

Alternate Path: Following failure of the group step counters, the reactor trip breakers are opened in accordance with Technical Requirement 3.1.7.

Facility JPM #: JPM B.1.a 5-09

Safety Function: 1 **Title:** Reactivity Control

K/A 001 A3.05 Ability to monitor automatic operation of the CRDS, including: Individual vs. group rod position.

Rating(s): 3.5/3.5 **CFR:** 41.7/45.13

Evaluation Method: Simulator __X__ In-Plant ______ **Classroom** ______

References: SOI-85.01, "Control Rod Drive and Position Indication System," Rev. 39.
TR 3.1.7, "Reactivity Control Systems, Position Indicating System - Shutdown."
AOI-2, "Malfunction of Reactor Control System," Rev. 37.

Task Number: RO-085-SOI-85-001 **Title:** Perform shutdown rod withdrawal.

Task Standard: The applicant:
1.) Discovers the Shutdown Bank "A" Group 1 demand counter failure when Group 1 rods are greater than 115 steps withdrawn.
2.) Stops shutdown bank withdrawal.
3.) Opens the reactor trip breakers to comply with TR 3.1.7, "Reactivity Control Systems, Position Indicating System - Shutdown."

Validation Time: 10 minutes **Time Critical:** Yes ____ No __X__

==

Applicant: __________________ ____________ Time Start: ______
NAME Docket No. Time Finish: ______

Performance Rating: SAT ____ UNSAT ____ Performance Time ___

Examiner: __________________ __________________/________
NAME SIGNATURE DATE

==

COMMENTS

____

SIMULATOR OPERATOR INSTRUCTIONS:

1. ENSURE NRC Examination Security has been established.
2. RESET to Initial Condition by performing the following actions:
   a. Select ICManager on the THUNDERBAR menu (right hand side of Instructor Console Screen).
   b. Locate IC 315.
   c. Right "click" on IC 315.
   d. Select Reset on the drop down menu.
   e. Right "click" on RESET.
   f. Enter the password for IC 315.
   g. Select "Yes" on the INITIAL CONDITION RESET pop-up window.
   h. Perform SWITCH CHECK.
3. ENSURE the following information appears on the Director Summary Screen:

	Key		Type	Event	Delay	Inserted	Ramp	Initial	Final	Value
	fw27c	lcv-6-105a fail position	M		00:00:00	00:00:00	00:00:00		100	100
	fw27d	lcv-6-105b fail position	M		00:00:00	00:00:00	00:00:00		100	100
	fw28b	lcv-6-190b fail	M		00:00:00	00:00:00	00:00:00		100	100
	rd19a	Reset Shut Bank A Group 1 Step Counter	M	27	00:00:00		00:00:00		Active	InActive

4. ENSURE Event 27, "Shutdown Bank A at 115 steps [pc_rdu0053 == 115]," is loaded.
5. Place simulator in RUN and acknowledge any alarms.
6. ENSURE a marked-up copy of SOI-85.01, "Control Rod Drive and Indication System," Section 5.4, "Shutdown Banks Withdrawal," signed (circled-and-slashed) through Step 5 is available to the Examiner.
7. ENSURE "Extra Operator" is present in the simulator.
8. Place simulator in FREEZE until Examiner cue is given.

READ TO APPLICANT

DIRECTION TO APPLICANT:

I will explain the initial conditions, and state the task to be performed. All control room steps shall be performed for this JPM, including any required communications. I will provide initiating cues and reports on other actions when directed by you. Ensure you indicate to me when you understand your assigned task. To indicate that you have completed your assigned task return the cue sheet I provided you.

INITIAL CONDITIONS:

1. **A unit startup is in progress following a trip from 100% power due to a generator electrical relay malfunction that occurred 6 days ago.**
2. **Per the Nuclear Operating Book (NOB), Sheet 7 BANK OVERLAP AND ROD INSERTION LIMITS, the shutdown banks fully withdrawn position is 230 steps.**
3. **GO-2, "Reactor Startup," Section 5.2 "Actions Performed Before Startup," is complete to Step [11.10].**
4. **The US/SRO has approved shutdown bank withdrawal.**
5. **SOI-85.01, "Control Rod Drive and Indication System," is being performed and is complete through Section 5.4, Step 8.**
6. **All reactivity briefs required by SPP-10.4, "Reactivity Management Program" have been completed.**

INITIATING CUES:

You are to continue the performance of SOI-85.01 at Section 5.4 Step 9, and withdraw the shutdown banks.

STEP/STANDARD	SAT/UNSAT

START TIME: _______

NOTE	
Actual Full Out Position of the SD Banks is determined by performing TI-85.005 quarterly. Full Out position varies from 225 to 231 Steps and can be verified on NOB Sheet A-7, Full Out Rod Position	
STEP 1: [9] **SELECT** SD Bank A (SBA) on ROD BANK SELECTOR SWITCH, 1-RBSS. STANDARD: ___Applicant locates 1-RBSS ROD BANK SELECTOR SWITCH and rotates the switch from the MANUAL position to the left to the SBA position. **Step is critical to ensure the correct shutdown bank is withdrawn.** COMMENTS:	**CRITICAL STEP** ___ SAT ___ UNSAT
STEP 2: [10] **PLACE** 1-FLRM, IN-HOLD-OUT SWITCH, to OUT to begin withdrawing Shutdown Banks A1 and A2 to greater than or equal to 225 Steps. STANDARD: Applicant locates 1-FLRM, IN-HOLD-OUT SWITCH and pushes the switch up to the "OUT" position and monitors shutdown bank A group A1 and A2 step counters are responding by observing each step counter "counts up" in the proper sequence (Group 1 moves one step, then Group 2 rods move 1 step.) **Step is critical since this will initiate rod withdrawal.** COMMENTS:	**CRITICAL STEP** ___ SAT ___ UNSAT

STEP/STANDARD	SAT/UNSAT
STEP 3: [11] **MONITOR** the following as the Bank is being withdrawn: • Group Step Counters • RPIs • "In-Out" Status Lights • Rod speed (64 Steps/Minute) STANDARD: The applicant locates and monitors RPIs and Rod Speed on the CERPI monitors as the rods are being withdrawn. The applicant locates and monitors 1-SBAG1, SHUTDOWN BANK A1 and 1-SBAG-2, SHUTDOWN BANK A2 Group Step Counters on 1-M-4 bench board. The applicant locates and observes the RED "RODS OUT" light is lit when rod withdrawal is in progress. COMMENTS:	___ SAT ___ UNSAT

EXAMINER: Malfunction to fail step counters is inserted (by Event 27) when Shutdown Bank A rods reach 115 steps.

STEP/STANDARD	SAT/UNSAT

TR 3.1 REACTIVITY CONTROL SYSTEMS

TR 3.1.7 Position Indication System, Shutdown

TR 3.1.7 The group demand position indicators shall be OPERABLE and capable of determining within ± 2 steps the demand position for each shutdown or control rod that is not fully inserted.

APPLICABILITY: MODES 3, 4, and 5, when the reactor trip breakers are closed.

ACTIONS

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. One or more group demand position indicators inoperable.	A.1 Open reactor trip breakers.	Immediately

EXAMINER: If applicant has identified the failure and informs the evaluator, cue the applicant to "take your appropriate actions."

STEP 4: Open the Reactor Trip Breakers

CRITICAL STEP

___ SAT

___ UNSAT

STANDARD:

Applicant determines the Group 1 step counter is not capable of determining the demand position for each of the Shutdown bank A rods within ± 2 steps and opens the reactor trip breakers

Cue: After the reactor trip breakers have been opened state "Another operator will perform the remaining actions."

COMMENTS:

END OF TASK

STOP TIME ________

APPLICANT CUE SHEET

(RETURN TO EXAMINER UPON COMPLETION OF TASK)

INITIAL CONDITIONS:

1. A unit startup is in progress following a trip from 100% power due to a generator electrical relay malfunction that occurred 6 days ago.
2. Per the Nuclear Operating Book (NOB), Sheet 7 BANK OVERLAP AND ROD INSERTION LIMITS, the shutdown banks fully withdrawn position is 230 steps.
3. GO-2, "Reactor Startup," Section 5.2 "Actions Performed Before Startup," is complete to Step [11.10].
4. The US/SRO has approved shutdown bank withdrawal.
5. SOI-85.01, "Control Rod Drive and Indication System," is being performed and is complete through Section 5.4, Step 8.
6. All reactivity briefs required by SPP-10.4, "Reactivity Management Program" have been completed.

INITIATING CUES:

You are to continue the performance of SOI-85.01 at Section 5.4 Step 9, and withdraw the shutdown banks.

TVA

Watts Bar Nuclear Plant

Unit 1

General Operating Instructions

GO-2

Reactor Startup

Revision 0037

Quality Related

Level of Use: Continuous Use

Effective Date: 10-20-2010

Responsible Organization: OPS, Operations

Prepared By: Brent Henderson

Approved By: Benjamin Hunt

Revision Log

Revision or Change Number	Effective Date	Affected Page Numbers	Description of Revision/Change
31	02/27/09	2, 34	Administrative change. Added step 5.H. to Appendix A to "ATTACH the completed Mode 2 entry portion of the Mode 3-to-Mode 2, 1 surveillance reports to this procedure." (PER ACTION 151245-005)
32	03/19/09	2, 5, 6	Added reference and precaution for jumper installation and removal. (PER 140641)
33	06/04/09	2, 7, 10, 30, 31	Minor /Editorial change to removed the steps that required entry into Tech Spec 3.3.2. Reworded caution prior to resetting the TDMFWP's and added P/L to address Tech Spec change 08-07.
34	10/08/09	3, 18	Revised step 5.3[8.3] to direct continued performance at step 5.3[21]. Pet 201 no longer directs the actions equivalent to steps 5.3[21]-[22]
34 / UC-1	10/19/09	9	Made step 4.0[7] conditional, there is no requirement the TDAFWP be running.
35	10/20/09	9	Incorporate UC-1 to revision 34.
36	06/02/10	31	Incorporate UC-1 to revision 35
37	10/20/10	2, 6, 7, 10, 12-15, 17, 18, 20-22, 24-26, 28-30, 34, 35, 37	Minor editorial changes including corrective action for PER 231487-001 and ODM-23 required changes.

Table of Contents

1.0 INTRODUCTION

1.1 Purpose

This Instruction provides actions to perform unit startup from Hot Standby (Mode 3) at normal operating temperature and pressure to between 1 and 4% Reactor Power (Mode 2).

1.2 Scope

This GO contains the following:

5.0 Instructions

5.1 General

5.2 Actions Performed Before Reactor Startup

5.3 Reactor Startup

2.0 REFERENCES

2.1 Performance References

A. 0-SI-0-3, Weekly Log

B. 1-SI-0-10, Shutdown Margin

C. 1-SI-0-11, Estimated Critical Position

D. 1-SI-0-2 Series, Shift And Daily Surveillance Log

E. 1-SI-0-903, Primary Pressure Boundary Isolation Valve Leak Test (Safety Injection Primary Check Valves)

F. 1-SI-47-76, Trip Actuating Device Operational Test (TADOT) Turbine Trip - Low Fluid Oil Pressure Channels I, II, III

G. 1-SI-47-77, Trip Actuating Device Operational Test (TADOT) Turbine Trip - Turbine Stop Valve Closure

H. 1-SI-68-34, Minimum Temperature for Criticality TAVG-TREF Deviation Alarm not Reset

I. 1-SI-85-1, Rod Drop Time Measurement by Simultaneously Dropping All Rod Banks

2.1 Performance References (continued)

J. 1-SI-85-10, Rod Drop Time Measurement Using CERPI Rod Drop Test Computer.

K. 1-SI-85-2, Reactivity Control Systems Moveable Control Assemblies (Mode 1 and 2)

L. 1-SI-85-3, Calibration (Cold/Hot) of Rod Position Indication Channels and Full Range Verification

M. 1-SI-92-8, Power Range Overpower Trip High Range Bistable Adjustment for Limiting Condition for Operation

N. 1-SI-99-4-A and (B), Trip Actuating Device Operational Test of Reactor Trip P-4 ESFAS Interlock Train A (B)

O. 1-TRI-85-1, Reactivity Control Systems Movable Control Assemblies (Modes 3,4, and 5)

P. CM-3.01, System Chemistry Specifications

Q. CM-5.08, Startup Primary Chemistry Control

R. Nuclear Operating Book (NOB)

S. OPDP-1, Conduct of Operations

T. PET-107, Mode 3 Physics Testing

U. PET-201, Initial Criticality and Low Power Physics Testing

V. SOI-2 & 3.01, Condensate And Feedwater System

W. SOI-62.02, Boron Concentration Control

X. SOI-62.04, CVCS Purification System

Y. SOI-68.02, Reactor Coolant Pumps

Z. SOI-85.01, Control Rod Drive And Indicating System

AA. TI-127, Reactor/Turbine Trip Report, Event Critique, Root Cause Analysis

BB. TI-34.04, Loose Parts Monitoring Gain and Alarm Setpoints

CC. 0-PI-OPS-1.1, Jumper Control Process\

DD. IMI-99.040A, Maintain Source Range in Service Jumpers

2.2 Developmental References

A. WBN, Technical Specifications

B. GOI-7, Generic Equipment Operating Guidelines

3.0 PRECAUTIONS AND LIMITATIONS

3.1 Precautions

NOTES

1) If a precaution cannot be complied with, the SM shall initial, date, and write a brief explanation. Precautions that contain must, shall, or will, must be adhered to.

2) This instruction may be entered from a partial shutdown. N/A section(s) not applicable and annotate reason.

3) During power changes, maximize letdown flow when possible to minimize crud induced power shifts.

A. Anticipate criticality anytime reactivity changes are being made. [C.1]

B. In Hot Standby, maintain Shutdown Margin to account for positive reactivity addition from Xenon transients to ensure inadvertent criticality does not occur. The SR and IR instruments must be closely observed to detect an inadvertent criticality during Xenon transients.[C.1]

C. Pzr-RCS C_B difference should be less than or equal to 50 ppm and is maintained by use of Pzr heaters and spray.

D. Contact Reactor Engineering for guidance on core operating recommendations during unusual power maneuvers such as startup at End of Life (EOL).

E. After refueling, NIS indications may be inaccurate until calibrated at higher power levels. NIS calibration procedures will adjust PRM trip setpoints lower than normal to ensure excore detectors protect against an overpower condition.

F. In Mode 2 (less than or equal to 5%), sudden temperature decreases, or C_B changes greater than 10 ppm, should be avoided. The operator should be alert to secondary steam flow to avoid cooling the RCS below the Minimum Temperature for Criticality of greater than or equal to 555°F, and/or causing a spurious Safety Injection.[C.2]

G. All jumper installation and removal shall be in accordance with 0-PI-OPS-1.1, Jumper Control Process.

3.1 Precautions (continued)

H. In Mode 2, the trip function of all Turbine Driven Main Feedwater Pumps (TDMFWP) is required when one or more (TDMFWP) is supplying feedwater to the Steam Generators. Refer to Tech Spec 3.3.2 condition J.

I. The Greek symbol (þ) precedes steps associated with direct reactivity manipulations, for example: RCS dilution and boration, control rod manipulations.

3.2 Limitations

A. In Mode 2 with K_{eff} less than 1.0, or in Mode 3 or 4, Shutdown Margin shall be maintained greater than or equal to 1600 pcm (T.S. 3.1.1).

B. In Mode 3, at least two RCPs shall be operable with two loops in operation when the Rod Control System is capable of rod withdrawal, and at least one RCP shall be in operation when the Rod Control System is not capable of rod withdrawal (T.S. 3.4.5).

C. SOURCE RANGE HI FLUX AT SHUTDOWN alarm shall be in operation any time the Reactor is shutdown with fuel in the Reactor vessel.

D. Simultaneous reactivity addition by rod withdrawal and dilution is not allowed while in the Source range.

E. If at any point during the approach to criticality, ONE of the two Source Ranges shows an unexplained rise in count rate by a factor of 5 or greater, or if BOTH Source ranges show an unexplained rise in count rate by a factor of 2 or greater, the approach to critical shall be SUSPENDED IMMEDIATELY and the control rods FULLY INSERTED (i. e., rod withdrawal and/or boron dilution shall be terminated). Further positive reactivity changes shall not be resumed UNTIL an evaluation is performed, Plant Manager approval obtained, and the SM authorizes resuming the approach to critical.[C.1]

F. A member of Operations Management Staff, not assigned to the operating crew, shall be present in the control room during the approach to criticality.

Date TODAY ________ **Initials** _____

4.0 PREREQUISITES

STARTUP No. ______________

NOTES

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

2) Prerequisite Actions may be complied with in any order. If a prerequisite cannot be complied with, the SM shall initial, date, and write a brief explanation. Prerequisites that contain must, shall, or will, cannot be N/A'd.

3) Throughout this instruction, Concurrent Verification (CV) for breaker or fuse manipulations may be marked N/A if no manipulations are performed.

[1] **MAINTAIN** Pzr pressure in the normal operating band with Pzr heaters and spray. TRO ______

[2] **MAINTAIN** Pzr level at greater than or equal to 25%. TRO ______

NOTE

T_{AVG} will vary as a function of reactor power until the unit is greater than 15% turbine load (C5) and the T_{avg} program is maintained by AUTO or manual rod control. The T_{AVG}-T_{REF} deviation alarm should be expected as reactor power approaches 7% RTP.

[3] **MAINTAIN** Steam Dumps in the Pressure Mode set at 84% (1092 psig), or with SG PORVs set at 84%. TRO ______

[4] **IF** SG PORVs are in service, **THEN**

ENSURE adequate CST level. TRO ______

[5] **IF** A-A AFW Pump is NOT running, **THEN**

MANUALLY START the A-A AFW Pump in accordance with SOI-3.02, Section 8.1.1. TRO ______

[6] **IF** B-B AFW Pump is NOT running, **THEN**

MANUALLY START the B-B AFW Pump in accordance with SOI-3.02, Section 8.1.2. TRO ______

Date TODAY ________ Initials_____

4.0 PREREQUISITES (continued)

[7] **IF** TD AFW Pump is desired to be running **AND** TD AFW Pump is **NOT** running, **THEN**

MANUALLY START the TD AFW Pump in accordance with SOI-3.02, Section 8.1.3. TRO ________

[8] **MAINTAIN** SG levels on program with AFW pumps. TRO ________

[9] **ENSURE** all RCPs are operating per SOI-68.02. TRO ________

[10] **ENSURE** Source Range jumpers have been removed per IMI-99.040A, Maintain Source Range in Service jumpers. (Ref GO-1). TRO ________

[11] **WHEN** Source Range jumpers are removed, **THEN**

REMOVE Caution Order from Reactor trip breakers, RTA and RTB . TRO ________

[12] **CONDUCT** a pre-evolution briefing in accordance with OPDP-1, stressing the following:

- Management Expectations
- Limitations/Precautions
- Communications
- Chain of Command
- Conservative actions when repositioning control rods during approach to critical

TSM ________
SM

Date TODAY ________ Initials_____

5.0 INSTRUCTIONS

5.1 General

NOTE

Section 5.0 steps must be performed sequentially, unless specifically stated otherwise. Prior SM approval is required to deviate from this sequence.

[1] **ENSURE** Section 4.0, Prerequisites, **COMPLETE.** TRO ______

5.2 Actions Performed Before Reactor Startup

[1] **INITIATE** Appendix A, Mode 3-To-Mode 2 Review and Approval, while continuing with this instruction. TRO ______

[2] **ENSURE** Daily Scheduling Supervisor has issued the Mode 3-to-Mode 2,1 surveillance reports to the applicable department sections to prepare for Mode 2 entry. TRO ______

[3] **ENSURE** Daily Scheduling Supervisor has issued the Reactor Trip Breaker reports to the applicable department sections before closing the Reactor trip breakers (N/A if previously performed). TRO ______

NOTE

The Pzr steam space sample should remain in service per CM-5.08 for removal of non-condensable gases.

[4] **COORDINATE** with Chemistry to establish primary and secondary startup chemistry controls per CM-5.08, and CM-3.01. TRO ______

NOTE

In Mode 2, trip function of all Turbine Driven Main Feedwater Pumps (TDMFWP) is required when one or more (TDMFWP) is supplying feedwater to the Steam Generators. Refer to Tech Spec 3.3.2 condition J.[C.5]

[5] **DETERMINE** which MFW pump will be started first. TRO ______

- 1A MFW pump ☐
- 1B MFW pump N/A ☐

Date TODAY________ **Initials_____**

5.2 Actions Performed Before Reactor Startup (continued)

> **CAUTION**
>
> Failure to have all three AFW pumps in operation with the FWPs tripped and trip buses energized will initiate an ESF Actuation.

[6] **ENSURE** power restored to MFPT trip buses TRO ______

NOMENCLATURE	LOCATION	POSITION	UNID	PERF INITIAL	VERIF INITIAL
		250V Batt Bd 1			
250V DC FDR FOR MFPT A TRIP BUS UNIT 1	PANEL 3	ON	1-BKR-46-9	DAH	HAD CV
250V DC FDR FOR MFPT B TRIP BUS UNIT 1	PANEL 3	ON	1-BKR-46-36	DAH	HAD CV

[7] **IF** an SI signal has occurred, **THEN**

CYCLE the Reactor Trip Breakers. N/A ______

[8] **SELECT** HIGHEST reading Source Range and Intermediate Range channels to record on 1-NR-92-145. TRO ______

[9] **ENSURE** the following:

[9.1] Audio Count Rate channel IN OPERATION. TRO ______

[9.2] Audio Count Rate selected to the highest Source Range. TRO ______

Date TODAY ______ Initials_____

5.2 Actions Performed Before Reactor Startup (continued)

NOTE

The Loose Parts Monitoring System (LPMS) alarm is required to be in service prior to Mode 2 entry (TR 3.3.6.)

[10] **PERFORM** Step 5.2[10.1] OR 5.2[10.2] below (**N/A** option **NOT** used):

[10.1] **IF** the plant has been maintained in Hot Standby Conditions, **THEN**

PERFORM the following to enable LPMS alarm [0-R-139 panel, Aux Instr. Rm] — N/A

A. **PRESS** SYSTEM RESET switch [1433-P module] _____

B. **PLACE** ANNUNCIATOR INHIBIT switch [1439 module] in DOWN position. _____

C. **PLACE** TAPE RECORDER INHIBIT AUTO START switch [1436WB module] in DOWN position. _____

[10.2] **IF** plant has NOT been maintained in Hot Standby Conditions, **THEN**

ENSURE Instrument Maintenance (IM) completes performance of TI-34.04 to place LPMS in service. TRO _____

[11] **IF** Shutdown Rods are INSERTED, **THEN**

[11.1] **CHECK** Reactor Trip Breaker Closure Surveillance report (generated by scheduling) is COMPLETE. TRO _____

[11.2] **ENSURE** Shutdown Bank withdrawal criteria MET per 1-SI-0-10. TRO _____

[11.3] **ENSURE** all Reactor Trip first-out alarms RESET. TRO _____

[11.4] **PLACE** Control Rod Drive System in service per SOI-85.01. TRO _____

[11.5] **CLOSE** Reactor Trip Breakers per SOI-85.01. TRO _____

Date TODAY Initials____

5.2 Actions Performed Before Reactor Startup (continued)

[11.6] **PERFORM** the following concurrently:

A. 1-TRI-85-1 (N/A if performed within the previous 31 days), TRO

B. 1-SI-85-2 (N/A if in frequency). TRO

[11.7] **PERFORM** the ROD BANK UPDATE on the ICS Computer (ROD BANK UPDATE is on NSSS Screen). TRO

[11.8] **ENSURE** Instrument Maintenance (IM) has completed 1-SI-99-4-A and -B, to check P-4 Interlock.[C.3] TRO

NOTE

Procedure PET-107, Mode 3 Physics Testing, satisfies low power physics testing if completed satisfactorily. If not, further testing will be required per PET-201, Initial Criticality and Low Power Physics Testing, which includes steps to withdraw Shutdown Banks.

[11.9] **ENSURE** PET-107, Mode 3 Physics Testing, completed satisfactorily. TRO
IF NOT, THEN

ENSURE Reactor Engineering completes PET-201, Initial Criticality and Low Power Physics Testing. N/A

Date TODAY______ Initials_____

5.2 Actions Performed Before Reactor Startup (continued)

CAUTION

Control Room activities not related to reactor startup should be minimized during the approach to criticality. SM should not permit shift turnover or other distractions to cause insufficient attention to the approach to criticality.

NOTES

1) NIS Instruments must be monitored in anticipation of unplanned reactivity changes.[C.1]

2) During rod withdrawal, Rod Position Indicators (RPIs) should be compared with the Step Counters to determine if rod misalignment or other rod related problems exist.[C.4]

3) COLR defines fully withdrawn as a band for the Shutdown and Control banks. Computer constant K0015 provides current value, and should be consistent with NOB Sheet A-7, Monthly Full Out Rod Position.

[11.10] **(b) WITHDRAW** Shutdown Rods to fully withdrawn per SOI-85.01. ______

[12] **IF** refueling was performed **OR** Reactor Vessel Head removed, **THEN**

[12.1] **ENSURE** Rod Drop Timing per either 1-SI-85-10 OR 1-SI-85-1 has been performed. ______

[12.2] **ENSURE** IM has performed RPI Calibration per 1-SI-85-3. ______

[13] **ENSURE** the following systems are operable prior to going to Mode 2.

- Containment H_2 Recombiners per SOI-83.01, Checklist 1. ______
- Permanent H_2 Mitigation System per SOI-268.01, Checklist 1, 2, & 3. ______

[14] **INITIATE** Appendix A, Mode 3-To-Mode 2 Review And Approval, to ensure ALL restraints to Mode 2 entry are resolved, and approvals for mode change granted. ______ SM

Date________ **Initials_____**

5.2 Actions Performed Before Reactor Startup (continued)

[15] **ENSURE** IM has completed the following Trip Actuating Device Operational Tests (TADOTs) (N/A if performed within 31 days before reactor startup):

- 1-SI-47-76 ________
- 1-SI-47-77 ________

End of Section

Date________ Initials_____

5.3 Reactor Startup

NOTE

Anytime reactivity changes are made, criticality must be anticipated. Closely monitor NIS instruments.

[1] **ENSURE** Section 5.2, Actions Performed Before Reactor Startup, have been COMPLETED. _________

[2] **BLOCK** SOURCE RANGE HI FLUX AT SHUTDOWN alarm by placing both HI FLUX AT SHUTDOWN switches at SR NIS panels [M-13] to BLOCK. _________

[3] **CHECK** Alarm 81 C, SOURCE RANGE HI FLUX AT SHUTDOWN ALM BLOCKED, is LIT. _________

[4] **CHECK** greater than or equal to 0.5 cps on highest SR NIS. _________

NOTE

The following count rates may be used as a reference during the approach to criticality.

[5] **RECORD** SR NIS count rates from 5.3[5.1] or 5.3[5.2] (N/A NIs not used): _________

[5.1]

1-M-4 (preferred)

1-NI-92-131A _________ cps

1-NI-92-132A _________ cps

[5.2]

SR NIS Drawer [1-M-13]

1-NI-92-131D _________ cps

cps1-NI-92-132E _________ cps

Date________ Initials_____

5.3 Reactor Startup (continued)

CAUTION

After refueling, NIS indications may be inaccurate until calibrated at higher power. NIS calibrations will adjust PRM setpoints lower than normal to ensure excore detectors protect against an overpower condition. Redundant indications of Reactor Power should be used until confidence is established in the PR indicators (ΔT, Turbine Power, NIS).

NOTE

ICRR plot being performed should be referred to until criticality is achieved.

[6] **IF** initial startup following refueling, **OR** activities occurred which could cause non-conservative NIS response, **THEN**

ENSURE Power Range high-flux trip setpoints are reduced to less than or equal to 85% RTP.

________ IM ________ Date ________ Time

CAUTION

Avoid operations that could produce sudden temperature changes or unplanned C_B changes during approach to critical or at low power.

[7] **MONITOR** Source and Intermediate range NIs during approach to critical to identify potential reactivity anomalies. ________

[8] **IF** initial startup is following refueling, **THEN**

PERFORM the following:

[8.1] **ENSURE** Shift and Daily Surveillance Log Mode 2, 1-SI-0-2A-02 (1900-0700) or 1-SI-0-2B-02 (0700-1900) is **COMPLETE** for Mode 2 entry.

________ Initials ________ Date ________ Time

[8.2] **NOTIFY** on-site personnel of Reactor startup over P/A. ________

Date________ Initials_____

5.3 Reactor Startup (continued)

NOTES
SR 3.1.7.1 (ECP above insertion limit), is triggered in PET-201.

[8.3] **IF** dilution to critical is required, **THEN**

ENSURE Appendix A, Mode 3-To-Mode 2 Review And Approval, **COMPLETE**, AND, _________

LOG Mode 2 entry in Narrative Log as directed by PET-201, Initial Criticality and Low Power Physics Testing. _________

GO TO step 5.3[21]. _________

NOTE
If performing PET-201, steps 5.3[9] through 5.3[22] are N/A.

[9] **CALCULATE** Estimated Critical Position (ECP) per 1-SI-0-11.

_____________ Initials _____________ Date _____________ Time

[10] **IF** actual C_B is **NOT** within 5 ppm of Estimated Critical C_B, **THEN**

RECALCULATE ECP

OR _________

PERFORM the following:

[10.1] **(þ) DILUTE/BORATE** per SOI-62.02, to the Estimated Critical C_B. _________

[10.2] **EQUALIZE** RCS-Pzr C_B (within 50 ppm) using Pzr heaters and spray. _________

[10.3] **WHEN** sufficient mixing has occurred (≥30 minutes), **THEN**

REQUEST Chemistry to obtain a new C_B sample. _________

Date________ Initials_____

5.3 Reactor Startup (continued)

[10.4] **ENSURE** actual C_B is within 5 ppm of estimated C_B. ________

[11] **RECORD** the 750 pcm Upper and Lower rod position limits, Estimated Critical Position, and the Mode 2 rod position, determined by 1-SI-0-11:

NOTE

If ARO on Control Bank D (CBD) is less than 750 pcm, the upper limit rod position is the Control Bank D ARO number.

A. Upper rod position limit _______ steps on bank _______

B. Lower rod position limit _______ steps on bank _______

C. Estimated Critical Position: _______steps on bank CBD

D. Mode 2, -1000 pcm rod position _______steps on bank_______ ________

[12] **CHECK** Shutdown Banks fully withdrawn, AND ________

CHECK the ROD BANK UPDATE was updated on the ICS Computer (ROD BANK UPDATE is on NSSS Screen). ________

[13] **ENSURE** the following are COMPLETE as required:

- TI-34.04, Loose Parts Monitoring System Gain and Alarm Setpoints (Ref. Step 5.2[10]) ________
- 1-SI-47-76, Trip Actuating Device Operational Test (TADOT) Turbine Trip - Low Fluid Oil Pressure Channels I, II, III (N/A if performed within 31 days before reactor startup) (Ref. Step 5.2[15]) ________
- 1-SI-47-77, Trip Actuating Device Operational Test (TADOT) Turbine Trip - Turbine Stop Valve Closure (N/A if performed within 31 days before reactor startup) (Ref. Step 5.2[15]) ________

Date________ **Initials**_____

5.3 Reactor Startup (continued)

[14] **ENSURE** a member of Operations Management Staff who is **NOT** a member of the operating crew, is present in the control room during the approach to criticality. ________ SRO

[15] **ANNOUNCE** Reactor startup over P/A (N/A if previously performed). ________

CAUTIONS

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

2) If the approach to criticality is suspended or delayed, the core shall be maintained sufficiently subcritical to avoid inadvertent criticality.

[16] **INITIATE** Reactor Startup by performing the following:

[16.1] **INITIATE** Inverse Count Rate Ratio monitoring (ICRR). ________

[16.2] **RECORD** both SR NIS readings for ICRR base counts:

1-NI-92-131A ________ cps

1-NI-92-132A ________ cps ________

NOTE

NIS Instruments shall be monitored in anticipation of unplanned reactivity rate of change [C.1]

[16.3] **(þ) START** Control Bank withdrawal per SOI-85.01. ________

[16.4] **PRIOR TO** rods reaching Mode 2 rod position specified in Step 5.3[11]D, **THEN**

ENSURE RPIs and step counters are within ± 12 steps. ________

Date________ **Initials**_____

5.3 Reactor Startup (continued)

[16.5] **IF** rods reach MODE 2 rod position specified in Step 5.3[11]D, **THEN**

ENSURE Appendix A, Mode 3-To-Mode 2 Review And Approval, **COMPLETE**, **AND**

LOG Mode 2 entry in Narrative Log. ________

________ ________ ________
Initials Date Time

NOTE
Step 5.3[16.6] and 5.3[17] may be signed off at the completion of the last full 50 steps before critical.

[16.6] **STOP** at 50 steps, and

PERFORM ICRR. ________

[17] **IF** ICRR predicts criticality will not occur in next 50 steps, **THEN**

(þ) WITHDRAW RODS an additional 50 steps, and

RETURN to step 5.3[16.4]. ________

[18] **IF** ICRR plot predicts criticality in the next 50 steps **AND**

within the tolerance in step 5.3[11]**, THEN**

[18.1] **CHECK** Estimated Critical Position above Insertion Limit, per 1-SI-0-11, within 4 hours of achieving criticality (SR 3.1.7.1). ________

[18.2] **ENSURE** T_{AVG} greater than or equal to 555°F. ________

[18.3] **(þ) WITHDRAW** RODS to achieve criticality, establish a positive startup rate, **THEN**

GO TO step 5.3[21]. ________

Date________ **Initials_____**

5.3 Reactor Startup (continued)

Start of Critical Step(s)

[19] **IF** criticality cannot be achieved within step 5.3[11] tolerance, **THEN**

PERFORM the following:

[19.1] **STOP** rod withdrawal. ________

[19.2] **(þ) INSERT** ALL Control Banks fully. ________

[19.3] **LOG** Mode 3 entry in Narrative Log.

__________ Initials __________ Date __________ Time

[19.4] **RECALCULATE** Shutdown Margin per 1-SI-0-10.

__________ Initials __________ Date __________ Time

End of Critical Step(s)

[20] **IF** all control rods were inserted per 5.3[19], **THEN**

[20.1] **ENSURE** Reactor Engineering evaluates **AND** Initiates a Service Request (SR). ________

[20.2] **RECALCULATE** ECP per 1-SI-0-11.

__________ Initials __________ Date __________ Time

[20.3] **OBTAIN** permission to proceed from Plant Manager. ________

[20.4] **(þ) DILUTE/BORATE** per SOI-62.02 to Estimated Critical C_B. ________

[20.5] **EQUALIZE** RCS-Pzr C_B (within 50 ppm) using Pzr heaters and spray. ________

Date________ Initials_____

5.3 Reactor Startup (continued)

[20.6] **WHEN** sufficient mixing has occurred (≥30 minutes), **THEN**

REQUEST Chemistry to obtain a new C_B sample. ________

[20.7] **ENSURE** actual C_B is within 5 ppm of ECP boron for Reactor Startup. ________

NOTE

If ARO on Control Bank D (CBD) is less than 750 pcm, the upper limit rod position is the Control Bank D ARO number.

[20.8] **RECORD** the 750 pcm Upper and Lower rod position limits, Estimated Critical Position, and Mode 2 rod position, determined by 1-SI-0-11:

A. Upper rod position limit

______ steps on bank ________

B. Lower rod position limit ________ steps

on bank ________.

C. Estimated Critical Position ________ steps

on bank CBD.

D. Mode 2, -1000 pcm rod position ________ steps

on bank ________ ________

[20.9] **ENSURE** 1-SI-0-2, **COMPLETE** for Mode 2 entry.

________	________	________
Initials	Date	Time

[20.10] **INITIATE** Inverse Count Rate Ratio monitoring (ICRR). ________

[20.11] **RECORD** both SR NIS readings for ICRR base counts:

1-NI-92-131A ________cps,

1-NI-92-132A ________cps ________

Date________

Initials_____

5.3 Reactor Startup (continued)

NOTE
NIS Instruments shall be monitored in anticipation of unplanned reactivity rate of change.[C.1]

[20.12] **(b) START** Control Bank withdrawal per SOI-85.01. ________

[20.13] **PRIOR** TO rods reaching Mode 2 rod position specified in Step 5.3[20.8]D **THEN**

ENSURE RPIs and step counters are within ± 12 steps. ________

[20.14] **IF** control rods reach Mode 2 rod position specified in Step 5.3[20.8]D **THEN**

ENSURE Appendix A, Mode 3-To-Mode 2 Review And Approval, **COMPLETE, AND** ________

LOG Mode 2 entry in Narrative Log.

________ Initials ________ Date ________ Time

NOTE
Step 5.3[20.15][and 5.3[20.16] may be signed off after last 50 steps before criticality.

[20.15] **STOP** at 50 steps, and

PERFORM ICRR. ________

[20.16] **IF** ICRR predicts criticality will **NOT** be achieved in next 50 steps, **THEN**

(b) WITHDRAW RODS an additional 50 steps, and

RETURN to step 5.3[20.13] ________

Date________

Initials_____

5.3 Reactor Startup (continued)

[20.17] **IF** ICRR plot predicts criticality in next 50 steps **AND** within the tolerance in step 5.3[20.8], **THEN**

[20.17.1] **CHECK** Estimated Critical Position above Insertion Limit, per 1-SI-0-11, within 4 hours of achieving criticality (SR 3.1.7.1). ________

[20.17.2] **ENSURE** T_{AVG} greater than or equal to 555°F. ________

[20.17.3] **(þ) WITHDRAW** rods to achieve Reactor criticality, establish a positive startup rate, **THEN**

GO TO step 5.3[21]. ________

Start of Critical Step(s)

IF criticality cannot be achieved within step 5.3[20.8] tolerance, **THEN**

[20.17.4] **STOP** rod withdrawal. ________

[20.17.5] **(þ) INSERT** ALL Control Banks fully. ________

[20.17.6] **LOG** Mode 3 entry in Narrative Log.

________ Initials ________ Date ________ Time

[20.17.7] **ENSURE** Reactor Engineering evaluates **AND** Initiates a SR. ________

[20.17.8] **INITIATE** new GO-2, if startup to continue.

________ SRO ________ Date ________ Time

End of Critical Step(s)

Date________

Initials_____

5.3 **Reactor Startup (continued)**

CAUTION

The Reactor will trip at 10^5 cps on one Source Range, if the trip is not blocked.

Start of Critical Step(s)

[21] **WHEN** 1/2 IR monitors reach 1.66 X 10^{-4}%, **THEN**

[21.1] **CHECK** Permissive 65 D, P-6 INTERMED RANGE PERMISSIVE, is LIT. _________

[21.2] **(b) ADJUST** Control Rods to maintain 0 SUR at less than 10^5 cps on SR monitors. _________

[21.3] **RECORD** both SR NIS readings:

1-NI-92-131A______ cps,

1-NI-92-132A______ cps _________

[21.4] **RECORD** both IR NIS readings:

1-NI-92-135A ________%,

1-NI-92-136A ________% _________

End of Critical Step(s)

Date________ **Initials_____**

5.3 Reactor Startup (continued)

NOTES

1) Blocking SRM Reactor Trip disables detectors outputs and removes audio count rate signal.

2) Steps 5.3[21.5] through 5.3[21.7] should, at SM discretion, be performed at the time of criticality. However, SR Trip must be BLOCKED conservatively before the SR Trip setpoint of 10^5 cps.

Start of Critical Step(s)

[21.5] **BLOCK** SR Trip by placing handswitches 1-N33A, SR TRIP TR A RESET-BLOCK P-6, and 1-N33B, SR TRIP TR B RESET-BLOCK P-6, to BLOCK. _________

End of Critical Step(s)

[21.6] **CHECK** the following:

[21.6.1] Permissive 64 C, SOURCE RANGE TRIP BLOCKED, LIT. _________

[21.6.2] Alarm 81 C, SOURCE RANGE HI FLUX AT SHUTDOWN ALM BLOCKED, **NOT** LIT. _________

[21.7] **SELECT** 1-NR-92-145 to record the highest indicating IR channel and one PR channel. _________

[22] **ANNOUNCE** Reactor Criticality on the P/A. _________

Date________ Initials_____

5.3 **Reactor Startup (continued)**

Start of Critical Step(s)

[23] **IF** initial startup following refueling **AND** criticality can **NOT** be achieved per PET-201, **THEN**

[23.1] **(b) INSERT** ALL Control Banks fully. ________

[23.2] **LOG** Mode 3 entry in Narrative Log.

________ Initials ________ Date ________ Time

[23.3] **EVALUATE** the discrepancy and

INITIATE new GO-2, if startup to continue.

________ SM ________ Date ________ Time

End of Critical Step(s)

[24] **IF** T_{AVG} is less than 561°F **AND** Alarm 94 A,

TAVG-TREF DEVIATION, is LIT, **THEN**

INITIATE 1-SI-68-34 (SR 3.4.2.1). ________

[25] **(b) ADJUST** Control Rods and/or boron concentration to RAISE Reactor power, at a rate of less than 1 dpm, to 1 X 10^{-2} %. ________

[26] **STABILIZE** Reactor power at 1 X 10^{-2} %. ________

Date________ Initials_____

5.3 Reactor Startup (continued)

[27] **RECORD** CRITICAL DATA:

Power Level: ____________ % (1 NI 92 135A) ____________ % (1 NI 92 136A)

Rod Position: ________ (Bank) ________ (Steps) ____________ RCS C_B ________ PPM

Loop T_{AVG} ________ °F (1 TI 68 2E) ________ °F (1 TI 68 25E) ________ °F (1 TI 68 44E) ________ °F (1 TI 68 67E)

________ Initials ________ Date ________ Time

[28] **IF** Actual Critical Rod Position is between 500 and 750 pcm from ECP, **THEN**

ENSURE Reactor Engineering evaluates **AND** initiates a SR. ________

[29] **IF** Mode 2 physics testing required, **THEN**

ENSURE that the Mode 2 and Mode 3 Surveillances are in effect during the duration of rod worth measurements (approx 8 hours) per PET-201, and

ENSURE Reactor Engineering has performed the applicable low-power physics tests per PET-201. ________

NOTE

If AFW is in service, Reactor power must be maintained within the capability of AFW to maintain SG levels.

[30] **EVALUATE** closing AFW Pumps Recirc Valves (refer to SOI-3.02, Section 8.9). ________

[31] **(þ) ADJUST** Control Rods or RCS C_B to RAISE Reactor power, at a rate of less than 1 dpm, to between 1 and 4%. ________

NOTE

T_{AVG} will vary as a function of reactor power until the unit is greater than 15% turbine load (C5) and the T_{avg} program is maintained by AUTO or manual rod control. The T_{AVG}-TREF deviation alarm is expected as reactor power approaches 7% RTP.

Date________ Initials_____

5.3 Reactor Startup (continued)

CAUTION

IF AFW is controlling levels in one or more SGs, THEN Reactor power must be maintained within AFW capability (less than 4% power).

[32] **STABILIZE** Reactor power between 1 and 4%: ________

[32.1] **MAINTAIN** RCS Steam Dumps in Pressure Mode, set at 84% (1092 psig.), or SG PORVs set at 84%. ________

[32.2] **(b) FOLLOW** Xenon by Rod movement or Boration to maintain control banks ABOVE the LO INSERTION LIMIT. ________

NOTE

In Mode 2, the trip function of all Turbine Driven Main Feedwater Pumps (TDMFWP) is required when one or more (TDMFWP) is supplying feedwater to the Steam Generators. Refer to Tech Spec 3.3.2 condition J.

[33] **IF** the 1A MFW pump was selected in Step5.2[5], **THEN**

RESET the 1A MFW pump per SOI-2 & 3.01. ________

[34] **IF** the 1B MFW pump was selected in Step 5.2[5], **THEN**

RESET the 1B MFW pump per SOI-2 & 3.01. ________

CAUTION

Tripping the reset MFW pump after the TD AFW pump is shutdown will initiate an ESF Actuation.

[35] **START** the MFW pump selected in step **5.2[5]** by continuing in SOI-2 & 3.01. ________

[36] **ENSURE** SG level and FW controls are maintaining SG level at program. ________

Date________ Initials_____

5.3 Reactor Startup (continued)

[37] **PLACE** the HS for NON-running MFPT to TRIP (**N/A** running MFPT):

MFPT	Handswitch	Initials	IV
MFPT A TRIP-RESET	1-HS-46-9A		
MFPT B TRIP-RESET	1-HS-46-36A		

[38] **SHUTDOWN** the AFW Pumps (AFW pumps may be shutdown in any order).

[38.1] SHUTDOWN the A-A AFW pump in accordance with SOI-3.02, Section 8.1.4. _____

A. **ENSURE** SG level and FW controls are maintaining SG level at program. _____

[38.2] SHUTDOWN the B-B AFW pump in accordance with SOI-3.02, Section 8.1.5. _____

A. **ENSURE** SG level and FW controls are maintaining SG level at program. _____

[38.3] SHUTDOWN the Turbine Driven AFW pump in accordance with SOI-3.02, Section 8.1.6. _____

A. **ENSURE** SG level and FW controls are maintaining SG level at program. _____

[39] **IF** startup is to continue, **THEN**

GO TO GO-3, Unit Startup From Less Than 4% Reactor Power To 30% Reactor Power. _____

[40] **IF** startup **NOT** to continue **AND** cooldown is desired, **THEN**

GO TO GO-5, Unit Shutdown From 30% Reactor Power To Hot Standby. _____

End of Section

6.0 RECORDS

6.1 QA Records

The following documents are QA records and handled in accordance with the Document Control and Records Management (DCRM) program:

Completed Data Package

6.2 Non-QA Records

None

Appendix A
(Page 1 of 4)

Mode 3-To-Mode 2 Review And Approval

Date________ **Initials**_____

STARTUP No. ________________

[1] **IF** startup is following a Reactor Trip, **THEN**

ENSURE TI-127 is **COMPLETED**, and restart AUTHORIZATION GRANTED.

____________ ____________ ____________
Time Date

[2] **ENSURE** 1-SI-0-2B-02, Shift and Daily Surveillance Log, **COMPLETE** for Mode 2 entry.

____________ ____________ ____________
Time Date

[3] **ENSURE** 0-SI-0-3, **COMPLETE** for Mode 2 entry.

____________ ____________ ____________
Time Date

[4] **ENSURE** 1-SI-0-903 (Safety Injection Primary Check Valves.) COMPLETE (**N/A** if not required this startup.)

____________ ____________ ____________
Time Date

[5] SRO shall review / perform the following:

A. Hold Orders.

____________ ____________ ____________
Time Date

B. TACFs.

____________ ____________ ____________
Time Date

C. LCO Tracking Log.

____________ ____________ ____________
Time Date

Appendix A
(Page 2 of 4)

Mode 3-To-Mode 2 Review And Approval

Date________ **Initials**_____

STARTUP No. ________________

SRO shall review / perform the following (continued)

D. MFP Trip Buses Energized (TS 3.3.2.6.e.)5

____________ ____________ ____________
Time Date

E. **DISCUSS** with Site Engineering the Functional Evaluations of SRs and PERs identified as GL 91-18 issues for outstanding "Required Actions for Operability" affecting mode change.

____________ ____________ ____________
Site Engineering Time Date

F. Annunciator and Computer Disablement Log.

____________ ____________ ____________
Time Date

NOTE

The Mode 3 to Mode 2, 1 surveillance report contains two sections:

1) Out of frequency section

2) Reactor Trip Report

Both sections are addressed in the following steps.

G. **OBTAIN** and **REVIEW** the Mode 2 entry sections of the Mode 3-to-Mode 2, 1 of surveillance report from the responsible departments, and **ENSURE** required surveillance testing for Mode 2 entry **COMPLETE**.

____________ ____________ ____________
Time Date

H. **ATTACH** the completed Mode 2 entry sections of the Mode 3-to-Mode 2, 1 surveillance report to this procedure. ________

I. MCR Board walkdown **COMPLETE**.[C.5]

____________ ____________ ____________
Time Date

Appendix A
(Page 3 of 4)

Mode 3-To-Mode 2 Review And Approval

Date________ **Initials**_____

STARTUP No. ________________

[6] SHIFT MANAGER (SM) HOLD POINT

A. Tech Spec and non-Tech Spec work related activities are **COMPLETE**, or will not prohibit entry or impact continued operation in Mode 2.

Outage Mgr	Time	Date
Mods Mgr	Time	Date

B. There are no open DCN and EDCs that prohibit Mode 2 entry.

Maint Mgr	Time	Date

C. Limitations in FP LCO program are not exceeded.

Fire Prot Mgr	Time	Date

D. Primary and secondary chemistry is acceptable for Mode 2.

Chemistry Mgr	Time	Date

E. Risk assessment completed for Mode 2 entry using LCO 3.0.4.

Corp Probabilistic Risk Asmt Group	Time	Date

F. TI-12.18 complete for Mode 2 entry.

SM	Time	Date

Appendix A
(Page 4 of 4)

Mode 3-To-Mode 2 Review And Approval

Date________ **Initials**_____

STARTUP No. _______________

SHIFT MANAGER (SM) HOLD POINT(continued)

G. SM has confirmed that:

- All applicable LCOs are satisfied

OR

- A Risk Assessment has been completed in accordance with TI-133 and required Risk Management Actions are in place consistent with TS 3.0.4.b.

_______________ SM _______ Time ___________ Date

H. SM has reviewed this Appendix, and grants approval for Mode 2 entry.

_______________ SM _______ Time ___________ Date

[7] **PLANT MANAGER HOLD POINT**

Plant Manager concurs and grants approval to proceed to Mode 2.

_______________ Plant Manager _______ Time ___________ Date

Source Notes
(Page 1 of 1)

Requirements Statement	Source Document	Implementing Statement
Premature criticality events during reactor startup	SOER 88-002, SER 89-022 3.1A, 3.1B, 3.2E 5.2[11.10] 5.3[16.3] 5.3[20.12]	C.1
Inadvertent SI During Cooldown	IE Circular 78-05 3.1F	C.2
Verify P-4 contacts after any condition requiring opening of Rx trip breakers	NCO 920043242 5.2[11.8]	C.3
Control Rod Mispositioning	SOER 84-02, Rec 8 5.2[11.10]	C.4
Rx Startup was performed with TS 3.3.2 not met.	WBPER960353 (See also NCO960031005 and LER 50-390/96-017) Note prior to 5.2[5] and Appendix A	C.5

TVA

Watts Bar Nuclear Plant

Unit 1

System Operating Instruction

SOI-85.01

Control Rod Drive And Indication System

Revision 0039

Quality Related

Level of Use: Continuous Use

Effective Date: 10-09-2009

Responsible Organization: OPS, Operations

Prepared By: R. A. O'Rear

Approved By: Henry E. Champagne Jr.

Revision Log

Revision or Change Number	Effective Date	Affected Page Numbers	Description of Revision/Change
34	08/25/05	2, 10, 22	Implemented CA for PER 79715 by adding note to obtain key for Logic Cabinet and new step [4] to Section 5.5 to check Bank Overlap Display and Master Cycler prior to Control Bank withdrawal. Deleted outdated pre-startup requirements that were in Section 4.2 step [1].
35	06/23/06	2, 4, 36 3	Added Section 8.3 for instructions on updating ICS Rod Bank Demand position and changed TOC to reflect the addition per operator feedback. Corrected Section number for Section 5.5 in TOC.
36	08/30/07	All	This procedure has been converted from W95 to Word 2002 (XP) by the WBN Conversion Team.
37	02/26/08	2, 8, 25 9	Incorporated DCN 52265 for new bank overlap. Added Mode 4 to P&L R (Operator Feedback).
38	10/10/08	2, 17, 19, 20, 21, 39	Implemented corrective action for PER 146695 by adding steps to ensure phase control cards' failure LEDs are not lit. Implemented corrective action for PER 150740 by clarifying the method used to balance M-G sets. Clarified when alarm 85A will clear.
39	10/09/09	2,23,24,25, 27,33,34, 44	Incorporated DCN 52957 to reflect change in system description, power supplies and MCR monitor-PLC pairing. Updated discussion section to reflect changes. Corrected CERPI name to Westinghouse terminology. Minor format change, converted listed monitor items to bulleted items, with checkmarks for place keeping.

Table of Contents

Table of Contents (continued)

1.0 INTRODUCTION

1.1 Purpose

To provide instructions for Operation of the Control Rod Drive and Indication System in Manual and Auto.

1.2 Scope

This Instruction includes operation of the following subsystems:

A. Control Rod Drive (CRD) Motor Generator (MG) Sets

B. Control Rod Drive System

C. Rod Position Indicators (RPIs)

2.0 REFERENCES

2.1 Performance References

A. SPP-2.2, Administration of Site Technical Procedures

B. SPP-10.4, Reactivity Management Program

C. 1-SI-99-4-A, Trip Actuating Device Operational Test of Reactor Trip P-4 ESFAS Interlock Train A

D. 1-SI-99-4-B, Trip Actuating Device Operational Test of Reactor Trip P-4 ESFAS Interlock Train B

E. 1-TRI-85-1, Reactivity Control Systems Movable Control Assemblies (Modes 3, 4, and 5)

F. TI-85.005, Quarterly Resetting of Full Out Rod Positions

2.2 Developmental References

A. N3-85-4003, System Description for Control Rod Drive

B. NOB SHEET A-7, Full Out Rod Position

C. Tech Spec 3.1.3, Core Reactivity

D. Tech Spec 3.1.5, Rod Group Alignment Limits

E. Tech Spec 3.1.7, Control Bank Insertion Limits

F. Tech Specification 3.2.3 Axial Flux Difference

G. Tech Specification 3.4.5 RCS Loops- Mode 3

H. Tech Specification 3.1.8 Rod Position Indication

I. Tech Requirements 3.1.7 Position Indication Sys, Shutdown

J. TVA Drawings:
45W600-99-1
45W760-85-1
45W708-1, -2
45W747-1, -2
45N1624-1 thru 11
45W1646-4
45N1674-2

2.2 Developmental References (continued)

K. TVA Vendor Manual WBN-VTM-W120-2414 Reactor Trip Circuit Breakers

L. Westinghouse Drawings and Vendor Manuals:
Westinghouse (W) Full Length Rod Control, Vol I, II & III

[D&VMN 0855, 0856, 0857]

W____1051E05 Sheet 1-14 (Contract 54114-1)
W____6056D35 Sheet 20
W____Rod Position Indication Sys (D&VMN 0853, Contract 54114-1)
W____KD-8805-76 1-6 RC
W____1054E62
W____1045F60
W____0092-2-1 thru 4 (Contact 54114-1)
Electrical Equipment for AC Power Supply System for Nuclear Reactor Rod Controller (D7VMN 0860)

3.0 PRECAUTIONS AND LIMITATIONS

A. Work in a Radiological Control Area (RCA) requires the use of existing RWPs, and may require additional ALARA Preplans. Failure to follow posted Rad control requirements can cause unnecessary radiation exposure. Rad Con should be notified of work having the potential to change radiological conditions.

B. Before Closing Reactor Trip Breakers (RTBs), the Bank Select Switch should be in MANUAL.

C. Before shutting down both MG Sets, all rods should be in the core, and RTBs should be OPEN.

D. Group Demand Position Indicators shall be OPERABLE and capable of determining within ± 2 steps the demand position for each Shutdown or Control Rod that is **NOT** fully inserted.

E. Rod Banks must be operated in prescribed sequence. For WITHDRAWAL sequence is Shutdown Bank A, B, C, D; then Control Bank A, B, C, D (maintaining Control Bank Overlap). The INSERTION sequence is the reverse of withdrawal.[1]

F. For Manual Bank sequencing, prescribed withdrawal/insertion sequence must be followed. Correct bank position is monitored by checking the Step Counters and Rod Position Indicators.[1]

G. Control Bank overlap must be maintained to ensure Acceptable Core Power distributions.[1] When Control Bank A reaches 116 Steps, verify Control Bank B begins to move. Observe this relationship for Control Banks C and D.

H. With ROD BANK SELECTOR SWITCH in BANK SELECT, Control Bank Overlap is **NOT** maintained (Control Banks may be moved in Bank Select for Physics Testing).

I. Control Banks must be maintained above their insertion limits[1] (Lo-Lo Alarm) to ensure:

1. Adequate shutdown margin
2. Maximum Ejected Rod reactivity limits are maintained
3. Acceptable Core Power distributions

J. In Modes 1 and 2, before withdrawing a Rod Bank from the FULLY INSERTED position, the bank's Group Step Counters must be at zero steps, and RPIs for that bank must be indicating ± 12 steps. During withdrawal, they must remain within ± 12 steps of each other.[1]

3.0 PRECAUTIONS AND LIMITATIONS (continued)

K. After CONTROL ROD URGENT FAILURE Alarm [86A], 1-RCAR, ROD CONTROL ALARM RESET, is **NOT** to be reset UNTIL cause of alarm is determined. Some failures may cause rods to "step in" if reset before correcting problem.

L. Control Banks must be operated to maintain Axial Flux Difference within limits, AND to stay above insertion limits. Boron dilution should be completed BEFORE Control Rods reach the upper limit (Bank D, 220 steps).[1]

NOTE
When possible, the Shutdown (SD) Banks should be FULLY WITHDRAWN during the conditions below to provide trippable reactivity.

M. All Shutdown Banks must be ≥ 225 steps when positive reactivity is being inserted by Boron changes, Xenon changes, RCS temp changes, or motion of control rods; except when:

1. Reactor Coolant System (RCS) temp and Boron Conc (C_B) are maintained at HOT STANDBY XENON FREE CONDITION (Mode 4), or

2. RCS is borated to COLD SHUTDOWN CB (Mode 5).

N. If the Shutdown Banks cannot be withdrawn, the RCS must be borated as conditions require and the C_B confirmed by sampling.

O. During Power Operation, all RPIs and Power Range Channels must be monitored for Rod misalignment and abnormal power tilts.

P. The Rod Control System must be switched to MANUAL if the Power Mismatch Channel or any necessary input is out of service.

Q. Do **NOT** operate with more than one Control Rod inoperable (See AOI-2 for inoperable Control Rod).

R. If in Mode 3 or 4, ensure at least two RCS loops in operation with two RCPs in service BEFORE closing Reactor Trip Breakers.

S. If STEP COUNTER goes below 0 while driving Control and Shutdown rods in:

1. Realign affected group's Step Counter using "UP" push button to raise counter output to 000.

2. Ensure Plant Computer points for Rod Bank Step Position are correct.

3.0 PRECAUTIONS AND LIMITATIONS (continued)

T. Instrument Maintenance should be notified to ensure required instrumentation will be placed in service as necessary to support system operation.

U. A delay of 2 to 5 seconds should be allowed between demands for rod motion when using 1-FLRM, ROD MOTION CONTROL switch, to step rods to avoid arcing/welding of contacts.

V. RCS pressure must be ≥100 psig, OR the RCS has been vacuum filled in accordance with GO-10, prior to energizing the CRDM coils.

Date ________ **Initials**

4.0 PREREQUISITE ACTIONS

NOTES

1) Throughout Instruction where **IF/THEN** exists, the step is **N/A** if stated condition does **NOT** exist.
2) Signoffs/information in unused Sections may be left blank
3) Throughout this instruction, Concurrent Verification (CV) may be marked **N/A** for breaker or fuse steps where no manipulation is performed..

4.1 Preliminary Actions

[1] **INDICATE** Section to be performed, and reason for use:

5.0	Startup ________	7.0	Shutdown ________
6.0	Normal Operation ________	8.0	Infrequent Operations ________

Section/ Reason/ Remarks: ____________________

____

____

____

4.2 Field Preparations

[1] **ENSURE** 125Vdc Vital Batt Bds AVAILABLE (SOI-236.01 **AND** SOI-236.02). ________

[2] **REVIEW** Section 3.0, Precautions and Limitations. ________

[3] **IF** in Mode 3, 4, 5 **AND** any Rod is to be moved from the fully inserted position, **THEN**

ENSURE 1-TRI-85-1 Performance is initiated (**N/A** if performed within the previous 31 days). ________

4.3 Approvals and Notifications

[1] **COORDINATE** system operations/manipulations with SM/Unit SRO. ________

Date ________ **Initials**

5.0 STARTUP

5.1 Placing Initial Control Rod Drive Motor Generator Set in Service

[1] **ENSURE** Section 4.2 is COMPLETE. ________

[2] **PLACE** Voltage Adjust Potentiometers for Generators 1 and 2 fully COUNTERCLOCKWISE.

A. 1A ________

B. 1B ________

[3] **PLACE** Synchronize Switches for Generators 1 and 2 in OFF.

A. 1A ________

B. 1B ________

[4] **PLACE** Voltmeter Selector Switches for Generators No.1 and No. 2 to 1-2.

A. 1A ________

B. 1B ________

NOTE

The following step is **N/A** if stated condition does **NOT** exist.

[5] **IF** both Generator and Motor Breaker operating switches, targets and lights do **NOT** indicate GREEN, **THEN**

PLACE switch to TRIP, **AND**

RELEASE to NEUTRAL position to reset switch. ________

[6] **ENSURE** 1KS, THREE POLE GROUNDING SWITCH, is OPEN [Inside 1-PNL-85-L115]. ________

[7] **PUSH** Protective Relay Flags Reset Push-button for Generators No. 1 and No. 2 to RESET. ________

Date ________ **Initials**

5.1 Placing Initial Control Rod Drive Motor Generator Set in Service (continued)

[8] **SELECT** MG Set to be placed in service first, **THEN**

CLOSE associated CRD MG SET Motor ACB.

A. 1A ________

B. 1B ________

[9] **WHEN** Generator reaches rated speed (approx. 15 sec), **THEN**

DEPRESS AND **HOLD** The GEN FIELD FLASH push-button. ________

NOTE
Voltage should read approximately 235 Vac.

[10] **WHEN** voltage stabilizes, **THEN**

RELEASE push-button. ________

[11] **ROTATE** VOLTAGE ADJUST potentiometer CLOCKWISE until voltmeter reads between 258-262 Vac. ________

[12] **CHECK** Voltage across other phases using VOLTMETER selector switch (EXPECT a slight variation between phases). ________

Date ________ **Initials**

5.1 Placing Initial Control Rod Drive Motor Generator Set in Service (continued)

NOTE
Generator voltage may drop slightly as electrical load rises. This is normal and is caused by the Regulator Droop Circuit.

[13] **CLOSE** the CRD MG SET Generator ACB. ________

[14] **CLOSE** 1-SW-85-1, FUSED DISCONNECT SWITCH CONTROL ROD DRIVE SYSTEM [782/A5U, MG Set Room Wall]. ________

NOTE
Section 5.3 contains instructions to close RTBs.

[15] **CLOSE** 1-BKR-85-L115/1CB, ROD CONTROL MG SET 1 OUTPUT [inside 1-PNL-85-L115]. ________

____
CV

Date ________ **Initials**

5.2 Startup of Second Motor Generator Set for Parallel Operation

CAUTION

The first generator should be loaded via RTBs (Sect 5.3) before paralleling 2nd generator. If too much load is on first generator, Auto Synchronizer may **NOT** tie second generator on. It may be necessary to deenergize a portion of power cabinets to synchronize second set to first set; the power cabinet should then be reenergized and Urgent Failure Alarm Reset. THIS SHALL ONLY BE DONE WITH ALL RODS ON THE BOTTOM.

[1] **ENSURE** Sect 5.1 is COMPLETE. ________

CAUTION

CRD MG SETs should be synchronized promptly to avoid periods of elevated vibration. This vibration may lead to equipment damage if the synchronization is **NOT** performed in a timely manner

[2] **PLACE** Synchronize Switches for Generators No. 1 and No. 2 to OFF.

A. 1A ________

B. 1B ________

[3] **PLACE** Generator Voltage Adjust potentiometer for Generator to be paralleled to the fully COUNTERCLOCKWISE position.

A. 1A ________

B. 1B ________

[4] **CLOSE** CRD MG SET Motor ACB to Second MG Set. ________

[5] **WHEN** Generator reaches rated speed (approx. 15 sec), **THEN**

DEPRESS AND **HOLD** the GEN FIELD FLASH push-button. ________

Date ________ **Initials**

5.2 Startup of Second Motor Generator Set for Parallel Operation (continued)

NOTE

Voltage should read approximately 235 Vac

[6] **WHEN** voltage stabilizes, **THEN**

RELEASE push-button. ________

NOTE

The difference should be LESS than 5 Volts AC.

[7] **ADJUST** voltage as close as possible to running MG set voltage. ________

[8] **PLACE** Synchronize Switch ON for MG Set being paralleled.

A. 1A ________

B. 1B ________

NOTES

1) Load reduction can be accomplished by de-energizing some of the power cabinets, ONLY IF ALL RODS ARE ON THE BOTTOM.

2) Failure to synchronize Problem usually occurs when attempting to Synchronize Generator with Reactor Trip Breakers OPEN (No Load) and running voltage too high.

[9] **IF** the MG Sets do **NOT** parallel within 10 seconds, **THEN**

REDUCE load by 5%, **AND**

ATTEMPT to parallel again. ________

[10] **WHEN** Generator has paralleled, **THEN**

PLACE Synchronize Switch to OFF. ________

Date ________ **Initials**

5.2 Startup of Second Motor Generator Set for Parallel Operation (continued)

[11] **PLACE** the CRD MG SET Generator ACB HS for generator paralleled to CLOSE position to obtain a red target. ________

NOTE

Local urgent failure alarm lights should be expected to remain LIT on individual power cabinets after the second MG set is placed in service until acknowledged from the MCR.

[12] **CHECK** all POWER, LOGIC, and HOLD Cabinets for alarm lights. ________

NOTE

Increasing voltage on MG set with lower digital ammeter indication will reduce digital ammeter indication on both MG sets. It may be necessary to adjust voltage on both MG sets to meet the limits required in the following step.

[13] **ADJUST** MG set A and/or B voltage as required to balance current as indicated on the digital ammeters, within ± 2 amps
AND

MAINTAIN the average of the MG set voltmeters at 258-262 Volts. ________

[14] **ENSURE** the locking mechanism is secure on the MG set 1A and 1B voltage adjust potentiometers. ________

Date ________ **Initials**

5.3 Closing Reactor Trip Breakers A and B

CAUTION

Before rod withdrawal and after Reactor Trip Breaker B closure, (in Modes 1, 2, or 3) 1-SI-99-4-A AND 1-SI-99-4-B are to be performed to verify P-4 contact position (Contact failure could prevent RESET/BLOCK of Safety Injection (SI) or prevent AUTO SI).

[1] **ENSURE** Control Rod Drive MG Set in service per Section 5.1. ________

[2] **ENSURE** REACTOR TRIP BREAKER A BYPASS, 1-BKR-99-L116/2B, and REACTOR TRIP BREAKER B BYPASS, 1-BKR-99-L116/2C, OPEN. ________

________ CV

[3] **ENSURE** REACTOR TRIP BREAKER A, 1-BKR-99-L116/1B, and REACTOR TRIP BREAKER B, 1-BKR-99-L116/1C, connected position with Control Power on. ________

________ CV

[4] **ENSURE** 1-XA-55-4D, REACTOR TRIP FIRST OUT Panel [1-M-4], CLEAR. ________

[5] **ENSURE** 1-RBSS, ROD BANK SELECT Switch [1-M-4], in MANUAL. ________

[6] **ENSURE** RCS pressure ≥100 psig, OR RCS has been vacuum filled per GO-10. ________

[7] **PLACE** 1-RT-1, REACTOR TRIP SWITCH [1-M-4], to CLOSE. ________

[8] **ENSURE** REACTOR TRIP BREAKER A, 1-BKR-99-L116/1B, and REACTOR TRIP BREAKER B, 1-BKR-99-L116/1C, CLOSE. ________

________ CV

Date ________ **Initials**

5.3 Closing Reactor Trip Breakers A and B (continued)

[9] **IF** both MG sets are running,

VERIFY MG set A and B current as indicated on the digital ammeters is within ± 2 amps **AND** ________

VERIFY voltage as indicated on MG set voltmeters is between 258-262 Volts AC. ________

NOTE

Startup Switch, 1-SUS, when taken to Startup Position, will zero Control Board Group Step Counters, Computer Points for Rod Position, Logic Cabinet Bank Overlap Counter Display and Master Cycle Counter.

[10] **PLACE** 1-SUS, ROD CONTROL STARTUP SWITCH, to STARTUP. ________

[11] **INITIATE** 1-TRI-85-1 for performance within 4 hours after closing Rx Trip Breakers per TSR 3.1.7.1 (N/A if performed within the previous 31 days). ________

[12] **ENSURE** Control Board Group Step Counters zero. ________

[13] **ENSURE** computer points for Control and Shutdown Banks (demand counters) zero. ________

[14] **ENSURE** the Rod Control Logic Cabinet's Bank Overlap Counter Displays [A5U/782, in 1-L-122], are ZERO. ________

[15] **ENSURE** Logic Cabinet Thumbwheels, S1 thru S6, set per last performance of TI-85.005. ________

[16] **ENSURE** Lift Coil Disconnect Switches CONNECTED [1-M-8]. ________

[17] **ENSURE** Switch "S1" on DC Hold Cabinet in OFF. ________

Date ________ **Initials**

5.3 Closing Reactor Trip Breakers A and B (continued)

NOTE

A placard on the power cabinet door may be used to determine identify slots with phase control cards.

[18] **ENSURE** failure LED on each phase control card in all power cabinets are NOT lit. ________

A. **IF** the failure LED on any phase control card is LIT, **THEN**

INITIATE a WO for MIG to RESET the LED by removing and reinstalling the affected circuit card. ________

B. **NOTIFY** Operations that work is completed on the affected phase control card(s) and

The failure LED on each phase control card in all power cabinets are NOT lit. ________ MIG

CAUTION

All phase control card failure LEDs must be reset (NOT lit) prior to continuing.

[19] **PUSH** 1-RCAR, ROD CONTROL ALARM RESET [1-M-4] button. ________

Date ________ **Initials**

5.3 Closing Reactor Trip Breakers A and B (continued)

[20] **RESET** 1-XA-55-4B, NIS & ROD CONTROL, with ANNUNCIATOR RESET-ACK-TEST Switch 1-XS-55-4D [1-M-4], **AND**

ENSURE following alarms CLEAR:

A. CONTROL ROD URGENT FAILURE [86A] ________

B. CONTROL ROD NON-URGENT FAILURE [86B] ________

[21] **IF** two M-G sets are running, **THEN**

ENSURE alarm CRD MG SET TRIP/GROUND [85A] is CLEAR. ________

[22] **ENSURE** Rods IN (Green) and Rods OUT (Red) direction lights OFF. ________

Date ________ **Initials**

5.4 Shutdown Banks Withdrawal

NOTES

1) Shutdown Bank withdrawal is a principal reactivity control evolution. Requirements of SPP-10.4, "Reactivity Management Program," shall be complied with at all times. The following step should be accomplished by holding crew briefings which includes applicable sections of SPP-10.4.

2) If it is necessary to rotate 1-RBSS, ROD BANK SELECTOR SWITCH, through the AUTO position, Tavg-Tref should be matched within 1°F to avoid unexpected rod motion. Group demand step counters should be verified to indicate the same position before and after the switch is rotated

[1] **ENSURE** SPP-10.4, "Reactivity Management Program," reviewed by personnel performing this Section. ________

[2] **ENSURE** 1-SI-0-10, "SHUTDOWN MARGIN", COMPLETE. ________

[3] **ENSURE** Control Rod Drive MG Set(s) in service per Sections 5.1 and 5.2. ________

[4] **ENSURE** Section 5.3 Complete. ________

[5] **IF** in Modes 1, 2, or 3 THEN, ENSURE 1-SI-99-4-A and 1-SI-99-4-B complete. ________

[6] **ENSURE** 1-RBSS, ROD BANK SELECTOR SWITCH [1-M-4], in MANUAL. ________

[7] **OBTAIN** SRO Approval to withdraw Shutdown Banks. ________

Date ________ **Initials**

5.4 Shutdown Banks Withdrawal (continued)

NOTE

1) The following block MANUAL Rod Withdrawal:

- Power Range High Flux (103% Power)
- Intermediate Range High Flux (20% Power)
- Overpower ΔT
- Overtemperature ΔT

[8] **OBSERVE** the following for proper response during Bank Withdrawal:

- Source Range (SR) ☐
- Intermediate Range (IR) ☐
- Startup Meters ☐
- Nuclear Recorders ☐

NOTE

Actual Full Out Position of the SD Banks is determined by performing TI-85.005 quarterly. Full Out position varies from 225 to 231 Steps and can be verified on NOB Sheet A-7, Full Out Rod Position

[9] **SELECT** SD Bank A (SBA) on ROD BANK SELECTOR SWITCH, 1-RBSS. ________

[10] **PLACE** 1-FLRM, IN-HOLD-OUT SWITCH, to OUT to begin withdrawing Shutdown Banks A1 and A2 to greater than or equal to 225 Steps. ________

Date ________ **Initials**

5.4 Shutdown Banks Withdrawal (continued)

[11] **MONITOR** the following as the Bank is being withdrawn:

- Group Step Counters ☐
- RPIs ☐
- "In-Out" Status Lights ☐
- Rod speed (64 Steps/Minute) ☐

[12] **SELECT** SD Bank B (SBB) on ROD BANK SELECTOR SWITCH, 1-RBSS. ________

[13] **PLACE** 1-FLRM, IN-HOLD-OUT SWITCH, to OUT to begin withdrawing Shutdown Banks B1 and B2 to greater than or equal to 225 Steps. ________

[14] **MONITOR** the following as the Bank is being withdrawn:

- Group Step Counters ☐
- RPIs ☐
- "In-Out" Status Lights ☐
- Rod speed (64 Steps/Minute) ☐

NOTE

Shutdown Banks C and D do **NOT** give an indicated speed output to the MCR.

[15] **SELECT** SD Bank C (SBC) on ROD BANK SELECTOR SWITCH, 1-RBSS. ________

[16] **PLACE** 1-FLRM, IN-HOLD-OUT SWITCH, to OUT to begin withdrawing Shutdown Bank C to greater than or equal to 225 Steps. ________

Date ________ **Initials**

5.4 Shutdown Banks Withdrawal (continued)

[17] **MONITOR** the following as the Bank is being withdrawn:

- Group Step Counters ☐
- RPIs ☐
- "In-Out" Status Lights ☐

[18] **SELECT** SD Bank D (SBD) on ROD BANK SELECTOR SWITCH, 1-RBSS. ________

[19] **PLACE** 1-FLRM, IN-HOLD-OUT SWITCH, to OUT to begin withdrawing Shutdown Bank D to greater than or equal to 225 Steps. ________

[20] **MONITOR** the following as the Bank is being withdrawn:

- Group Step Counters ☐
- RPIs ☐
- "In-Out" Status Lights ☐

[21] **WHEN** Shutdown Banks A, B, C, and D are fully withdrawn,

THEN

PLACE ROD BANK SELECT SWITCH (1-RBSS) in MANUAL. ________

Date ________ **Initials**

5.5 Control Bank Withdrawal

NOTE

Control Bank withdrawal is a principal reactivity control evolution. Requirements of SPP-10.4, "Reactivity Management Program," shall be complied with at all times. The following step should be accomplished by holding crew briefings which includes applicable sections of SPP-10.4.

[1] **ENSURE** SPP-10.4 REVIEWED by personnel performing this Section. ________

CAUTION

During withdrawal of Control Banks, observe proper overlap. When Control Bank A reaches 116 Steps, Control Bank B should begin to move. When Bank B reaches 116 Steps, Bank C should move. When Bank C reaches 116 Steps, Bank D should move.

NOTES

1) Once Control Bank A is above 20 Steps, "Rods at Bottom" alarm light on 1-XA-55-4B [87D] can be reset. Once Control Bank A gets above 20 steps and Rods are driven in, the alarm will come in. Once Control Banks B, C, and D get above 35 Steps, then drop below 20 Steps, the alarm will come back in.
2) Once criticality has been established, proceed with the performance of GO-2.
3) Actual Full Out Position of the Control Banks will be determined by the quarterly performance of TI-85.005. Full Out position will vary from 225 Steps to 231 Steps and can be verified on NOB Sheet A-7, Full Out Rod Position.
4) If it is necessary to rotate 1-RBSS, ROD BANK SELECTOR SWITCH, through the AUTO position, Tavg-Tref should be matched within 1°F to avoid unexpected rod motion. Group demand step counters should be verified to indicate the same position before and after the switch is rotated.

[2] **ENSURE** all Control Bank Group Step Counters and Control Bank Rod Position Indicators at zero prior to initiation of Rod Withdrawal. ________

[3] **ENSURE** Section 5.4 completed, and all Shutdown Rods are fully withdrawn. ________

Date ________ **Initials**

5.5 Control Bank Withdrawal (continued)

NOTE
Key # 28 may be needed to perform the following step.

[4] **ENSURE** the following displayed in the Control Rod Logic Cabinet [control rod drive room, el 782, panel 1-L-122]:

[4.1] **IF** Bank Overlap Counter does **NOT** display 000, **THEN**

PRESS RESET Button [top button just left of the Bank Overlap Display]. ________

[4.2] **IF** Master Cycler Logic (MCL) card A105 [fifth slot from left in top row with three LEDs] does **NOT** display bottom LED lit, **THEN**

PRESS Master Cycler +1 Button [at top center of logic panel] until at least the bottom LED, of the three LEDs, is lit. ________

[5] **ENSURE** ROD BANK SELECT SWITCH, 1-RBSS, in MANUAL. ________

[6] **OBTAIN** SRO Approval to withdraw Control Banks. ________

[7] **PLACE** the 1-FLRM, IN-HOLD-OUT SWITCH, to OUT to begin intermittent programmed withdrawal of Control Banks to obtain criticality. ________

[8] **MONITOR** the following as the Control Banks are withdrawn:

- Group Step Counters ☐
- RPIs ☐
- Rod Speed (48 Steps/Minute) ☐
- Proper Bank Overlap ☐

Date ________

Initials

5.6 Manual Rod Control With Reactor At Power

NOTE

The manipulation of Control Rod position to maintain required parameter(s) is a continuous action by a Licensed Reactor Operator. The following is exempt from the "Continuous Use" requirements of SPP-2.2.

[1] **ENSURE** ROD BANK SELECT SWITCH (1-RBSS) in MANUAL. ________

[2] **POSITION** Control Rods as necessary to maintain Tavg with Tref using 1-FLRM, IN-HOLD-OUT SWITCH (maximum Tavg-Tref deviation < 3.0°F). ________

[3] **WHEN** AUTOMATIC Rod control is desired, **THEN**

ENSURE Tavg is within 1.0°F of Tref to avoid immediate rod movement on transfer. ________

CAUTION

Allowing at least 5 minutes between any rod control input (i.e., T-avg, T-ref, or NIS) change and placing rods in AUTO, will help prevent undesired control rod movement.

[4] **ENSURE** zero demand on control rod position indication [1-M-4]. ________

[5] **PLACE** ROD BANK SELECT SWITCH (1-RBSS) in AUTO. ________

[6] **WHEN** Rod Control is in AUTO, **THEN**

ENSURE the following: ________

A. Tavg and Tref within +/- 1.5°F ________

B. Step counters and RPIs within 12 steps ________

C. Bank Overlap maintained ________

D. Power distribution within limits, AFD/QPTR ________

Date ________

Initials

5.7 Transfer from Manual to Automatic Rod Control

NOTES

1) In AUTOMATIC, the Rod Control System functions to maintain Tavg within ≥1.5°F of programmed Tavg. If Tavg deviates more than 1.5°F from programmed Tavg, the rods will step at 8 steps/min between 1.5°F and 3.0°F deviation. If Tavg deviates more than 3.0°F from programmed Tavg, the Rods will step at a varying rate up to 32 steps/min per degree deviation between 3.0 and 5.0°F. Maximum Rod Speed is 72 steps/min with Tavg deviation of ≥5.0°F from the programmed Tavg temperature.
2) The following block AUTO Rod withdrawal:
   - Power Range High Flux (103% Power)
   - Intermediate Range High Flux (20% Power)
   - Overpower ΔT
   - Overtemperature ΔT
   - Turbine Impulse Pressure (<15%)
   - Rods at 220 steps
3) Do **NOT** attempt automatic operation if automatic rod sequencing is **NOT** available.

[1] **ENSURE** turbine power greater than 15% and Low Power Block C-5 Light **NOT** LIT [66A]. ________

[2] **ADJUST** Tavg to within 1.0°F of Tref to avoid immediate rod movement on transfer. ________

CAUTION

Allowing at least 5 minutes between any rod control input (i.e., T-avg, T-ref, or NIS) change and placing rods in AUTO, will help prevent undesired control rod movement.

NOTE

Periodically monitor Power Range, Intermediate Range, and Rod Position Indications for Control Rod misalignment and abnormal power tilts.

[3] **ENSURE** zero demand on control rod position indication [1-M-4]. ________

Date ________ **Initials**

5.7 Transfer from Manual to Automatic Rod Control (continued)

[4] **PLACE** ROD BANK SELECT SWITCH (1-RBSS), in AUTO. ________

[5] **WHEN** Rod Control is in AUTO, **THEN**

ENSURE the following:

A. Tavg and Tref within ±1.5°F ________

B. Step Counters and RPIs within 12 steps ________

C. Bank Overlap maintained. ________

D. Power distribution within limits, AFD/QPTR ________

Date ________ **Initials**

5.8 Transfer From Automatic to Manual Rod Control

NOTES

1) Rod withdrawal is inhibited in MANUAL by the following:
   - Power Range High Flux (103% Power)
   - Intermediate Range High Flux (20% Power)
   - Overpower ΔT
   - Overtemperature ΔT
2) Transferring from Automatic to Manual Rod Control should be done when the Rods are **NOT** receiving a signal to move.

[1] **PLACE** ROD BANK SELECT SWITCH (1-RBSS) in MANUAL. ________

[2] **PERFORM** Section 5.6. ________

6.0 NORMAL OPERATION

Applicable Checklists will be performed at discretion of Operations Superintendent or designee. Checklists will normally be performed for System Alignment Verification in Mode 5 or whenever alignment verification is needed.

6.1 Control Rod Drive and Motor Generator Sets

Both CRD MG Sets Motor Breakers 1A and 1B are CLOSED.

Both Rod Control MG Sets Output Breakers 1 and 2 are CLOSED.

The annunciator alarm, CRD MG SET TRIP/GROUND, is **NOT** LIT [85A].

NOTE

The following will give CRD MG SET TRIP/GROUND Alarm and TRIP the associated breaker:

- MG Set Load Breaker Overvoltage Trip, or Directional Overcurrent Trip.
- MG Set Motor Breaker Undervoltage Trip, Manual Trip, or Overcurrent Trip.

6.2 Rod Position Indicators

The Rod Position Indicators (RPIs) indicate actual Rod position in steps for each individual Shutdown and Control Rod.

The RPIs for each bank of Rods, are to read approximately the same as the Step Counters (Demand Position Indicators) (within ±12 steps).

The Step Counters (demand) will indicate:

1. Each Control Bank Group Position.
2. Each Shutdown Bank Group Position.

The step counters are liquid crystal display counters powered by two internal batteries each. These batteries have a projected life of 10 years (Batteries will be replaced during refueling outages NOT to exceed 78 month intervals). The LCD display will go blank on loss of battery power with the RPIs being relied upon until battery replacement. Adjacent to each LCD display will be three push buttons used to raise, lower or reset the counts on the display. These push buttons are labeled'UP', "DN", and "RS" respectively. The counter is installed with a "clicker" to alert the operator to any rod movement.

6.3 Analog Rod Position System

The RPIs continuously SENSE and DISPLAY Rod position for each Rod. The Primary Sensor is a linear transformer-type detector mounted outside and concentric with the Control Rod Drive Pressure Housing. The detector consists of alternately stacked primary and secondary coils, and the Control Rod Drive Shaft acts as the armature. The vertical position of the top of the drive shaft within the Rod Position Detector determines the amount of coupling between the Primary and Secondary Windings. With the Rod Drive Shaft fully inserted, the magnetic coupling between the primary and secondary coils is small; therefore, the signal induced in the secondary coil is small. As the Rod is withdrawn, the relatively high permeability of the Rod causes a rise in magnetic coupling between the Primary and Secondary Windings. This results in a substantially larger voltage induced in the Secondary Windings.

DCN 52957 modified CERPI system to provide two redundant and separate communications path between each PLC and the flat panel displays on 1-M-4. PLC A and B are now separated, with each having two redundant communication paths to MCR flat panel displays. The flat panel displays have been separated with CERPI Monitor A slaved to PLC A and CERPI Monitor B slaved to PLC B. With this configuration, Monitor A can only display data from PLC A, and Monitor B can only display data from PLC B. Failure of a PLC will result in loss of indication on the related monitor.

This modification allows testing of one communications path and a subsequent failure of another communications path while continuing to provide RPI in the MCR(1-M-4), ICS, Maintenance Test Panel, and Auxiliary Instrument Room. The power supplies were modified to provide separation with 120V Instrument Power Rack B feeding PLC B, and Rack A feeding PLC A.

6.4 Shutdown Rod Positioning

All Shutdown Banks must be ≥ 225 Steps when Positive reactivity being inserted by Boron or Xenon Changes, RCS Temperature changes or motion of Control Rods; except when:

1. Reactor Coolant System (RCS) temperature and Boron Concentration (C_B) are maintained at HOT STANDBY XENON FREE condition or:
2. RCS is borated to COLD SHUTDOWN C_B.

NOTE
When possible, the Shutdown (SD) Banks should be FULLY WITHDRAWN during the conditions listed above to provide for trippable reactivity.

6.5 Rod Insertion Limits

The Control Banks are to be maintained above their respective Insertion Limits (COLR "Core Operating Limits Report") to ensure:

1. Adequate Shutdown Reactivity.
2. Misaligned Rod Reactivity Limits are maintained.
3. Acceptable Core Power Distribution.

6.6 Rod Control Inputs

In AUTOMATIC, the Rod Control System functions to maintain Tavg within ≥1.5°F of programmed Tavg. If Tavg deviates more than 1.5°F from programmed Tavg, the rods will step at 8 steps/min between 1.5°F and 3.0°F deviation. If Tavg deviates more than 3.0°F from programmed Tavg, the Rods will step at a varying rate up to 32 steps/min per degree deviation between 3.0 and 5.0°F. Maximum Rod Speed is 72 steps/min with Tavg deviation of ≥5.0°F from the programmed Tavg temperature.

The rod control circuitry contains multiple lead/lag modules. Even with T-avg/T-ref matched within 1 °F, rod movement could occur when the rods are returned to AUTO if and changes occurred to the rod control inputs while rods were in MANUAL. Decay time for T-avg lead/lag modules is approximately 3 minutes. Decay time for T-ref lead/lag modules and NIS lead/lag modules is approximately 5 minutes. Ensuring zero demand on the Computer Enhanced Rod Position Indication (CERPI) monitors in the main control room will prevent undesired control rod movement.

Date ________ **Initials**

7.0 SHUTDOWN

7.1 Removing Motor Generator Sets From Service

CAUTIONS

1) If shutting down one MG Set, tripping the motor circuit breaker for the MG Set to remain in service will trip the Reactor.
2) Before shutting down the both MG Sets, all Control Rods and Shutdown Rods must be in the core and RTBs must be OPEN.

NOTES

1) The Generator voltage will be maintained for a short time after opening Motor Circuit Breaker due to an intended time delay.
2) A Rod Control Non-Urgent alarm will energize after the last MG Set is removed from service.

[1] **PLACE** selected Generator Circuit Breaker control for MG Set to be shutdown, to TRIP.

A. 1A ________

B. 1B ________

[2] **PLACE** selected Motor Circuit Breaker control for MG Set to be shutdown to TRIP.

A. 1A ________

B. 1B ________

[3] **ENSURE** MG Set decelerates slowly to a STOP. ________

NOTE

If only one MG set being shutdown, N/A steps 7.1[4], 7.1[5], 7.1[6].

[4] **PLACE** selected Generator Circuit Breaker control for Second MG Set to be shutdown to TRIP. ________

A. 1A ________

B. 1B ________

Date ________ **Initials**

7.1 Removing Motor Generator Sets From Service (continued)

[5] **PLACE** selected Motor Circuit Breaker control for Second MG Set to be shutdown to TRIP.

A. 1A ________

B. 1B ________

[6] **ENSURE** MG Set decelerates slowly to a STOP. ________

[7] **IF** BOTH MG sets are being shutdown**, THEN**

[7.1] **OPEN** 1-SW-85-1, FUSED DISCONNECT SWITCH CONTROL ROD DRIVE SYSTEM [782/A5U, MG Set Room Wall]. ________

[7.2] **OPEN** 1-BKR-85-L115/1CB, ROD **CONTROL** MG SET 1 OUTPUT [inside 1-PNL-85-L115]. ________

____
CV

Date ________ **Initials**

8.0 INFREQUENT OPERATIONS

8.1 Opening Reactor Trip Breakers A and B

NOTE

If reactor is in Mode 3 and no transient is in progress, and it is desirable to maintain main feedwater in service, then Step 8.1[1] should be performed concurrently with Step 8.1[2]. Otherwise, Step 8.1[1] and 8.1[3] may be marked **N/A**.

[1] **PLACE** 1-HS-3-99A1, MFW ISOL ACT RESET TR-A, **AND** 1-HS-3-99B1 MFW ISOL ACT RESET TR-B toggle switches in the RESET position, **AND HOLD** ________

[2] **OPEN** Rx Trip Bkr A and Rx Trip Bkr B by PLACING 1-RT-1 REACTOR TRIP SWITCH to TRIP position. ________

[3] **RELEASE** 1-HS-3-99A1, MFW ISOL ACT RESET TR-A, **AND** 1-HS-3-99B1 MFW ISOL ACT RESET TR-B toggle switches. ________

Date ________ **Initials**

8.2 Balancing MG set A & B Current While Control Rods are Withdrawn

NOTES

1) This section is applicable only if both MG sets are running, loaded, and paralleled.
2) Perform this section only at the direction of US/SM. The MG may be left outside the 2 amp / 258-262 Volt band if no other problems are occurring with the MGs and engineering concurs.

CAUTION

Potentiometers are sensitive. Adjusting potentiometers on-line may bring in a MG overcurrrent trip, Contact system engineering prior to adjusting potentiometers.

[1] **OBTAIN** US/SM permission to adjust CRD MG currents. ________ US/SM

[2] **PLACE** control rods in manual per Section 5.8. ________

[3] **ENSURE** no alarm lights on all Power, Logic, and Hold Cabinets. ________

[4] **RECORD** as found MG current (digital ammeter) and volts.

METER	AMPS	GENERATOR LINE VOLTS	VOLTS
1-EI-85-A/A CRDM MG SET GENERATOR 1A A-PHASE		1-2 PHASE (MG 1A)	
1-EI-85-A/C CRDM MG SET GENERATOR 1A C-PHASE		2-3 PHASE (MG 1A)	
		3-1 PHASE (MG 1A)	
1-EI-85-A/C CRDM MG SET GENERATOR 1B A-PHASE		1-2 PHASE (MG 1B)	
1-EI-85-A/C CRDM MG SET GENERATOR 1B A-PHASE		2-3 PHASE (MG 1B)	
		3-1 PHASE (MG 1B)	

Performer Initials ________________

Date ________ **Initials**

8.2 Balancing MG set A & B Current While Control Rods are Withdrawn (continued)

[5] **ENSURE** MG sets' overcurrrent relays do **NOT** have any flags showing. ________

[6] **ENSURE** MCR annuciators 85A, 86A, and 86B are clear(MCR). ________

[7] **IF** MGs are being adjusted before a forced or refueling outage, **THEN** contact system 85 System Engineering for amp and voltage requirements. Record values given by engineering:

(**N/A** this step if the normal amp and volt criteria is to be used) ________

Amps ____________________

Volts ____________________

[8] **LOOSEN** the locking mechanism on the MG set 1A and 1B voltage adjust potentiometers. ________

NOTES

1) When adjusting amps, match the 1A MG A-phase to the 1B MG A-phase and the 1A MG C-phase to the 1B MG C-phase. A and C phases do **NOT** have to be matched.

2) Increasing voltage on MG set with lower digital ammeter indication will reduce digital ammeter indication on both MG sets. It may be necessary to adjust voltage on both MG sets to meet the limits required in the following step.

[9] **ADJUST** MG set A and/or B voltages as required to balance current as indicated on the digital ammeter within ± 2 amps (or value recorded in 8.2[7] **AND**

MAINTAIN the average of the MG set voltmeters at 258-262 volts. ________

[10] **RETIGHTEN** the locking mechanism on the MG set 1A and 1B voltage adjust potentiometers. ________

Date ________ **Initials**

8.2 Balancing MG set A & B Current While Control Rods are Withdrawn (continued)

NOTE

STEPS 8.2[11] and 8.2[12] may be performed concurrently.

[11] **IF DESIRED**, **PLACE** control rods back in Automatic per Section 5.7. ________

Date ________ **Initials**

8.2 Balancing MG set A & B Current While Control Rods are Withdrawn (continued)

[12] **RECORD** as left currents and volts

METER	AMPS	GENERATOR LINE VOLTS	VOLTS
1-EI-85-A/A CRDM MG SET GENERATOR 1A A-PHASE		1-2 PHASE (MG 1A)	
1-EI-85-A/C CRDM MG SET GENERATOR 1A C-PHASE		2-3 PHASE (MG 1A)	
		3-1 PHASE (MG 1A)	
1-EI-85-A/C CRDM MG SET GENERATOR 1B A-PHASE		1-2 PHASE (MG 1B)	
1-EI-85-A/C CRDM MG SET GENERATOR 1B A-PHASE		2-3 PHASE (MG 1B)	
		3-1 PHASE (MG 1B)	

Performer Initials ________________

Date ________ **Initials**

8.3 ICS Rod Bank Update

NOTES

1) After entering the desired data and then performing the save function, Annunciator 83D should clear for that function but may reflash if other points to the alarm are in alarm status. Annunciator 83D menu may be accessed from the NSSS and BOP Menu for determination of points that may be in alarm.

2) If Rod Bank Update Status indicates **NOT** UPDATED, then Rod to Bank, Rod Sequence, and Rod Bank D Withdrawal Limit calculations are **NOT** performed UNTIL the control rod bank positions have been entered and SAVED to the ICS Computer by pressing the F3 function key.

[1] **SELECT** NSSS and BOP from PEDS primary screen. ________

[2] **SELECT** ROD BANK UPDATE. ________

[3] **SELECT** the appropriate rod bank update data entry box. ________

[4] **ENTER** the desired rod bank position for each bank required. ________

[5] **SELECT** SAVE (F3). ________

9.0 RECORDS

9.1 QA Records

Section 4.0, “Prerequisite Actions”

Section 5.0, “Startup” except Section 5.6

Section 7.0, “Shutdown”

Checklist 1, “CRD Motor Generator Sets and Reactor Trip Switchgear Alignment Verification.”

9.2 Non-QA Records

No Non-QA records are created by this instruction.

Checklist 1
(Page 1 of 1)

CRD Motor Generator Sets, RPI, And Reactor Trip Switchgear Alignment Verification

Date Complete ____________________

NOMENCLATURE	LOCATION	POSITION	UNID	PERF INITIALS	VERIFIER INITIALS
480V UNIT BD 1A					
CRD MG SET 1A (1-GEN-85-A)	C/4D	CONNECTED	1-BKR-85-A		CV
480V UNIT BD 1B					
CRD MG SET 1B (1-GEN-85-B)	C/3B	CONNECTED	1-BKR-85-B		CV
120V INST PWR RACK A (1-M-7)					
UNIT CNTL BD 1-M-7 BKR 7A TO 1-PNL-085-R42	BKR 7	ON	1-BKR-85-R42A		CV
120V INST PWR RACK B (1-M-7)					
UNIT CNTL BD 1-M-7 BKR 7B TO 1-PNL-85-R42	BKR 7	ON	1-BKR-85-R42B		CV
120V INST PWR DIST PNL A					
INST PWR DIST PNL A BKR 7 TO 1-PNL-085-L117	Vital Batt Board Rm I, Bkr 7	ON	1-BKR-85-L117A		CV

Source Notes
(Page 1 of 1)

Requirements Statement	Source Document	Implementing Statement
1	SOER 84-002, Rec 8	Control Rod Mispositioning
2	LER 390/96012	This Source Note was deleted by Revision 31.

SPARE B.1.b
Transfer 6.9 KV Shutdown Board 1A-A from Normal to Alternate on 0-M-26

NOTE: This JPM may be conducted on the Simulator OR in the Main Control Room

WATTS BAR NUCLEAR PLANT
JOB PERFORMANCE MEASURE
SPARE B.1.b
06-2011 NRC Exam

EVALUATION SHEET

Task: Transfer 6.9 KV Shutdown Board 1A-A from Normal to Alternate on 0-M-26.

Alternate Path: n/a

Facility JPM #: 3-OT-JPMR003A

Safety Function: 6 **Title:** Electrical Systems

K/A 062 A4.01 Ability to manually operate and/or monitor in the control room: All breakers (including available switchyard)

Rating(s): 3.3/3.1 **CFR:** 41.7 / 45.5 / to 45.8

Evaluation Method: Simulator __X__ In-Plant __X__ **Classroom** ____

References: SOI-211.01, "6.9 KV Shutdown Board 1A-A," Rev. 14.

Task Number: RO-211-SOI-211-003 **Title:** Transfer the 6.9 kV Shutdown Boards from Normal to Alternate.

Task Standard: The applicant transfers 6.9 KV Shutdown Board 1A-A from its normal supply to its alternate supply without causing a start of the Diesel Generators.

Validation Time: 6 minutes **Time Critical:** Yes ____ No __X__

==

Applicant: ________________ NAME ____________ Docket No. Time Start: ______ Time Finish: ______

Performance Rating: SAT ____ UNSAT ____ Performance Time ___

Examiner: ________________ NAME ________________ SIGNATURE / ______ DATE

==

COMMENTS

SIMULATOR OPERATOR INSTRUCTIONS:

IF CONDUCTED IN THE SIMULATOR, THEN PERFORM THE FOLLOWING:

1. **ENSURE NRC Examination Security has been established.**
2. **RESET to Initial Condition by performing the following actions:**
    a. **Select ICManager on the THUNDERBAR menu (right hand side of Instructor Console Screen).**
    b. **Locate IC 324.**
    c. **Right "click" on IC 324.**
    d. **Select Reset on the drop down menu.**
    e. **Right "click" on RESET.**
    f. **Enter the password for IC 324.**
    g. **Select "Yes" on the INITIAL CONDITION RESET pop-up window.**
    h. **Perform SWITCH CHECK.**
3. **Place simulator in RUN and acknowledge any alarms.**
4. **ENSURE a marked-up copy of SOI-211.01, "6.9 KV Shutdown Board 1A-A," is available to the Examiner for each applicant**
5. **ENSURE "Extra Operator" is present in the simulator.**
6. **Place simulator in FREEZE until Examiner cue is given.**

IF CONDUCTED IN THE MAIN CONTROL ROOM, THEN:

<u>Tools/Equipment/Procedures Needed:</u>

ENSURE a copy of SOI-211.01, "6.9 KV Shutdown Board 1A-A," is available to the Examiner, marked as "EXAM MATERIAL, FOR TRAINING ONLY," for each applicant.

Begin the JPM at the Shift Manager's Desk.

WATTS BAR NUCLEAR PLANT
JOB PERFORMANCE MEASURE
SPARE B.1.b
06-2011 NRC Exam

READ TO APPLICANT

DIRECTION TO APPLICANT:

I will explain the initial conditions, and state the task to be performed. All control room steps shall be performed for this JPM, including any required communications. I will provide initiating cues and reports on other actions when directed by you. Ensure you indicate to me when you understand your assigned task. To indicate that you have completed your assigned task return the cue sheet I provided you.

INITIAL CONDITIONS:

You are an extra operator assigned to the shift.

INITIATING CUES:

The Unit Supervisor directs you to transfer the 1A-A 6.9 KV shutdown Board from its normal feed to its alternate feed from panel 0-M-26.

STEP/STANDARD	SAT/UNSAT
EXAMINER: USE PAGES 6 through 11 if conducting JPM on the Simulator.	
SIMULATOR PERFORMANCE	

START TIME: _______

STEP 1: Obtain a copy of the procedure. STANDARD: Applicant locates a copy of SOI-211.01, "6.9KV Shutdown board 1A-A," and determines that Section 8.7, "Transfer: Normal to Alternate [0-M-26]," is the appropriate section for the task. COMMENTS:	___ SAT ___ UNSAT
EXAMINER: The following actions are taken from SOI-211.01, "6.9KV Shutdown board 1A-A," Section 8.7, "Transfer: Normal to Alternate [0-M-26]."	
CAUTION Aux Boiler "A" may trip during board transfer.	
EXAMINER: If asked, state that the Aux Boiler is not in service.	
STEP 2: [1] **OBTAIN** SRO approval. STANDARD: Applicant determines from the INITAIL CONDITIONS that SRO approval has been granted. COMMENTS:	___ SAT ___ UNSAT
NOTE Evaluate TS 3.8.1 A When Man/Auto transfer switch is in Manual. With switch **NOT** in Auto, an auto transfer of the SDBD from normal feeder to alternate feeder on a transformer fault will not occur.	

STEP/STANDARD	**SAT/UNSAT**
STEP 3: [2] **ENSURE** 1-XS-57-43, 6.9 SD BD 1A-A XFER SELECTOR [1-M-1], in MAN. STANDARD: Applicant locates 1-XS-57-43, 6.9 SD BD 1A-A XFER SELECTOR on panel 1-M-1 and rotates the transfer switch to the right to the "MAN" position. **Step is critical to allow transfer from normal to alternate power supply.** COMMENTS:	**CRITICAL STEP** ___ SAT ___ UNSAT
STEP 4: [3] **PLACE** 1-XS-82-6A, 6.9 SD TRAIN 1A-A VOLTMETER SEL, in CSST D. STANDARD: Applicant locates 1-XS-82-6A, 6.9 SD TRAIN 1A-A VOLTMETER SEL on 0-M-26, and rotates the selector switch to the right to the "CSST D" position. COMMENTS:	___ SAT ___ UNSAT

STEP/STANDARD	SAT/UNSAT
STEP 5: [4] **ENSURE** 6.9V SD Bd 1A-A Alternate supply voltage in Limits on one of the following (**N/A** EI **NOT** used): 6800-7200V, 1-EI-82-6A [0-M-26]. 6800-7260V, 1-EI-57-39 [1-M-1]. STANDARD: Applicant locates 1-EI-82-6A, 6.9 SD TR 1A-A VOLTS on 0-M-26, and observes approximately 7000 volts **OR** Applicant locates 1-EI-57-39, 6.9 SDB 1A-A VOLTS on 1-M-1, and observes approximately 7095 volts. COMMENTS:	___ SAT ___ UNSAT
STEP 6: [5] **PLACE** 1-XS-82-6A, in SHTDN BD 1A-A. STANDARD: Applicant locates 1-XS-82-6A, 6.9 SD TRAIN 1A-A VOLTMETER SEL on 0-M-26, and rotates the selector switch to the left from the "CSST D" position to the "SHTDN BD 1A-A" position. COMMENTS:	___ SAT ___ UNSAT

STEP/STANDARD	SAT/UNSAT
STEP 7: [6] **PLACE** 1-HS-57-114, CSST D SYNC SWITCH, in SYN. STANDARD: Applicant locates 1-HS-57-114, ALTERNATE CSST D SYNC SWITCH and rotates the handswitch to the right from the "OFF" position to the "SYN" position. **Step is critical to allow transfer from normal to alternate power supply.** COMMENTS:	**CRITICAL STEP** ___ SAT ___ UNSAT
EXAMINER: SOI-211.01, "6.9 KV Shutdown Board 1A-A," Section 8.7, "Transfer: Normal to Alternate," designates Steps 7 and 8 as "CRITICAL STEPS." The definition of "CRITICAL STEP" is contained in NPG-SPP-01.2, "Administration of Site Technical Procedures," Section 5.0 "Definitions."	
Start of Critical Step(s) STEP 8: [7] **TURN** 1-HS-57-97B, 1932 ALTERNATE FROM CSST D, to CLOSE, **AND HOLD** UNTIL transfer is COMPLETE. STANDARD: Applicant locates 1-HS-57-97B, 1932 ALTERNATE FROM CSST D and rotates the handswitch to the right to the "CLOSE" position and holds the handswitch there until the transfer is complete. **Step is critical to ensure a loss of voltage to the 1A-A Shutdown board does not occur during the transfer, resulting in diesel generator starts.** COMMENTS:	**CRITICAL STEP** ___ SAT ___ UNSAT

STEP/STANDARD	SAT/UNSAT
STEP 9: [8] **TURN** 1-HS-57-41B, 1716-NORMAL FROM CSST C, to TRIP, **AND CHECK** ACB 1932 CLOSED, and ACB 1716 OPEN. **End of Critical Step(s)** STANDARD: Applicant locates 1-HS-57-41B, 1716-NORMAL FROM CSST C and rotates the handswitch to the left to the "TRIP" position. Applicant observes 1-HS-57-97B, 1932 ALTERNATE FROM CSST D GREEN light is DARK and RED light is lit, indicating that breaker 1932 is CLOSED. Applicant observes1-HS-57-41B, 1716-NORMAL FROM CSST C GREEN light is LIT and RED light is DARK, indicating that breaker 1716 is OPEN. **Step is critical to ensure a loss of voltage to the 1A-A Shutdown board does not occur during the transfer, resulting in diesel generator starts.** ***EXAMI*NER: IF THE APPLICANT DID NOT PERFORM THE CORRECT HANDSWITCH ALIGNMENT AND THE DIESEL GENERATORS ARE RUNNING, STOP THE JPM PERFORMANCE AT THIS POINT.** COMMENTS:	**CRITICAL STEP** ___ SAT ___ UNSAT

STEP/STANDARD	**SAT/UNSAT**
STEP 10: [9] **VERIFY** SD Bd volts in Limits on one of the following (**N/A** EI **NOT** used): 6800-7200V, 1-EI-82-6A [0-M-26]. 6800-7260V, 1-EI-57-39 [1-M-1]. STANDARD: Applicant locates 1-EI-82-6A, 6.9 SD TR 1A-A VOLTS on 0-M-26, and observes approximately 7000 volts **OR** Applicant locates 1-EI-57-39, 6.9 SDB 1A-A VOLTS on 1-M-1, and observes approximately 7095 volts. COMMENTS:	___ SAT ___ UNSAT
STEP 11: [10] **PLACE** 1-HS-57-114, CSST D SYNC SWITCH, in OFF. STANDARD: Applicant locates 1-HS-57-114, ALTERNATE CSST D SYNC SWITCH and rotates the handswitch to the left from the "SYN" position to the "OFF" position. COMMENTS: **END OF TASK**	___ SAT ___ UNSAT

STOP TIME ________

STEP/STANDARD	SAT/UNSAT

EXAMINER: USE PAGES 12 through 18 if conducting JPM in the Main Control Room.

MAIN CONTROL ROOM PERFORMANCE

START TIME ________

STEP 1: Obtain a copy of the procedure. STANDARD: Applicant locates a copy of SOI-211.01, "6.9KV Shutdown board 1A-A," and determines that Section 8.7, "Transfer: Normal to Alternate [0-M-26]," is the appropriate section for the task. COMMENTS:	___ SAT ___ UNSAT

EXAMINER: The following actions are taken from SOI-211.01, "6.9KV Shutdown board 1A-A," Section 8.7, "Transfer: Normal to Alternate [0-M-26]."

CAUTION

Aux Boiler "A" may trip during board transfer.

EXAMINER: If asked, state that the Aux Boiler is not in service.

STEP 2: [1] **OBTAIN** SRO approval. STANDARD: Applicant determines from the INITAIL CONDITIONS that SRO approval has been granted. COMMENTS:	___ SAT ___ UNSAT

STEP/STANDARD	SAT/UNSAT
NOTE Evaluate TS 3.8.1 A When Man/Auto transfer switch is in Manual. With switch **NOT** in Auto, an auto transfer of the SDBD from normal feeder to alternate feeder on a transformer fault will not occur.	
STEP 3: [2] **ENSURE** 1-XS-57-43, 6.9 SD BD 1A-A XFER SELECTOR [1-M-1], in MAN. STANDARD: Applicant locates 1-XS-57-43, 6.9 SD BD 1A-A XFER SELECTOR on panel 1-M-1 and indicates that the handswitch must be rotated to the right to the "MAN" position. **CUE: After the applicant has indicated how to establish the correct switch alignment, indicate that 1-XS-57-43, 6.9 SD BD 1A-A XFER SELECTOR in MAN position.** **Step is critical to allow transfer from normal to alternate power supply.** COMMENTS:	**CRITICAL STEP** ___ SAT ___ UNSAT

STEP/STANDARD	SAT/UNSAT
STEP 4: [3] **PLACE** 1-XS-82-6A, 6.9 SD TRAIN 1A-A VOLTMETER SEL, in CSST D. STANDARD: Applicant locates 1-XS-82-6A, 6.9 SD TRAIN 1A-A VOLTMETER SEL on 0-M-26, and indicates that the selector switch must be rotated to the right to the "CSST D" position. **CUE: After the applicant has indicated how to establish the correct switch alignment, indicate that 1-XS-82-6A, 6.9 SD TRAIN 1A-A VOLTMETER SEL, is aligned to CSST D.** COMMENTS:	___ SAT ___ UNSAT

STEP/STANDARD	SAT/UNSAT
STEP 5: [4] **ENSURE** 6.9V SD Bd 1A-A Alternate supply voltage in Limits on one of the following (**N/A EI NOT** used): 6800-7200V, 1-EI-82-6A [0-M-26]. 6800-7260V, 1-EI-57-39 [1-M-1]. STANDARD: Applicant locates 1-EI-82-6A, 6.9 SD TR 1A-A VOLTS on 0-M-26, and observes approximately 7000 volts **OR** Applicant locates 1-EI-57-39, 6.9 SDB 1A-A VOLTS on 1-M-1, and observes approximately 7095 volts. **CUE: If asked, indicate approximately 7000 volts on 1-EI-82-6A, 6.9 SD TR 1A-A VOLTS on 0-M-26** **CUE: If asked, indicate approximately 7000 volts on 1-EI-57-39, 6.9 SDB 1A-A VOLTS on 1-M-1** COMMENTS:	___ SAT ___ UNSAT

STEP/STANDARD	SAT/UNSAT
STEP 6: [5] **PLACE** 1-XS-82-6A, in SHTDN BD 1A-A. STANDARD: Applicant locates 1-XS-82-6A, 6.9 SD TRAIN 1A-A VOLTMETER SEL on 0-M-26, and indicates that the selector switch must be rotated to the right from the "CSST D" position to the "SHTDN BD 1A-A" position. **CUE: After the applicant has indicated how to establish the correct switch alignment, indicate that 1-XS-82-6A, 6.9 SD TRAIN 1A-A VOLTMETER SEL, is aligned to SHTDN BD 1A-A.** COMMENTS:	___ SAT ___ UNSAT
STEP 7: [6] **PLACE** 1-HS-57-114, CSST D SYNC SWITCH, in SYN. STANDARD: Applicant locates 1-HS-57-114, ALTERNATE CSST D SYNC SWITCH and indicates that the selector switch must be rotated to the right from the "OFF" position to the "SYN" position. **CUE: After the applicant has indicated how to establish the correct switch alignment, indicate that 1-HS-57-114, ALTERNATE CSST D SYNC SWITCH is aligned to the SYN position.** **Step is critical to allow transfer from normal to alternate power supply.** COMMENTS:	**CRITICAL STEP** ___ SAT ___ UNSAT

STEP/STANDARD	**SAT/UNSAT**
EXAMINER: SOI-211.01, "6.9 KV Shutdown Board 1A-A," Section 8.7, "Transfer: Normal to Alternate," designates Steps 7 and 8 as "CRITICAL STEPS." The definition of "CRITICAL STEP" is contained in NPG-SPP-01.2, "Administration of Site Technical Procedures," Section 5.0 "Definitions."	
Start of Critical Step(s) STEP 8: [7] **TURN** 1-HS-57-97B, 1932 ALTERNATE FROM CSST D, to CLOSE, **AND HOLD** UNTIL transfer is COMPLETE. STANDARD: ___Applicant locates 1-HS-57-97B, 1932 ALTERNATE FROM CSST D and indicates that the handswitch must be rotated to the right the "CLOSE" position and held there until the transfer is complete **CUE: After the applicant has indicated how to establish the correct switch alignment, indicate that 1-HS-57-97B, 1932 ALTERNATE FROM CSST D is being held in the CLOSE position.** **Step is critical to ensure a loss of voltage to the 1A-A Shutdown board does not occur during the transfer, resulting in diesel generator starts.** COMMENTS:	**CRITICAL STEP** ___ SAT ___ UNSAT

STEP/STANDARD	SAT/UNSAT
STEP 9: [8] **TURN** 1-HS-57-41B, 1716-NORMAL FROM CSST C, to TRIP, **AND CHECK** ACB 1932 CLOSED, and ACB 1716 OPEN. **End of Critical Step(s)** STANDARD: ___Applicant locates 1-HS-57-41B, 1716-NORMAL FROM CSST C and indicates that the handswitch must be rotated to the left to the "TRIP" position. **CUE: After the applicant has indicated how to establish the correct switch alignment,, indicate that 1-HS-57-41B, 1716-NORMAL FROM CSST C is in the TRIP position.** **EXAMINER: IF THE APPLICANT DID NOT DEMONSTRATE CORRECT HANDSWITCH ALIGNMENT, INDICATE THAT THE DIESEL GENERATORS ARE RUNNING AND STOP THE JPM PERFORMANCE AT THIS POINT.** Applicant indicates that 1-HS-57-97B, 1932 ALTERNATE FROM CSST D GREEN light is expected to be DARK and RED light is expected to be LIT, indicating that breaker 1932 is CLOSED. **CUE: After the applicant has indicated how to establish the correct switch alignment, indicate that 1-HS-57-97B, 1932 ALTERNATE FROM CSST D GREEN light is DARK and RED light LIT.** Applicant observes 1-HS-57-41B, 1716-NORMAL FROM CSST C GREEN light is expected to be LIT and RED light is expected to be DARK, indicating that breaker 1716 is OPEN. **CUE: After the applicant has indicated how to establish the correct switch alignment, indicate that 1-HS-57-41B, 1716-NORMAL FROM CSST C GREEN light LIT and RED light is DARK.** **Step is critical to ensure a loss of voltage to the 1A-A Shutdown board does not occur during the transfer, resulting in diesel generator starts.** COMMENTS:	**CRITICAL STEP** ___ SAT ___ UNSAT

STEP/STANDARD	SAT/UNSAT
STEP 10: [9] **VERIFY** SD Bd volts in Limits on one of the following (**N/A EI NOT** used): 6800-7200V, 1-EI-82-6A [0-M-26]. 6800-7260V, 1-EI-57-39 [1-M-1]. STANDARD: Applicant locates 1-EI-82-6A, 6.9 SD TR 1A-A VOLTS on 0-M-26, and observes approximately 7000 volts **OR** Applicant locates 1-EI-57-39, 6.9 SDB 1A-A VOLTS on 1-M-1, and observes approximately 7095 volts. **CUE: If asked, indicate approximately 7000 volts on 1-EI-82-6A, 6.9 SD TR 1A-A VOLTS on 0-M-26** **CUE: If asked, indicate approximately 7095 volts on 1-EI-57-39, 6.9 SDB 1A-A VOLTS on 1-M-1** COMMENTS:	___ SAT ___ UNSAT
STEP 11: [10] **PLACE** 1-HS-57-114, CSST D SYNC SWITCH, in OFF. STANDARD: Applicant locates 1-HS-57-114, ALTERNATE CSST D SYNC SWITCH and rotates the handswitch to the left from the "SYN" position to the "OFF" position. COMMENTS: **END OF TASK**	___ SAT ___ UNSAT

STOP TIME ________

APPLICANT CUE SHEET

(RETURN TO EXAMINER UPON COMPLETION OF TASK)

INITIAL CONDITIONS:

You are an extra operator assigned to the shift.

INITIATING CUES:

The Unit Supervisor directs you to transfer the 1A-A 6.9 KV shutdown Board from its normal feed to its alternate feed from panel 0-M-26.

Watts Bar Nuclear Plant

Unit 1

System Operating Instruction

SOI-211.01

6.9KV Shutdown Board 1A-A

Revision 0014

Quality Related

Level of Use: Continuous Use

Effective Date: 11-22-2010

Responsible Organization: OPS, Operations

Prepared By: Nicholas Armour

Approved By: Greg Evans

Revision Log

Revision or Change Number	Effective Date	Affected Page Numbers	Description of Revision/Change
8	9/18/00	2,8	Non-intent. Clarified step [4] of Section 5.0 to prevent emergency DG start.
9	3/4/02	2, 12, 15	Non-intent. Incorporated DCN 50565. Changed time delay setting for 27DAT, 27DBT, and 27DCT from 6 to 10 seconds. Enhanced description of relays in Normal Operations section and updated per DCN W-355200-A.
10	1/12/04	2, 4, 8, 43, 44	Non-intent. Added Appendix A for 480V Bd loads stripped from blackout relay operation. This list was removed from AOI-35 in revision 27, and was referenced to in body of this instruction (operator feedback).
11	07/07/04	2-4, 8-11, 13-42	Non-intent. Incorporated critical steps. Incorporated additional CV requirement from PER 03-012913-000. Changed required bus voltage ranges to match 1-15E500 print design output and T/S requirements. Changed customer group to TPS. Changed 2nd to CV.
12	06/05/07	All	This procedure has been converted from Word 95 to Word 2002 XP using rev 13, by Austin Norris.
13	02/16/10	2, 8, 16, 18, 20, 21, 24, 25, 27, 29, 31, 33, 35, 37, 39	Administrative change to add Note to evaluate TS 3.8.1 A prior to taking switch to manual. (PER 176635)
14	11/22/10	2, 4, 6, 8, 9, 11, 12, 14, 15, 17-56, 61	Minor/editorial revision: Added Chiller trip NOTE to Section 8.3 (PER 259197). Revised verification steps to CV only for numerous steps. Reformatted source notes, added end of section identification and created external attachment for checklist.

Table of Contents

Table of Contents (continued)

1.0 INTRODUCTION

1.1 Purpose

To provide instructions for Operation of 6.9kV Shutdown Board (SD Bd) 1A-A.

1.2 Scope

This Instruction covers the following operations:

A. Energizing the Board from Normal or Alternate Supply.

B. Transferring Supply Breakers from Main Control Room or Locally.

C. Deenergizing the Board.

2.0 REFERENCES

2.1 Performance References

A. AOI-35, Loss of Offsite Power

2.2 Developmental References

A. FSAR Section 8.3

B. GOI-7, Generic Equipment Operating Guidelines

C. Tech Specs

D. WB-DC-30-28, Low and Medium Voltage Power Systems

E. TVA Drawings:

1. 1-15E500-1,-2
2. 1-45W724 Series
3. 1-45W760-211 Series
4. 1-45W760-212 Series
5. 1-45W760-270-2
6. 45B6211 Series

F. DS-E18.1.24, TVA Nuclear Power Electrical Design STD

3.0 PRECAUTIONS AND LIMITATIONS

A. Protective relaying shall remain IN SERVICE, and trip circuit fuses IN PLACE before energizing a feeder or bus.

B. All breakers on a board shall be OPEN, and protective grounds REMOVED before energizing the board.

C. Each ACB's closing spring shall be verified charged immediately after racking ACB in, and after each ACB operation. [C.3]

D. Transferring the dc Control Bus must be controlled and expeditious. This may require a second operator to hold the Blackout (BO) Reset Button [6.9kV Logic Panel] to prevent BO Relays from staying in the BO condition which would sequence on ESF Equipment, OR ensuring the opposite train blackout relays are normal before transferring the dc, then resetting the transferred train of BO relays. [C.1]

E. Tech Spec Actions shall be considered if the Alternate or Maintenance Supply breaker are used.

F. A 6.9kV SD Bd breaker being fully racked down shall have seismic restraints installed, or be removed from its compartment. This ensures class 1E bkrs are maintained seismically qualified. This requirement is applicable anytime the Board is required by Tech Specs to be Operable. [C.2]

G. When removing or installing 7200V line-side or bus PT fuses, Electrically-Rated Protective Gloves shall be used.

H. Maintenance supply is an unqualified feed to a shutdown board. Anytime maintenance supply is used to feed a shutdown board, the board is inoperable. [C.6]

I. Auxiliary boiler "A" may trip during board transfer. If continuous boiler operation is necessary, loads should be swapped to B boiler prior to board transfer. [C.4]

J. Load Dispatcher should be notified when any 6.9kV Shutdown Board is placed on maintenance feeder.

Date________ **Initials**

4.0 PREREQUISITE ACTIONS

NOTES

1) Throughout Instruction where **IF/THEN** exists, the step is **N/A** if stated condition does **NOT** exist.
2) Signoffs/information in unused Sections may be left blank.

4.1 Preliminary Actions

[1] **INDICATE** Section to be performed, and reason for use:

5.0	Startup	________	7.0	Shutdown	________
6.0	Normal Operation	N/A	8.0	Infrequent Operations	________

Section/ Reason/ Remarks: ____________________

____

____

____

4.2 Field Preparations

[1] **REVIEW** plant procedures, processes, and programs in progress to ensure adequate configuration of components necessary for system operation. ________

[2] **REVIEW** Section 3.0, Precautions and Limitations. ________

4.3 Approvals and Notifications

[1] **COORDINATE** system operations/manipulations with UO. ________

Date________ **Initials**

8.7 Transfer: Normal to Alternate [0-M-26]

CAUTION

Aux Boiler "A" may trip during board transfer. [C.4]

[1] **OBTAIN** SRO approval. ________ SRO

NOTE

Evaluate TS 3.8.1 A When Man/Auto transfer switch is in Manual. With switch **NOT** in Auto, an auto transfer of the SDBD from normal feeder to alternate feeder on a transformer fault will not occur.

[2] **ENSURE** 1-XS-57-43, 6.9 SD BD 1A-A XFER SELECTOR [1-M-1], in MAN. ________

[3] **PLACE** 1-XS-82-6A, 6.9 SD TRAIN 1A-A VOLTMETER SEL, in CSST D. ________

[4] **ENSURE** 6.9V SD Bd 1A-A Alternate supply voltage in Limits on one of the following (**N/A** EI **NOT** used):

6800-7200V, 1-EI-82-6A [0-M-26]. ________

6800-7260V, 1-EI-57-39 [1-M-1]. ________

[5] **PLACE** 1-XS-82-6A, in SHTDN BD 1A-A. ________

[6] **PLACE** 1-HS-57-114, CSST D SYNC SWITCH, in SYN. ________

________ CV

Date________ **Initials**

8.7 Transfer: Normal to Alternate [0-M-26] (continued)

Start of Critical Step(s)

[7] **TURN** 1-HS-57-97B, 1932 ALTERNATE FROM CSST D, to CLOSE, **AND**

HOLD UNTIL transfer is COMPLETE. ________

________ CV

[8] **TURN** 1-HS-57-41B, 1716-NORMAL FROM CSST C, to TRIP, **AND**

CHECK ACB 1932 CLOSED, and ACB 1716 OPEN. ________

________ CV

End of Critical Step(s)

[9] **VERIFY** SD Bd volts in Limits on one of the following (**N/A** EI **NOT** used):

6800-7200V, 1-EI-82-6A [0-M-26]. ________
6800-7260V, 1-EI-57-39 [1-M-1]. ________

[10] **PLACE** 1-HS-57-114, CSST D SYNC SWITCH, in OFF. ________

End of Section

TVA

Watts Bar Nuclear Plant

Unit 1

System Operating Instruction

SOI-211.01

6.9KV Shutdown Board 1A-A

Revision 0014

Quality Related

Level of Use: Continuous Use

Effective Date: 11-22-2010

Responsible Organization: OPS, Operations

Prepared By: Nicholas Armour

Approved By: Greg Evans

Revision Log

Revision or Change Number	Effective Date	Affected Page Numbers	Description of Revision/Change
8	9/18/00	2,8	Non-intent. Clarified step [4] of Section 5.0 to prevent emergency DG start.
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12	06/05/07	All	This procedure has been converted from Word 95 to Word 2002 XP using rev 13, by Austin Norris.
13	02/16/10	2, 8, 16, 18, 20, 21, 24, 25, 27, 29, 31, 33, 35, 37, 39	Administrative change to add Note to evaluate TS 3.8.1 A prior to taking switch to manual. (PER 176635)
14	11/22/10	2, 4, 6, 8, 9, 11, 12, 14, 15, 17-56, 61	Minor/editorial revision: Added Chiller trip NOTE to Section 8.3 (PER 259197). Revised verification steps to CV only for numerous steps. Reformatted source notes, added end of section identification and created external attachment for checklist.

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Table of Contents (continued)

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A. Energizing the Board from Normal or Alternate Supply.

B. Transferring Supply Breakers from Main Control Room or Locally.

C. Deenergizing the Board.

2.0 REFERENCES

2.1 Performance References

A. AOI-35, Loss of Offsite Power

2.2 Developmental References

A. FSAR Section 8.3

B. GOI-7, Generic Equipment Operating Guidelines

C. Tech Specs

D. WB-DC-30-28, Low and Medium Voltage Power Systems

E. TVA Drawings:

1. 1-15E500-1,-2
2. 1-45W724 Series
3. 1-45W760-211 Series
4. 1-45W760-212 Series
5. 1-45W760-270-2
6. 45B6211 Series

F. DS-E18.1.24, TVA Nuclear Power Electrical Design STD

3.0 PRECAUTIONS AND LIMITATIONS

A. Protective relaying shall remain IN SERVICE, and trip circuit fuses IN PLACE before energizing a feeder or bus.

B. All breakers on a board shall be OPEN, and protective grounds REMOVED before energizing the board.

C. Each ACB's closing spring shall be verified charged immediately after racking ACB in, and after each ACB operation. [C.3]

D. Transferring the dc Control Bus must be controlled and expeditious. This may require a second operator to hold the Blackout (BO) Reset Button [6.9kV Logic Panel] to prevent BO Relays from staying in the BO condition which would sequence on ESF Equipment, OR ensuring the opposite train blackout relays are normal before transferring the dc, then resetting the transferred train of BO relays. [C.1]

E. Tech Spec Actions shall be considered if the Alternate or Maintenance Supply breaker are used.

F. A 6.9kV SD Bd breaker being fully racked down shall have seismic restraints installed, or be removed from its compartment. This ensures class 1E bkrs are maintained seismically qualified. This requirement is applicable anytime the Board is required by Tech Specs to be Operable. [C.2]

G. When removing or installing 7200V line-side or bus PT fuses, Electrically-Rated Protective Gloves shall be used.

H. Maintenance supply is an unqualified feed to a shutdown board. Anytime maintenance supply is used to feed a shutdown board, the board is inoperable. [C.6]

I. Auxiliary boiler "A" may trip during board transfer. If continuous boiler operation is necessary, loads should be swapped to B boiler prior to board transfer. [C.4]

J. Load Dispatcher should be notified when any 6.9kV Shutdown Board is placed on maintenance feeder.

Date________ **Initials**

4.0 PREREQUISITE ACTIONS

NOTES

1) Throughout Instruction where **IF/THEN** exists, the step is **N/A** if stated condition does **NOT** exist.
2) Signoffs/information in unused Sections may be left blank.

4.1 Preliminary Actions

[1] **INDICATE** Section to be performed, and reason for use:

5.0	Startup	________	7.0	Shutdown	________
6.0	Normal Operation	N/A	8.0	Infrequent Operations	________

Section/ Reason/ Remarks: ________________________

____

____

____

4.2 Field Preparations

[1] **REVIEW** plant procedures, processes, and programs in progress to ensure adequate configuration of components necessary for system operation. ________

[2] **REVIEW** Section 3.0, Precautions and Limitations. ________

4.3 Approvals and Notifications

[1] **COORDINATE** system operations/manipulations with UO. ________

Date________ **Initials**

5.0 ENERGIZE 6.9KV SHUTDOWN BD 1A-A

[1] **OBTAIN** SRO approval. ________ SRO

NOTE

Evaluate TS 3.8.1 A When Man/Auto transfer switch is in Manual. With switch **NOT** in Auto, an auto transfer of the SDBD from normal feeder to alternate feeder on a transformer fault will not occur.

[2] **ENSURE** 1-XS-57-43, 6.9 SD BD 1A-A XFER SELECTOR [1-M-1], in MAN. ________

[3] **PERFORM** the following:

NOMENCLATURE	LOCATION	POSITION	UNID	PERF INITIALS	VERIF INITIALS
ALT SUPPLY FROM 6.9KV COMMON SWG D	6.9KV SDB 1A-A, C/1	RACKED UP & OPEN	1-BKR-211-1932/1		CV
EMERG SUPPLY FROM DIESEL GENERATOR 1A-A	6.9KV SDB 1A-A, C/6	RACKED UP & OPEN	1-BKR-211-1912/6		CV
MAINT SUPPLY FROM 6.9KV UNIT BD 1B	6.9KV SDB 1A-A, C/11	0-PI-OPS-17.1	1-BKR-211-1718/11		
NORM SUPPLY FROM COMMON SWG C	6.9KV SDB 1A-A, C/16	RACKED UP & OPEN	1-BKR-211-1716/16		CV
6.9KV SD BOARD 1A-A BACKUP BUS ALT FEEDER	125VDC VIT BATT BD I	ON	0-BKR-236-1/201		CV
6.9KV SD BOARD 1A-A NORM BUS NORM FEEDER	125VDC VIT BATT BD I	ON	0-BKR-236-1/204		CV
6.9KV SD BOARD 1A-A BACKUP BUS NORM FEEDER	125VDC VIT BATT BD III	ON	0-BKR-236-3/201		CV
6.9KV SD BOARD 1A-A NORM BUS ALT FEEDER	125VDC VIT BATT BD III	ON	0-BKR-236-3/204		CV

NOTE

The 480V load breakers which were stripped by blackout must be reset individually before re-closing. REFER TO Appendix A.

[4] **ENSURE** all load breakers on 6.9kV SD Bd 1A-A, OPEN with Handswitches in PULL-TO-LOCK or RACKED DOWN to prevent an emergency start from the blackout. [C.2] ________

Date________ **Initials**

5.0 ENERGIZE 6.9KV SHUTDOWN BD 1A-A (continued)

[5] **ENSURE** DIESEL GEN 1A-A COMMON EMERG START RELAYS 43TL [SHUTDOWN BOARD 1A-A LOGIC RELAY PANEL, 1-PNL-211-A-A], in TEST. ________

________ CV

NOTE

The Normal or Alternate Supply must be available to energize board. Steps 5.0[6] & 5.0[7] OR 5.0[8] & 5.0[9] may be omitted if that supply is **NOT** available.

[6] **CHECK** CSST C Y-WINDING VOLTS [0-ECB-2], 6.80 to 7.26 kV. ________

[7] **CHECK** ACB 1712, NORM FEEDER FOR 6.9KV SHDN BD 1A-A & ALT FEEDER FOR 6.9KV SHDN BD 2B-B [0-ECB-2], CLOSED. ________

[8] **CHECK** CSST D Y-WINDING VOLTS [0-ECB-3], 6.80 to 7.26 kV. ________

[9] **CHECK** ACB 1812, NORM FEEDER FOR 6.9KV SHDN BD 2B-B & ALT FEEDER FOR 6.9KV SHDN BD 1A-A [0-ECB-3], CLOSED. ________

NOTE

Alternate 125Vdc control power may be used if the normal dc supply is **NOT** available, if approved by SRO (normal and backup bus control power are on same 125V Vital Batt Bd if either switch is in alternate).

[10] **ENSURE** 125V DC SUPPLY TRANSFER SWITCH NORMAL BUS selected to 125V DC SUPPLY NORMAL SUPPLY FROMBATTERY BOARD I, and 125-V DC CONTROL BUS ENERGIZED Red light [Pnl 2], is LIT. ________

________ CV

[11] **ENSURE** 125V DC SUPPLY TRANSFER SWITCH BACKUP BUS selected to 125V DC SUPPLY NORMAL SUPPLY FROM BATTERY BOARD III, and 125-V DC CONTROL BUS ENERGIZED Red light [Pnl 17], is LIT. ________

________ CV

Date________ **Initials**

5.0 ENERGIZE 6.9KV SHUTDOWN BD 1A-A (continued)

[12] **ENSURE** Alternate Supply ACB 1932 Overcurrent Relays [Pnl 1], INSTALLED and RESET. ________

[13] **ENSURE** LOCKING OUT RELAY 86-932 [Pnl 1], RESET (Egg- shaped handle VERTICAL, Green target, and Amber light LIT). ________

[14] **ENSURE** Emergency Supply ACB 1912 Overcurrent Relays [Pnl 6], INSTALLED and RESET. ________

[15] **ENSURE** 6.9kV SD Bd 1A-A Differential Relays [Pnl 12], INSTALLED and RESET. ________

[16] **ENSURE** LOCKING-OUT RELAY 86S1A [Pnl 12], RESET (Egg- shaped handle VERTICAL, Green target, and Amber light LIT). ________

[17] **ENSURE** Normal Supply ACB 1716 Overcurrent Relays [Pnl 16], INSTALLED and RESET. ________

[18] **ENSURE** LOCKING-OUT RELAY 86-716 [Pnl 16], RESET (Egg- shaped handle VERTICAL, Green target, and Amber light LIT). ________

[19] **ENSURE** Undervoltage Relays INSTALLED [1-PNL-211-A-A]. ________

Date________ **Initials**

5.0 ENERGIZE 6.9KV SHUTDOWN BD 1A-A (continued)

CAUTION

Maintenance supply is an unqualified feed to a shutdown board. Anytime that the maintenance supply is used to feed a shutdown board, the board is inoperable. [C.6]

[20] **IF** 1-BKR-211-1718/11, MAINT SUPPLY FROM 6.9KV UNIT BD 1B is to be used (only below mode 4), **THEN**:

[20.1] **NOTIFY** TPS to lower degraded voltage relays by one setting to ensure against relays picking up during normal 500kV grid swings. [C.6] ________

[20.2] **ENSURE** 1-BKR-211-1718/11, MAINT SUPPLY FROM 6.9KV UNIT BD 1B [6.9 SD Bd 1A-A, C/11], UNLOCKED and RACKED UP. ________

________ CV

[20.3] **ENSURE** 1-BKR-201-B/8, MAINT FEEDER TO 6.9KV SHUTDOWN BD 1A-A [6.9 Unit Bd 1B C/8], is CLOSED. ________

________ CV

[21] **CLOSE** one of the following bkrs as required for plant conditions [1-M-1] (**N/A** bkrs **NOT** closed):

[21.1] 1-HS-57-41A, 1716 NORMAL- 6.9 SD BD 1A-A FROM CSST C. ________

________ CV

[21.2] 1-HS-57-97A, 1932- ALT 6.9 SD BD 1A-A FROM CSST D. ________

________ CV

[21.3] 1-HS-57-44A, 1718 MAINTENANCE- 6.9 SD BD 1A-A FROM 6.9 UNIT BD 1B (only below mode 4). ________

________ CV

Date________ Initials

5.0 ENERGIZE 6.9KV SHUTDOWN BD 1A-A (continued)

NOTE

SD Bd volts may be verified 6800 to 7260V on local VOLTMETER MAIN BUS [Pnl 12], or with 1-XS-82-6A, 6.9 SD TRAIN 1A-A VOLTMETER SEL [0-M-26] in SHTDN BD 1A-A and read 1-EI-82-6A, 6.9 SD TR 1A-A VOLTS.

[22] **VERIFY** 6800 to 7260V on 1-EI-57-39, 6.9 SDB 1A-A VOLTS [1-M-1], with 1-XS-57-39, 6.9 SD BD 1A-A VOLTMETER SELECTOR, in SHTDN BD 1A-A. ________

[23] **IF** 1716 NORMAL- 6.9 SD BD 1A-A FROM CSST C, is CLOSED, **AND** Auto transfer control is desired, **THEN**

ENSURE 1-XS-57-43, 6.9 SD BD 1A-A XFER SELECTOR [1-M-1], in AUTO. ________

________ IV

NOTE

After SD Bd is energized, the load-stripping relays seal-in function can be checked by failure of the load-stripping relay flag to reset, or the relay aux relays (27S1AX1, 27S1AX2, 27S1AY1, 27S1AY2) energized (buttons pulled in) [Logic Panel, 1-PNL-211-A-A].

[24] **RESET** 6.9kV SD Bd 1A-A Undervoltage Relays (requires upper or lower relay comb to be pulled to reset a load-stripping relay if the relay is sealed in) [1-PNL-211-A-A]. ________

[25] **RESET** 6.9kV SD Bd 1A-A Logic Panel BO Relays by PUSHING BLACK-OUT RELAYS BO-RESET button [1-PNL-211-A-A]. ________

NOTE

Placing 43TL to Normal enables all of the DG emergency start circuit, and could allow DG to start if a start signal is present.

[26] **PLACE** DIESEL GEN 1A-A COMMON EMERG START RELAYS 43TL [1-PNL-211-A-A], in NORMAL. ________

________ IV

[27] **ENSURE** alarms 12B,12C,12E, 199E, 201B, 201C, are CLEAR. ________

End of Section

Date________ **Initials**

6.0 NORMAL OPERATION

The 6.9kV SD Board is associated with the onsite ac Power System and provides power to safety and nonsafety related loads requiring a reliable power source. The board receives its normal and alternate power supplies from the Common Station Service Transformers (CSSTs). Emergency power is from the Diesel Generator (DG). Control power is from both a normal and emergency bus, and is supplied from 125Vdc Vital Battery Bds.

The Maintenance Supply may only be used during maintenance below mode 4. Auto transfer from the normal supply to alternate initiates by a CSST transformer fault, sudden pressure, or transfer trip. Return to normal is manual only. Board Undervoltage or degraded voltage initiates transfer straight to the DG.

Degraded Voltage relays (27 DAT, 27 DBT, 27DCT) operate if board voltage reduces to 96% of 6900V for 10 seconds. These relays (2/3) trip and lock-out all supply breakers except DG breaker, and initiate a load shed. These relays also alarms in MCR.

Loss-of-Voltage relays (27 LVA, 27 LVB, 27 LVC) operate if board voltage reduces to 87% of 6900V for 0.75 sec. These relays (2/3) trip and lock-out all supply breakers except DG breaker.

Diesel Start relays (27D AØ and 27 CØ) operate on failure of bus voltage (1/2) for 0.5 to 1.5 sec to start the DGs.

Load Shed relays (27S AØ and 27S CØ) operate on failure of bus voltage [1/2, (two sets per phase)] for 3 to 5 sec. The load shed signal will: 1) trip incoming supply breakers, 2) trip all 6.9kV SD Bd motor breakers, 3) trip selected electrically-operated breakers on the 480V SD Bds, 4) initiate a Blackout Signal, and 5) electrically reset the auto/manual selector to manual. When DG speed is greater than 850 rpm and voltage greater than 95%, its breaker will close to supply SD Bd.

High-Voltage relays (59 OVA, 59 OVC) pick up at 7260V (110% of motor rated voltage) and alarm in MCR.

Date________ **Initials**

7.0 DEENERGIZE 6.9KV SHUTDOWN BD 1A-A

[1] **OBTAIN** SRO approval. ________ SRO

[2] **REFER TO** Tech Spec LCO actions BEFORE deenergizing Board. ________

[3] **PLACE** Train B equipment in service as needed to deenergize following Bds:

[3.1] 480V Shutdown Bd 1A1-A ________

[3.2] 480V Shutdown Bd 1A2-A ________

[3.3] 480V Reactor MOV Bd 1A1-A ________

[3.4] 480V Reactor MOV Bd 1A2-A ________

[3.5] 480V Reactor Vent Bd 1A-A ________

[3.6] 480V C&A Vent Bd 1A1-A ________

[3.7] 480V C&A Vent Bd 1A2-A ________

[3.8] 480V Diesel Aux Bd 1A1-A ________

[3.9] **WHEN** 480V Diesel Aux Bd 1A2-A removed from service, **THEN**

PROVIDE Temp power to DGB CO_2 unit until Bd is REENERGIZED. ________

[4] **ENSURE** all 6.9kV SD Bd 1A-A load bkrs, OPEN or RACKED DOWN. [C.2] ________

NOTE
Placing 43TL in test renders DG inoperable (prevents DG UV start).

[5] **PLACE** DIESEL GEN 1A-A COMMON EMERG START RELAYS 43TL [1A-A LOGIC RELAY PANEL, 1-PNL-211-A-A], in TEST. ________

________ CV

Date________ **Initials**

7.0 DEENERGIZE 6.9KV SHUTDOWN BD 1A-A (continued)

NOTE

Evaluate TS 3.8.1 A When Man/Auto transfer switch is in Manual. With switch **NOT** in Auto, an auto transfer of the SDBD from normal feeder to alternate feeder on a transformer fault will not occur.

[6] **ENSURE** 1-XS-57-43, 6.9 SD BD 1A-A XFER SELECTOR [1-M-1], in MAN. ________

[7] **ENSURE** the following:

NOMENCLATURE	LOCATION	POSITION	UNID	PERF INITIALS	VERIF INITIALS
1932-ALT 6.9 SD BD 1A-A FROM CSST D	1-M-1, or 0-M-26	OPEN	1-HS-57-97A, or 1-HS-57-97B		CV
1912- DG TO SD BD 1A-A	0-M-26	OPEN	1-HS-57-46A		CV
1718 MAINTENANCE- 6.9 SD BD 1A-A FROM UNIT BD 1B	1-M-1, or 0-M-26	OPEN	1-HS-57-44A, or 1-HS-57-44B		CV
1716 NORMAL- 6.9 SD BD 1A-A FROM CSST C	1-M-1, or 0-M-26	OPEN	1-HS-57-41A, or 1-HS-57-41B		CV

[8] **PLACE** 1-XS-57-39, 6.9 SD BD 1A-A VOLTMETER SELECTOR [1-M-1], in SHTDN BD 1A-A, **AND**

VERIFY NO voltage on 1-EI-57-39, 6.9 SDB 1A-A VOLTS [1-M-1]. ________

End of Section

8.0 INFREQUENT OPERATIONS

6.9kV SD Board manual transfer is "fast"; auto transfer is "fast" to the Alternate supply on a CSST fault. If degraded voltage less than 96% occurs for 10 seconds, the Board will transfer to the DG Supply. Blackout Relays should be checked normal after any transfer.

Date________ **Initials**

8.1 Transfer: Normal to Alternate [1-M-1]

> **CAUTION**
>
> Aux Boiler "A" may trip during board transfer. [C.4]

[1] **OBTAIN** SRO approval. ________ SRO

[2] **PLACE** 1-XS-57-39, 6.9 SD BD 1A-A VOLTMETER SELECTOR, in CSST D, **AND**

VERIFY 6800 to 7260V on 1-EI-57-39, 6.9 SDB 1A-A VOLTS. ________

[3] **PLACE** 1-XS-57-39, in SHTDN BD 1A-A. ________

> **NOTE**
>
> Evaluate TS 3.8.1 A When Man/Auto transfer switch is in Manual. With switch **NOT** in Auto, an auto transfer of the SDBD from normal feeder to alternate feeder on a transformer fault will not occur.

[4] **ENSURE** 1-XS-57-43, 6.9 SD BD 1A-A XFER SELECTOR, in MAN. ________

Start of Critical Step(s)

[5] **TURN** 1-HS-57-97A, 1932-ALT 6.9 SD BD 1A-A FROM CSST D, to CLOSE, **AND**

HOLD UNTIL transfer is COMPLETE. ________

________ CV

[6] **TURN** 1-HS-57-41A, 1716 Normal - 6.9 SD BD 1A-A FROM CSST C, to TRIP, **AND**

CHECK ACB 1932 CLOSED, and ACB 1716 OPEN. ________

________ CV

End of Critical Step(s)

[7] **VERIFY** 6800 to 7260V on 1-EI-57-39. ________

End of Section

Date________ **Initials**

8.2 Transfer: Normal to Maintenance [1-M-1]

CAUTIONS

1) Maintenance supply is an unqualified feed to a shutdown board. Anytime that the maintenance supply is used to feed a shutdown board, the board is inoperable. [C.6]
2) Aux Boiler "A" may trip during board transfer. [C.4]

[1] **OBTAIN** SRO approval. ________ SRO

NOTE

Shutdown board will be considered inoperable after next step. [C.6]

[2] **NOTIFY** TPS to lower degraded voltage relays by one setting to ensure against relays picking up during normal 500kV grid swings. [C.6] ________

[3] **ENSURE** 1-BKR-211-1718/11, MAINT SUPPLY FROM 6.9KV UNIT BD 1B [6.9 SD Bd 1A-A, C/11], UNLOCKED and RACKED UP. ________

________ CV

[4] **ENSURE** 1-BKR-201-B/8, MAINT FEEDER TO 6.9KV SHUTDOWN BD 1A-A [6.9 Unit Bd 1B, C/8], is CLOSED. ________

________ CV

[5] **PLACE** 1-XS-57-39, 6.9 SD BD 1A-A VOLTMETER SELECTOR, in UB1B, **AND**

VERIFY 6800 to 7260V on 1-EI-57-39, 6.9 SDB 1A-A VOLTS. ________

[6] **PLACE** 1-XS-57-39, in SHTDN BD 1A-A. ________

NOTE

Evaluate TS 3.8.1 A When Man/Auto transfer switch is in Manual. With switch **NOT** in Auto, an auto transfer of the SDBD from normal feeder to alternate feeder on a transformer fault will not occur.

[7] **ENSURE** 1-XS-57-43, 6.9 SD BD 1A-A XFER SELECTOR, in MAN. ________

Date________ **Initials**

8.2 Transfer: Normal to Maintenance [1-M-1] (continued)

Start of Critical Step(s)

[8] **TURN** 1-HS-57-44A, 1718 MAINTENANCE- 6.9 SD BD 1A-A FROM 6.9 UNIT BD 1B, to CLOSE, **AND**

HOLD UNTIL transfer is COMPLETE. ________

________ CV

[9] **TURN** 1-HS-57-41A, 1716 NORMAL- 6.9 SD BD 1A-A FROM CSST C, to TRIP, **AND**

CHECK ACB 1718 CLOSED, and ACB 1716 OPEN. ________

________ CV

End of Critical Step(s)

[10] **VERIFY** 6800 to 7260V on 1-EI-57-39. ________

End of Section

Date________ **Initials**

8.3 Transfer: Alternate to Normal [1-M-1]

CAUTION

Aux Boiler "A" may trip during board transfer. [C.4]

NOTE

MCR Chiller A may trip when the Shutdown Board power is transferred from Alternate to Normal.

[1] **OBTAIN** SRO approval. ________ SRO

[2] **PLACE** 1-XS-57-39, 6.9 SD BD 1A-A VOLTMETER SELECTOR, in CSST C, **AND**

VERIFY 6800-7260V on 1-EI-57-39, 6.9 SDB 1A-A VOLTS. ________

[3] **PLACE** 1-XS-57-39, in SHTDN BD 1A-A. ________

NOTE

Evaluate TS 3.8.1 A When Man/Auto transfer switch is in Manual. With switch **NOT** in Auto, an auto transfer of the SDBD from normal feeder to alternate feeder on a transformer fault will not occur.

[4] **ENSURE** 1-XS-57-43, 6.9 SD BD 1A-A XFER SELECTOR, in MAN. ________

Date________ **Initials**

8.3 Transfer: Alternate to Normal [1-M-1] (continued)

Start of Critical Step(s)

[5] **TURN** 1-HS-57-41A, 1716 NORMAL- 6.9 SD BD 1A-A FROM CSST C, to CLOSE, **AND**

HOLD UNTIL transfer is COMPLETE. ________ ________ CV

[6] **TURN** 1-HS-57-97A, 1932- ALT 6.9 SD BD 1A-A FROM CSST D, to TRIP, **AND**

CHECK ACB 1716 CLOSED, and ACB 1932 OPEN. ________ ________ CV

End of Critical Step(s)

[7] **VERIFY** 6800-7260V on 1-EI-57-39. ________

[8] **ENSURE** 1-XS-57-43, 6.9 SD BD 1A-A XFER SELECTOR, in AUTO. ________ ________ IV

End of Section

Date________ **Initials**

8.4 Transfer: Alternate to Maintenance [1-M-1]

CAUTIONS

1) Maintenance supply is an unqualified feed to a shutdown board. Anytime that the maintenance supply is used to feed a shutdown board, the board is inoperable. [C.6]
2) Aux Boiler "A" may trip during board transfer. [C.4]

[1] **OBTAIN** SRO approval. ________ SRO

NOTE

Shutdown board will be considered inoperable after next step. [C.6]

[2] **NOTIFY** TPS to lower degraded voltage relays by one setting to ensure against relays picking up during normal 500kV grid swings. [C.6] ________

[3] **ENSURE** 1-BKR-211-1718/11, MAINT SUPPLY FROM 6.9KV UNIT BD 1B [6.9 SD Bd 1A-A, C/11], UNLOCKED and RACKED UP. ________

________ CV

[4] **ENSURE** 1-BKR-201-B/8, MAINT FEEDER TO 6.9KV SHUTDOWN BD 1A-A [6.9 Unit Bd 1B, C/8], is CLOSED. ________

________ CV

[5] **PLACE** 1-XS-57-39, 6.9 SD BD 1A-A VOLTMETER SELECTOR, in UB1B, **AND**

VERIFY 6800-7260V on 1-EI-57-39, 6.9 SDB 1A-A VOLTS. ________

[6] **PLACE** 1-XS-57-39, in SHTDN BD 1A-A. ________

Date________ **Initials**

8.4 Transfer: Alternate to Maintenance [1-M-1] (continued)

> **NOTE**
>
> Evaluate TS 3.8.1 A When Man/Auto transfer switch is in Manual. With switch **NOT** in Auto, an auto transfer of the SDBD from normal feeder to alternate feeder on a transformer fault will not occur.

[7] **ENSURE** 1-XS-57-43, 6.9 SD BD 1A-A XFER SELECTOR, in MAN. ________

Start of Critical Step(s)

[8] **TURN** 1-HS-57-44A, 1718 MAINTENANCE- 6.9 SD BD 1A-A FROM 6.9 UNIT BD 1B, to CLOSE, **AND**

HOLD UNTIL transfer is COMPLETE. ________

________ CV

[9] **TURN** 1-HS-57-97A, 1932- ALT 6.9 SD BD 1A-A FROM CSST D, to TRIP, **AND**

CHECK ACB 1718 CLOSED, and ACB 1932 OPEN. ________

________ CV

End of Critical Step(s)

[10] **VERIFY** 6800-7260V on 1-EI-57-39. ________

End of Section

Date________ **Initials**

8.5 Transfer: Maintenance to Normal [1-M-1]

CAUTION

Aux Boiler "A" may trip during board transfer. [C.4]

[1] **OBTAIN** SRO approval. ________ SRO

[2] **PLACE** 1-XS-57-39, 6.9 SD BD 1A-A VOLTMETER SELECTOR, in CSST C, **AND**

VERIFY 6800-7260V on 1-EI-57-39, 6.9 SDB 1A-A VOLTS. ________

[3] **PLACE** 1-XS-57-39, in SHTDN BD 1A-A. ________

NOTE

Evaluate TS 3.8.1 A When Man/Auto transfer switch is in Manual. With switch **NOT** in Auto, an auto transfer of the SDBD from normal feeder to alternate feeder on a transformer fault will not occur.

[4] **ENSURE** 1-XS-57-43, 6.9 SD BD 1A-A XFER SELECTOR, in **MAN**. ________

Start of Critical Step(s)

[5] **TURN** 1-HS-57-41A, 1716 NORMAL- 6.9 SD BD 1A-A FROM CSST C, to CLOSE, **AND**

HOLD UNTIL transfer is COMPLETE. ________

________ CV

[6] **TURN** 1-HS-57-44A, 1718 MAINTENANCE- 6.9 SD BD 1A-A FROM 6.9 UNIT BD 1B, to TRIP, **AND**

CHECK ACB 1716 CLOSED, and ACB 1718 OPEN. ________

________ CV

End of Critical Step(s)

[7] **VERIFY** 6800-7260V on 1-EI-57-39. ________

Date________ **Initials**

8.5 Transfer: Maintenance to Normal [1-M-1] (continued)

[8] **ENSURE** 1-XS-57-43, 6.9 SD BD 1A-A XFER SELECTOR, in AUTO. ________ ________ IV

[9] **NOTIFY** TPS to return degraded voltage relays to normal settings (SD board is considered inoperable until this step is completed). [C.6] ________

[10] **OPEN** 1-BKR-201-B/8, MAINT FEEDER TO 6.9KV SHUTDOWN BD 1A-A [6.9 Unit Bd 1B, C/8]. ________ ________ CV

[11] **RACK DOWN** and **LOCK** 1-BKR-211-1718/11, MAINT SUPPLY FROM 6.9KV UNIT BD 1B [6.9 SD Bd 1A-A, C/11]. ________ ________ CV

End of Section

Date________ **Initials**

8.6 Transfer: Maintenance to Alternate [1-M-1]

CAUTION
Aux Boiler "A" may trip during board transfer. [C.4]

[1] **OBTAIN** SRO approval. ________ SRO

[2] **PLACE** 1-XS-57-39, 6.9 SD BD 1A-A VOLTMETER SELECTOR, in CSST D, **AND**

VERIFY 6800-7260V on 1-EI-57-39, 6.9 SDB 1A-A VOLTS. ________

[3] **PLACE** 1-XS-57-39, in SHTDN BD 1A-A. ________

NOTE
Evaluate TS 3.8.1 A When Man/Auto transfer switch is in Manual. With switch **NOT** in Auto, an auto transfer of the SDBD from normal feeder to alternate feeder on a transformer fault will not occur.

[4] **ENSURE** 1-XS-57-43, 6.9 SD BD 1A-A XFER SELECTOR, in MAN. ________

Start of Critical Step(s)

[5] **TURN** 1-HS-57-97A, 1932-ALT 6.9 SD BD 1A-A FROM CSST D, to CLOSE, **AND**

HOLD UNTIL transfer is COMPLETE. ________

________ CV

[6] **TURN** 1-HS-57-44A, 1718 MAINTENANCE- 6.9 SD BD 1A-A FROM 6.9 UNIT BD 1B, to TRIP, **AND**

CHECK ACB 1932 CLOSED, and ACB 1718 OPEN. ________

________ CV

End of Critical Step(s)

[7] **VERIFY** 6800-7260V on 1-EI-57-39. ________

Date________ **Initials**

8.6 Transfer: Maintenance to Alternate [1-M-1] (continued)

[8] **NOTIFY** TPS to return degraded voltage relays to normal settings (SD board is considered inoperable until this step is completed). [C.6] ________

[9] **OPEN** 1-BKR-201-B/8, MAINT FEEDER TO 6.9KV SHUTDOWN BD 1A-A [6.9 Unit Bd 1B, C/8]. ________

____
CV

[10] **RACK** DOWN and LOCK 1-BKR-211-1718/11, MAINT SUPPLY FROM 6.9KV UNIT BD 1B [6.9 SD Bd 1A-A, C/11]. ________

____
CV

End of Section

Date________ **Initials**

8.7 Transfer: Normal to Alternate [0-M-26]

CAUTION

Aux Boiler "A" may trip during board transfer. [C.4]

[1] **OBTAIN** SRO approval. ________ SRO

NOTE

Evaluate TS 3.8.1 A When Man/Auto transfer switch is in Manual. With switch **NOT** in Auto, an auto transfer of the SDBD from normal feeder to alternate feeder on a transformer fault will not occur.

[2] **ENSURE** 1-XS-57-43, 6.9 SD BD 1A-A XFER SELECTOR [1-M-1], in MAN. ________

[3] **PLACE** 1-XS-82-6A, 6.9 SD TRAIN 1A-A VOLTMETER SEL, in CSST D. ________

[4] **ENSURE** 6.9V SD Bd 1A-A Alternate supply voltage in Limits on one of the following (**N/A** EI **NOT** used):

6800-7200V, 1-EI-82-6A [0-M-26]. ________
6800-7260V, 1-EI-57-39 [1-M-1]. ________

[5] **PLACE** 1-XS-82-6A, in SHTDN BD 1A-A. ________

[6] **PLACE** 1-HS-57-114, CSST D SYNC SWITCH, in SYN. ________

________ CV

Date________ **Initials**

8.7 Transfer: Normal to Alternate [0-M-26] (continued)

Start of Critical Step(s)

[7] **TURN** 1-HS-57-97B, 1932 ALTERNATE FROM CSST D, to CLOSE, **AND**

HOLD UNTIL transfer is COMPLETE. ________

________ CV

[8] **TURN** 1-HS-57-41B, 1716-NORMAL FROM CSST C, to TRIP, **AND**

CHECK ACB 1932 CLOSED, and ACB 1716 OPEN. ________

________ CV

End of Critical Step(s)

[9] **VERIFY** SD Bd volts in Limits on one of the following (**N/A** EI **NOT** used):

6800-7200V, 1-EI-82-6A [0-M-26]. ________
6800-7260V, 1-EI-57-39 [1-M-1]. ________

[10] **PLACE** 1-HS-57-114, CSST D SYNC SWITCH, in OFF. ________

End of Section

Date________ **Initials**

8.8 Transfer: Normal to Maintenance [0-M-26]

CAUTIONS

1) Maintenance supply is an unqualified feed to a shutdown board. Anytime that the maintenance supply is used to feed a shutdown board, the board is inoperable. [C.6]
2) Aux Boiler "A" may trip during board transfer. [C.4]

[1] **OBTAIN** SRO approval. ________ SRO

NOTE

Shutdown board will be considered inoperable after next step. [C.6]

[2] **NOTIFY** TPS to lower degraded voltage relays by one setting to ensure against relays picking up during normal 500kV grid swings. [C.6] ________

[3] **ENSURE** 1-BKR-211-1718/11, MAINT SUPPLY FROM 6.9KV UNIT BD 1B [6.9 SD Bd 1A-A, C/11], UNLOCKED and RACKED UP. ________

________ CV

[4] **ENSURE** 1-BKR-201-B/8, MAINT FEEDER TO 6.9KV SHUTDOWN BD 1A-A [6.9 Unit Bd 1B, C/8], is CLOSED. ________

________ CV

NOTE

Evaluate TS 3.8.1 A When Man/Auto transfer switch is in Manual. With switch **NOT** in Auto, an auto transfer of the SDBD from normal feeder to alternate feeder on a transformer fault will not occur.

[5] **ENSURE** 1-XS-57-43, 6.9 SD BD 1A-A XFER SELECTOR [1-M-1], in MAN. ________

[6] **PLACE** 1-XS-82-6A, 6.9 SD TRAIN 1A-A VOLTMETER SEL, in UB1B. ________

Date________ **Initials**

8.8 Transfer: Normal to Maintenance [0-M-26] (continued)

[7] **ENSURE** 6.9kV SD Bd 1A-A Maintenance supply voltage in Limits on one of the following (**N/A** EI **NOT** used):

6800-7200V, 1-EI-82-6A [0-M-26]. ________
6800-7260V, 1-EI-57-39 [1-M-1]. ________

[8] **PLACE** 1-XS-82-6A, in SHTDN BD. ________

[9] **PLACE** 1-HS-57-45, MAINTENANCE 6.9 UNIT BD 1B SYNC SWITCH, in SYN. ________

________ CV

Start of Critical Step(s)

[10] **TURN** 1-HS-57-44B, 1718- MAINTENANCE FROM 6.9 UNIT BD 1B, to CLOSE, **AND**

HOLD UNTIL transfer is COMPLETE. ________

________ CV

[11] **TURN** 1-HS-57-41B, 1716-NORMAL FROM CSST C, to TRIP, **AND**

CHECK ACB 1718 CLOSED, and ACB 1716 OPEN. ________

________ CV

End of Critical Step(s)

[12] **VERIFY** SD Bd volts in Limits on one of the following (**N/A** EI **NOT** used):

6800-7200V, 1-EI-82-6A [0-M-26]. ________
6800-7260V, 1-EI-57-39 [1-M-1]. ________

[13] **PLACE** 1-HS-57-45, MAINTENANCE 6.9 UNIT BD 1B SYNC SWITCH, in OFF. ________

End of Section

Date________ **Initials**

8.9 Transfer: Alternate to Normal [0-M-26]

CAUTION

Aux Boiler “A” may trip during board transfer. [C.4]

[1] **OBTAIN** SRO approval. ________ SRO

NOTE

Evaluate TS 3.8.1 A When Man/Auto transfer switch is in Manual. With switch **NOT** in Auto, an auto transfer of the SDBD from normal feeder to alternate feeder on a transformer fault will not occur.

[2] **ENSURE** 1-XS-57-43, 6.9 SD BD 1A-A XFER SELECTOR [1-M-1], in MAN. ________

[3] **PLACE** 1-XS-82-6A, 6.9 SD TRAIN 1A-A VOLTMETER SEL, in CSST C. ________

[4] **ENSURE** 6.9kV SD Bd 1A-A Normal supply voltage in Limits on one of the following (**N/A** EI **NOT** used):

6800-7200V, 1-EI-82-6A [0-M-26]. ________
6800-7260V, 1-EI-57-39 [1-M-1]. ________

[5] **PLACE** 1-XS-82-6A, in SHTDN BD 1A-A. ________

[6] **PLACE** 1-HS-57-42, NORMAL-CSST C SYNC SWITCH, in SYN. ________

________ CV

Date________ **Initials**

8.9 Transfer: Alternate to Normal [0-M-26] (continued)

Start of Critical Step(s)

[7] **TURN** 1-HS-57-41B, 1716-NORMAL FROM CSST C, to CLOSE, **AND**

HOLD UNTIL transfer is COMPLETE. ________ ________ CV

[8] **TURN** 1-HS-57-97B,1932 ALTERNATE FROM CSST D, to TRIP, **AND**

CHECK ACB 1716 CLOSED, and ACB 1932 OPEN. ________ ________ CV

End of Critical Step(s)

[9] **VERIFY** SD BD volts in Limits on one of the following (**N/A** EI **NOT** used):

6800-7200V, 1-EI-82-6A [0-M-26]. ________
6800-7260V, 1-EI-57-39 [1-M-1]. ________

[10] **PLACE** 1-HS-57-42, NORMAL-CSST C SYNC SWITCH, in OFF. ________

[11] **ENSURE** 1-XS-57-43, 6.9 SD BD 1A-A XFER SELECTOR, in AUTO. ________ ________ IV

End of Section

Date________ **Initials**

8.10 Transfer: Alternate to Maintenance [0-M-26]

CAUTIONS

1) Maintenance supply is an unqualified feed to a shutdown board. Anytime that the maintenance supply is used to feed a shutdown board, the board is inoperable. [C.6]
2) Aux Boiler "A" may trip during board transfer. [C.4]

[1] **OBTAIN** SRO approval. ________ SRO

NOTE

Shutdown board will be considered inoperable after next step. [C.6]

[2] **NOTIFY** TPS to lower degraded voltage relays by one setting to ensure against relays picking up during normal 500kV grid swings. [C.6] ________

[3] **ENSURE** 1-BKR-211-1718/11, MAINT SUPPLY FROM 6.9KV UNIT BD 1B [6.9 SD Bd 1A-A, C/11], UNLOCKED and RACKED UP. ________ ________ CV

[4] **ENSURE** 1-BKR-201-B/8, MAINT FEEDER TO 6.9KV SHUTDOWN BD 1A-A [6.9 Unit Bd 1B, C/8], is CLOSED. ________ ________ CV

NOTE

Evaluate TS 3.8.1 A When Man/Auto transfer switch is in Manual. With switch **NOT** in Auto, an auto transfer of the SDBD from normal feeder to alternate feeder on a transformer fault will not occur.

[5] **ENSURE** 1-XS-57-43, 6.9 SD BD 1A-A XFER SELECTOR [1-M-1], in MAN. ________

[6] **PLACE** 1-XS-82-6A, 6.9 SD TRAIN 1A-A VOLTMETER SEL, in UB1B. ________

Date________ **Initials**

8.10 Transfer: Alternate to Maintenance [0-M-26] (continued)

[7] **VERIFY** 6.9kV SD Bd 1A-A Maintenance supply voltage in Limits on one of the following (**N/A** EI **NOT** used):

6800-7200V, 1-EI-82-6A [0-M-26]. ________
6800-7260V, 1-EI-57-39 [1-M-1]. ________

[8] **PLACE** 1-XS-82-6A, in SHTDN BD 1A-A. ________

[9] **PLACE** 1-HS-57-45, MAINTENANCE 6.9 UNIT BD 1B SYNC SWITCH, in SYN. ________

____
CV

Start of Critical Step(s)

[10] **TURN** 1-HS-57-44B, 1718- MAINTENANCE FROM 6.9 UNIT BD 1B, to CLOSE, **AND**

HOLD UNTIL transfer is COMPLETE. ________

____
CV

[11] **TURN** 1-HS-57-97B,1932 ALTERNATE FROM CSST D, to TRIP, **AND**

CHECK ACB 1718 CLOSED, and ACB 1932 OPEN. ________

____
CV

End of Critical Step(s)

[12] **VERIFY** SD Bd volts in Limits on one of the following (**N/A** EI **NOT** used):

6800-7200V, 1-EI-82-6A [0-M-26]. ________
6800-7260V, 1-EI-57-39 [1-M-1]. ________

[13] **PLACE** 1-HS-57-45, MAINTENANCE 6.9 UNIT BD 1B SYNC SWITCH, in OFF. ________

End of Section

Date________ **Initials**

8.11 Transfer: Maintenance to Normal [0-M-26]

CAUTION

Aux Boiler "A" may trip during board transfer. [C.4]

[1] **OBTAIN** SRO approval. ________ SRO

NOTE

Evaluate TS 3.8.1 A When Man/Auto transfer switch is in Manual. With switch **NOT** in Auto, an auto transfer of the SDBD from normal feeder to alternate feeder on a transformer fault will not occur.

[2] **ENSURE** 1-XS-57-43, 6.9 SD BD 1A-A XFER SELECTOR [1-M-1], in MAN. ________

[3] **PLACE** 1-XS-82-6A, 6.9 SD TRAIN 1A-A VOLTMETER SEL, in CSST C. ________

[4] **ENSURE** 6.9kV SD Bd 1A-A Normal supply voltage in Limits on one of the following (**N/A** EI **NOT** used):

6800-7200V, 1-EI-82-6A [0-M-26]. ________
6800-7260V, 1-EI-57-39 [1-M-1]. ________

[5] **PLACE** 1-XS-82-6A, in SHTDN BD 1A-A. ________

[6] **PLACE** 1-HS-57-42, NORMAL-CSST C SYNC SWITCH, in SYN. ________

________ CV

Start of Critical Step(s)

[7] **TURN** 1-HS-57-41B, 1716-NORMAL FROM CSST C, to CLOSE, **AND**

HOLD UNTIL transfer is COMPLETE. ________

________ CV

Date________ **Initials**

8.11 Transfer: Maintenance to Normal [0-M-26] (continued)

[8] **TURN** 1-HS-57-44B, 1718-MAINTENANCE FROM 6.9 UNIT BD 1B, to TRIP, **AND**

CHECK ACB 1716 CLOSED, and ACB 1718 OPEN. ________ ________ CV

End of Critical Step(s)

[9] **VERIFY** SD Bd volts in Limits on one of the following (**N/A** EI **NOT** used):

6800-7200V, 1-EI-82-6A [0-M-26]. ________
6800-7260V, 1-EI-57-39 [1-M-1]. ________

[10] **PLACE** 1-HS-57-42, NORMAL-CSST C SYNC SWITCH, in OFF. ________

[11] **ENSURE** 1-XS-57-43, 6.9 SD BD 1A-A XFER SELECTOR, in AUTO. ________ ________ IV

[12] **NOTIFY** TPS to return degraded voltage relays to normal settings (SD board is considered inoperable until this step is completed). [C.6] ________

[13] **OPEN** 1-BKR-201-B/8, MAINT FEEDER TO 6.9KV SHUTDOWN BD 1A-A [6.9 Unit Bd 1B, C/8]. ________ ________ CV

[14] **RACK DOWN** and **LOCK** 1-BKR-211-1718/11, MAINT SUPPLY FROM 6.9KV UNIT BD 1B [6.9 SD Bd 1A-A, C/11]. ________ ________ CV

End of Section

Date________

Initials

8.12 Transfer: Maintenance to Alternate [0-M-26]

CAUTION

Aux Boiler "A" may trip during board transfer. [C.4]

[1] **OBTAIN** SRO approval.

________ SRO

NOTE

Evaluate TS 3.8.1 A When Man/Auto transfer switch is in Manual. With switch **NOT** in Auto, an auto transfer of the SDBD from normal feeder to alternate feeder on a transformer fault will not occur.

[2] **ENSURE** 1-XS-57-43, 6.9 SD BD 1A-A XFER SELECTOR [1-M-1], in MAN. ________

[3] **PLACE** 1-XS-82-6A, 6.9 SD TRAIN 1A-A VOLTMETER SEL, in CSST D. ________

[4] **ENSURE** 6.9kV SD Bd 1A-A Alternate supply voltage in Limits on one of the following (**N/A** EI **NOT** used):

6800-7200V, 1-EI-82-6A [0-M-26]. ________
6800-7260V, 1-EI-57-39 [1-M-1]. ________

[5] **PLACE** 1-XS-82-6A, in SHTDN BD 1A-A. ________

[6] **PLACE** 1-HS-57-114, CSST D SYNC SWITCH, in SYN. ________

________ CV

Date________ **Initials**

8.12 Transfer: Maintenance to Alternate [0-M-26] (continued)

Start of Critical Step(s)

[7] **TURN** 1-HS-57-97B, 1932 ALTERNATE FROM CSST D, to CLOSE, **AND**

HOLD UNTIL transfer is COMPLETE. ________ ________ CV

[8] **TURN** 1-HS-57-44B, 1718- MAINTENANCE FROM 6.9 UNIT BD 1B, to TRIP, **AND**.

CHECK ACB 1932 CLOSED, and ACB 1718 OPEN. ________ ________ CV

End of Critical Step(s)

[9] **VERIFY** SD Bd volts in Limits on one of the following (**N/A** EI **NOT** used):

6800-7200V, 1-EI-82-6A [0-M-26]. ________
6800-7260V, 1-EI-57-39 [1-M-1]. ________

[10] **PLACE** 1-HS-57-114, CSST D SYNC SWITCH, in OFF. ________

[11] **NOTIFY** TPS to return degraded voltage relays to normal settings (SD board is considered inoperable until this step is completed). [C.6] ________

[12] **OPEN** 1-BKR-201-B/8, MAINT FEEDER TO 6.9KV SHUTDOWN BD 1A-A [6.9 Unit Bd 1B, C/8]. ________ ________ CV

[13] **RACK DOWN** and **LOCK** 1-BKR-211-1718/11, MAINT SUPPLY FROM 6.9KV UNIT BD 1B [6.9 SD Bd 1A-A, C/11]. ________ ________ CV

End of Section

Date________ **Initials**

8.13 Transfer: Normal to Alternate [Local]

NOTE

"Fast" manual transfer requires Two people.

CAUTION

Aux Boiler "A" may trip during board transfer. [C.4]

[1] **OBTAIN** SRO approval. ________ SRO

[2] **ENSURE** 6.9V SD Bd 1A-A Alternate supply voltage in Limits on one of the following (**N/A** El **NOT** used):

6800-7200V, VOLTMETER ALTERNATE SUPPLY [Pnl 2]. ________

6800-7260V, 1-EI-57-39 [1-M-1]. ________

[3] **PLACE** 1-XS-57-97, 6.9KV SD BD 1A-A TRANSFER SWITCH [Pnl 1], in **AUX.** ________

________ CV

[4] **PLACE** 1-XS-57-41, 6.9 KV SHTDN BD 1A-A TRANS SW [Pnl 16], in AUX. ________

________ CV

Date________ **Initials**

8.13 Transfer: Normal to Alternate [Local] (continued)

Start of Critical Step(s)

[5] **TURN** 1-HS-57-97C-A, 1932-ALTERNATE FROM CSST D [Pnl 1], to CLOSE, **AND**

HOLD UNTIL transfer is COMPLETE. ________ ________ CV

[6] **TURN** 1-HS-57-41C-A, 1716- NORMAL FROM CSST C [Pnl 16], to TRIP, **AND**

CHECK ACB 1932 CLOSED, and ACB 1716 OPEN. ________ ________ CV

End of Critical Step(s)

[7] **VERIFY** SD Bd volts in Limits on one of the following (**N/A** EI **NOT** used):

6800-7200V, VOLTMETER MAIN BUS [Pnl 12]. ________
6800-7260V, 1-EI-57-39 [1-M-1]. ________

[8] **PLACE** 1-XS-57-41, 6.9 KV SHTDN BD 1A-A TRANS SW [Pnl 16], in NOR. ________ ________ IV

[9] **PLACE** 1-XS-57-97, 6.9KV SD BD 1A-A TRANSFER SWITCH [Pnl 1], in NOR. ________ ________ IV

End of Section

Date________ **Initials**

8.14 Transfer: Normal to Maintenance [Local]

CAUTIONS

1) Maintenance supply is an unqualified feed to a shutdown board. Anytime that the maintenance supply is used to feed a shutdown board, the board is inoperable. [C.6]
2) Aux Boiler "A" may trip during board transfer. [C.4]

NOTE

"Fast" manual transfer requires Two people.

[1] **OBTAIN** SRO approval. ________ SRO

NOTE

Shutdown board will be considered inoperable after next step. [C.6]

[2] **NOTIFY** TPS to lower degraded voltage relays by one setting to ensure against relays picking up during normal 500kV grid swings. [C.6] ________

[3] **ENSURE** 1-BKR-211-1718/11, MAINT SUPPLY FROM 6.9KV UNIT BD 1B [6.9 SD Bd 1A-A, C/11], UNLOCKED and RACKED UP. ________ ________ CV

[4] **ENSURE** 1-BKR-201-B/8, MAINT FEEDER TO 6.9KV SHUTDOWN BD 1A-A [6.9 Unit Bd 1B, C/8], is CLOSED. ________ ________ CV

[5] **ENSURE** 6.9kV SD Bd 1A-A Maintenance supply voltage in Limits on one of the following (**N/A** EI **NOT** used):

6800-7200V, VOLTMETER MAINTENANCE SUPPLY [Pnl 12]. ________
6800-7260V, 1-EI-57-39 [1-M-1]. ________

[6] **PLACE** 1-XS-57-44-A, 6.9 KV SHTDN BD 1A-A TRANS SW [Pnl 11], in AUX. ________ ________ CV

Date________ **Initials**

8.14 Transfer: Normal to Maintenance [Local] (continued)

[7] **PLACE** 1-XS-57-41, 6.9 KV SHTDN BD 1A-A TRANS SW [Pnl 16], in AUX.

____
________ CV

Start of Critical Step(s)

[8] **TURN** 1-HS-57-44C-A, 1718-MAINTENANCE FROM 6.9 UNIT BD 1B [Pnl 11], to **CLOSE**, **AND**

HOLD UNTIL transfer is COMPLETE.

____
________ CV

[9] **TURN** 1-HS-57-41C-A, 1716-NORMAL FROM CSST C [Pnl 16], to TRIP, **AND**

CHECK ACB 1718 CLOSED, and ACB 1716 OPEN.

____
________ CV

End of Critical Step(s)

[10] **VERIFY** SD Bd volts in Limits on one of the following (**N/A** EI **NOT** used):

6800-7200V, VOLTMETER MAIN BUS [Pnl 12]. ________
6800-7260V, 1-EI-57-39 [1-M-1]. ________

[11] **PLACE** 1-XS-57-44-A, 6.9 KV SHTDN BD 1A-A TRANS SW [Pnl 11], in NOR.

____
________ IV

[12] **PLACE** 1-XS-57-41, 6.9 KV SHTDN BD 1A-A TRANS SW [Pnl 16], in NOR.

____
________ IV

End of Section

Date________ **Initials**

8.15 Transfer: Alternate to Normal [Local]

CAUTION
Aux Boiler "A" may trip during board transfer. [C.4]

NOTE
"Fast" manual transfer requires two people.

[1] **OBTAIN** SRO approval. ________ SRO

[2] **ENSURE** 6.9kV SD Bd 1A-A Normal supply voltage in Limits on one of the following (N/A EI NOT used):

6800-7200V, VOLTMETER NORMAL SUPPLY [Pnl 17]. ________

6800-7260V, 1-EI-57-39 [1-M-1]. ________

[3] **PLACE** 1-XS-57-97, 6.9KV SD BD 1A-A TRANSFER SWITCH [Pnl 1], in **AUX**. ________ ________ CV

[4] **PLACE** 1-XS-57-41, 6.9 KV SHTDN BD 1A-A TRANS SW [Pnl 16], in **AUX**. ________ ________ CV

Start of Critical Step(s)

[5] **TURN** 1-HS-57-41C-A, 1716- NORMAL FROM CSST C [Pnl 16], to CLOSE, **AND**

HOLD UNTIL transfer is COMPLETE. ________ ________ CV

[6] **TURN** 1-HS-57-97C-A, 1932- ALTERNATE FROM CSST D [Pnl 1], to TRIP, **AND**

CHECK ACB 1716 CLOSED, and ACB 1932 OPEN. ________ ________ CV

End of Critical Step(s)

Date________ **Initials**

8.15 Transfer: Alternate to Normal [Local] (continued)

[7] **VERIFY** SD Bd volts in Limits on one of the following (**N/A** EI **NOT** used):

6800-7200V, VOLTMETER MAIN BUS [Pnl 12]. ________

6800-7260V, 1-EI-57-39 [1-M-1]. ________

[8] **PLACE** 1-XS-57-41, 6.9 KV SHTDN BD 1A-A TRANS SW [Pnl 16], in NOR.

____

________ IV

[9] **PLACE** 1-XS-57-97, 6.9KV SD BD 1A-A TRANSFER SWITCH [Pnl 1], in NOR.

____

________ IV

End of Section

Date________ **Initials**

8.16 Transfer: Alternate to Maintenance [Local]

CAUTIONS

1) Maintenance supply is an unqualified feed to a shutdown board. Anytime that the maintenance supply is used to feed a shutdown board, the board is inoperable. [C.6]
2) Aux Boiler "A" may trip during board transfer. [C.4]

NOTE

"Fast" manual transfer requires two people.

[1] **OBTAIN** SRO approval. ________ SRO

NOTE

Shutdown board will be considered inoperable after next step. [C.6]

[2] **NOTIFY** TPS to lower degraded voltage relays by one setting to ensure against relays picking up during normal 500kV grid swings. [C.6] ________

[3] **ENSURE** 1-BKR-211-1718/11, MAINT SUPPLY FROM 6.9KV UNIT BD 1B [6.9 SD Bd 1A-A, C/11], UNLOCKED and RACKED UP. ________ ________ CV

[4] **ENSURE** 1-BKR-201-B/8, MAINT FEEDER TO 6.9KV SHUTDOWN BD 1A-A [6.9 Unit Bd 1B, C/8], is CLOSED. ________ ________ CV

[5] **ENSURE** 6.9kV SD Bd 1A-A Maintenance supply voltage in Limits on one of the following (**N/A** EI **NOT** used):

6800-7200V, VOLTMETER MAINTENANCE SUPPLY [Pnl 12]. ________
6800-7260V, 1-EI-57-39 [1-M-1]. ________

[6] **PLACE** 1-XS-57-44-A, 6.9 KV SHTDN BD 1A-A TRANS SW [Pnl 11], in AUX. ________ ________ CV

Date________ **Initials**

8.16 Transfer: Alternate to Maintenance [Local] (continued)

[7] **PLACE** 1-XS-57-97, 6.9KV SD BD 1A-A TRANSFER SWITCH [Pnl 1], in AUX. ________ ________ CV

Start of Critical Step(s)

[8] **TURN** 1-HS-57-44C-A, 1718- MAINTENANCE FROM 6.9 UNIT BD 1B [Pnl 11], to CLOSE, **AND**

HOLD UNTIL transfer is **COMPLETE**. ________ ________ CV

[9] **TURN** 1-HS-57-97C-A, 1932- ALTERNATE FROM CSST D [Pnl 1], to TRIP, **AND**

CHECK ACB 1718 CLOSED, and ACB 1932 OPEN. ________ ________ CV

End of Critical Step(s)

[10] **VERIFY** SD Bd volts in Limits on one of the following (**N/A** EI **NOT** used):

6800-7200V, VOLTMETER MAIN BUS [Pnl 12]. ________
6800-7260V, 1-EI-57-39 [1-M-1] ________

[11] **PLACE** 1-XS-57-44-A, 6.9 KV SHTDN BD 1A-A TRANS SW [Pnl 11], in NOR. ________ ________ IV

[12] **PLACE** 1-XS-57-97, 6.9KV SD BD 1A-A TRANSFER SWITCH [Pnl 1], in NOR. ________ ________ IV

End of Section

Date________ **Initials**

8.17 Transfer: Maintenance to Normal [Local]

CAUTION

Aux Boiler "A" may trip during board transfer. [C.4]

NOTE

"Fast" manual transfer requires Two people.

[1] **OBTAIN** SRO approval. ________ SRO

[2] **ENSURE** 6.9kV SD Bd 1A-A Normal supply voltage in Limits on one of the following (**N/A** EI **NOT** used):

6800-7200V, VOLTMETER NORMAL SUPPLY [Pnl 17]. ________

6800-7260V, 1-EI-57-39 [1-M-1]. ________

[3] **PLACE** 1-XS-57-44-A, 6.9 KV SHTDN BD 1A-A TRANS SW [Pnl 11], in AUX. ________ ________ CV

[4] **PLACE** 1-XS-57-41, 6.9 KV SHTDN BD 1A-A TRANS SW [Pnl 16], in AUX. ________ ________ CV

Start of Critical Step(s)

[5] **TURN** 1-HS-57-41C-A, 1716-NORMAL FROM CSST C, to **CLOSE** [Pnl 16], **AND**

HOLD UNTIL transfer is COMPLETE. ________ ________ CV

[6] **TURN** 1-HS-57-44C-A, 1718-MAINTENANCE FROM 6.9 UNIT BD 1B [Pnl 11], to TRIP, **AND**

CHECK ACB 1716 CLOSED, and ACB 1718 OPEN. ________ ________ CV

End of Critical Step(s)

Date________ **Initials**

8.17 Transfer: Maintenance to Normal [Local] (continued)

[7] **VERIFY** SD Bd volts in Limits on one of the following (**N/A** EI **NOT** used):

6800-7200V, VOLTMETER MAIN BUS [Pnl 12]. ________
6800-7260V, 1-EI-57-39 [1-M-1]. ________

[8] **PLACE** 1-XS-57-44-A, 6.9 KV SHTDN BD 1A-A TRANS SW [Pnl 11], in NOR. ________
________ IV

[9] **PLACE** 1-XS-57-41, 6.9 KV SHTDN BD 1A-A TRANS SW [Pnl 16], in NOR. ________
________ IV

[10] **NOTIFY** TPS to return degraded voltage relays to normal settings (SD board is considered inoperable until this step is completed). [C.6] ________

[11] **OPEN** 1-BKR-201-B/8, MAINT FEEDER TO 6.9KV SHUTDOWN BD 1A-A [6.9 Unit Bd 1B, C/8]. ________
________ CV

[12] **RACK DOWN** and **LOCK** 1-BKR-211-1718/11, MAINT SUPPLY FROM 6.9KV UNIT BD 1B [6.9 SD Bd 1A-A, C/11]. ________
________ CV

End of Section

Date________ **Initials**

8.18 Transfer: Maintenance to Alternate [Local]

CAUTION

Aux Boiler "A" may trip during board transfer. [C.4]

NOTE

"Fast" manual transfer requires Two people.

[1] **OBTAIN** SRO approval. ________ SRO

[2] **ENSURE** 6.9kV SD Bd 1A-A Alternate supply voltage in Limits on one of the following (N/A EI NOT used):

6800-7200V, VOLTMETER ALTERNATE SUPPLY [Pnl 2]. ________
6800-7260V, 1-EI-57-39 [1-M-1]. ________

[3] **PLACE** 1-XS-57-44-A, 6.9 KV SHTDN BD 1A-A TRANS SW [Pnl 11], in AUX. ________ ________ CV

[4] **PLACE** 1-XS-57-97, 6.9KV SD BD 1A-A TRANSFER SWITCH [Pnl 1], in AUX. ________ ________ CV

Start of Critical Step(s)

[5] **TURN** 1-HS-57-97C-A, 1932- ALTERNATE FROM CSST D [Pnl 1], to CLOSE, **AND**

HOLD UNTIL transfer is COMPLETE. ________ ________ CV

[6] **TURN** 1-HS-57-44C-A, 1718-MAINTENANCE FROM 6.9 UNIT BD 1B [Pnl 11], to TRIP, **AND**

CHECK ACB 1932 CLOSED, and ACB 1718 OPEN. ________ ________ CV

End of Critical Step(s)

Date________ **Initials**

8.18 Transfer: Maintenance to Alternate [Local] (continued)

[7] **VERIFY** SD Bd volts in Limits on one of the following (**N/A** EI **NOT** used):

6800-7200V, VOLTMETER MAIN BUS [Pnl 12]. ________

6800-7260V, 1-EI-57-39 [1-M-1]. ________

[8] **PLACE** 1-XS-57-44-A, 6.9 KV SHTDN BD 1A-A TRANS SW [Pnl 11], in NOR. ________ ________ IV

[9] **PLACE** 1-XS-57-97, 6.9KV SD BD 1A-A TRANSFER SWITCH [Pnl 1], in NOR. ________ ________ IV

[10] **NOTIFY** TPS to return degraded voltage relays to normal settings (SD board is considered inoperable until this step is completed). [C.6] ________

[11] **OPEN** 1-BKR-201-B/8, MAINT FEEDER TO 6.9KV SHUTDOWN BD 1A-A [6.9 Unit Bd 1B, C/8]. ________ ________ CV

[12] **RACK DOWN** and **LOCK** 1-BKR-211-1718/11, MAINT SUPPLY FROM 6.9KV UNIT BD 1B [6.9 SD Bd 1A-A, C/11]. ________ ________ CV

End of Section

Date________ **Initials**

8.19 Transfer: 125V DC Normal Control Power, Normal To Alternate

NOTES

1) This section requires two operators to perform.
2) Normal and backup bus control power are on same 125V Vital Batt Bd if either switch is in alternate.
3) Each panel has a 125-V DC CONTROL BUS ENERGIZED red light which should be verified ON prior to and after transfer of dc control power.

[1] **OBTAIN** SRO approval. ________ SRO

NOTE

Holding the BO-RESET Switch prevents unwanted start of Train A equipment, such as CCPs, AFW pumps, ERCW pumps, and Pzr Heaters when BO relays energize.

[2] **ENSURE** 0-BKR-236-3/204, 6.9KV SD BOARD 1A-A NORM BUS ALT FEEDER [125Vdc Vit Batt Bd III], is ON. ________

Start of Critical Step(s)

[3] **DEPRESS** and HOLD the 6.9kV SD Bd 1A-A BO-RESET switch [Logic Panel 1A-A] until transfer is COMPLETE. ________

End of Critical Step(s)

[4] **SELECT** 125V DC SUPPLY TRANSFER SWITCH NORMAL BUS to 125V DC SUPPLY ALTERNATE SUPPLY FROM BATTERY BOARD III [Panel 2]. ________

________ CV

[5] **RELEASE** the 6.9kV SD Bd 1A-A BO-RESET switch [Logic Panel 1A-A] ________

[6] **VERIFY** 125-V DC CONTROL BUS ENERGIZED red light ON [panel 2]. ________

End of Section

Date________ **Initials**

8.20 Transfer: 125V DC Normal Control Power, Alternate To Normal

NOTES

1) This section requires two operators to perform.
2) Normal and backup bus control power are on same 125V Vital Batt Bd if either switch is in alternate.
3) Each panel has a 125-V DC CONTROL BUS ENERGIZED red light which should be verified ON prior to and after transfer of dc control power.

[1] **OBTAIN** SRO approval. ________ SRO

NOTE

Holding the BO-RESET Switch prevents unwanted start of Train A equipment, such as CCPs, AFW pumps, ERCW pumps, and Pzr Heaters when BO relays energize.

[2] **ENSURE** 0-BKR-236-1/204, 6.9KV SD BOARD 1A-A NORM BUS NORM FEEDER [125Vdc Vit Batt Bd I], is ON. ________

Start of Critical Step(s)

[3] **DEPRESS** and HOLD the 6.9kV SD Bd 1A-A BO-RESET switch [Logic Panel 1A-A] until transfer is COMPLETE. ________

End of Critical Step(s)

[4] **SELECT** 125V DC SUPPLY TRANSFER SWITCH NORMAL BUS to 125V DC SUPPLY NORMAL SUPPLY FROM BATTERY BOARD I [Panel 2]. ________

________ CV

[5] **RELEASE** the 6.9kV SD Bd 1A-A BO-RESET switch [Logic Panel 1A-A] ________

[6] **VERIFY** 125-V DC CONTROL BUS ENERGIZED red light ON [panel 2]. ________

End of Section

Date________ **Initials**

8.21 Transfer: 125V DC Backup Control Power, Normal To Alternate

NOTES

1) This section requires two operators to perform.
2) Normal and backup bus control power are on same 125V Vital Batt Bd if either switch is in alternate.
3) Each panel has a 125-V DC CONTROL BUS ENERGIZED red light which should be verified ON prior to and after transfer of dc control power.

[1] **OBTAIN** SRO approval. ________ SRO

NOTE

Holding the BO-RESET Switch prevents unwanted start of Train A equipment, such as CCPs, AFW pumps, ERCW pumps, and Pzr Heaters when BO relays energize.

[2] **ENSURE** 0-BKR-236-1/201, 6.9KV SD BOARD 1A-A BACKUP BUS ALT FEEDER [125Vdc Vit Batt Bd I], is ON.

Start of Critical Step(s)

[3] **DEPRESS** and HOLD the 6.9kV SD Bd 1A-A BO-RESET switch [Logic Panel 1A-A] until transfer is COMPLETE. ________

End of Critical Step(s)

[4] **SELECT** 125V DC SUPPLY TRANSFER SWITCH BACKUP BUS to 125V DC SUPPLY ALTERNATE SUPPLY FROM BATTERY BOARD I [Panel 17]. ________

________ CV

[5] **RELEASE** the 6.9kV SD Bd 1A-A BO-RESET switch [Logic Panel 1A-A] ________

[6] **VERIFY** 125-V DC CONTROL BUS ENERGIZED red light ON [panel 17]. ________

End of Section

Date________ **Initials**

8.22 Transfer: 125V DC Backup Control Power, Alternate To Normal

NOTES

1) This section requires two operators to perform.
2) Normal and backup bus control power are on same 125V Vital Batt Bd if either switch is in alternate.
3) Each panel has a 125-V DC CONTROL BUS ENERGIZED red light which should be verified ON prior to and after transfer of dc control power.

[1] **OBTAIN** SRO approval. ________ SRO

NOTE

Holding the BO-RESET Switch prevents unwanted start of Train A equipment, such as CCPs, AFW pumps, ERCW pumps, and Pzr Heaters when BO relays energize.

[2] **ENSURE** 0-BKR-236-3/201, 6.9KV SD BOARD 1A-A BACKUP BUS NORM FEEDER [125Vdc Vit Batt Bd III], is ON. ________

Start of Critical Step(s)

[3] **DEPRESS** and HOLD the 6.9kV SD Bd 1A-A BO-RESET switch [Logic Panel 1A-A] until transfer is COMPLETE. ________

End of Critical Step(s)

[4] **SELECT** 125V DC SUPPLY TRANSFER SWITCH BACKUP BUS to 125V DC SUPPLY NORMAL SUPPLY FROM BATTERY BOARD III [Panel 17]. ________

________ CV

[5] **RELEASE** the 6.9kV SD Bd 1A-A BO-RESET switch [Logic Panel 1A-A] ________

[6] **VERIFY** 125-V DC CONTROL BUS ENERGIZED red light ON [panel 17]. ________

End of Section

9.0 RECORDS

9.1 QA Records

The following documents are QA records and are handled per the Document Control and Records Management (DCRM) Program:

Attachment 1P

9.2 Non-QA Records

None

Appendix A
(Page 1 of 2)

480V Loads Stripped by Blackout Relay Operation

NOTE

The following 480V loads are shed by blackout relay operation. These loads may be reset and energized at the local breaker without reset of the blackout signal (BOX/BOY) relays. If D/G is in service to the shutdown board, then D/G loading must be monitored when returning equipment to service.

1. C & A Vent Bd 1A1-A, Compt 2D - PRIMARY WATER MAKEUP PUMP 1A.
2. C & A Vent Bd 1A1-A, Compt 3F2 - VALVE & STRAINER ROOM SUMP A PUMP 1A-A.
3. C & A Vent Bd 1A1-A, Compt 5F1 - SB VENTILATION RAD MON.
4. C & A Vent Bd 1A1-A, Compt 13C - EGTS CNTMT ANN VAC FAN 1A.
5. Rx MOV Bd 1A1-A, Compt 17A - BORIC ACID BATCH TANK HTR 2.
6. Rx MOV Bd 1A1-A, Compt 17E - POWER OUTLETS 1-PO-213-A1/1-A1/5.
7. Rx MOV Bd 1A1-A, Compt 17F1 - NORM FDR FOR BATT CHGR XFER SW (0-XSW-240-S).
8. Rx MOV Bd 1A1-A, Compt 18F1 - ALT FDR FOR TELE BATT CHGR 1A.
9. Rx MOV Bd 1A1-A, Compt 18F2 - POWER OUTLETS 1-PO-213-A1/6-A1/10.
10. Diesel Aux Bd 1A1-A Compt 2C - DG ENG 1A1 IMMERSION HTR.
11. Diesel Aux Bd 1A1-A Compt 5A - DG ENG 1A2 AIR COMPR.
12. Diesel Aux Bd 1A1-A Compt 5F1 - DGB CORRIDOR EL 742 HTR 1A.
13. Diesel Aux Bd 1A1-A Compt 5F2 - POWER OUTLETS (1-PO-215-1/2/3.)
14. Diesel Aux Bd 1A1-A Compt 6F1 - DGB LUBE OIL STOR RM HTR.
15. Diesel Aux Bd 1A2-A Compt 2C - DG ENG 1A2 IMMERSION HTR.

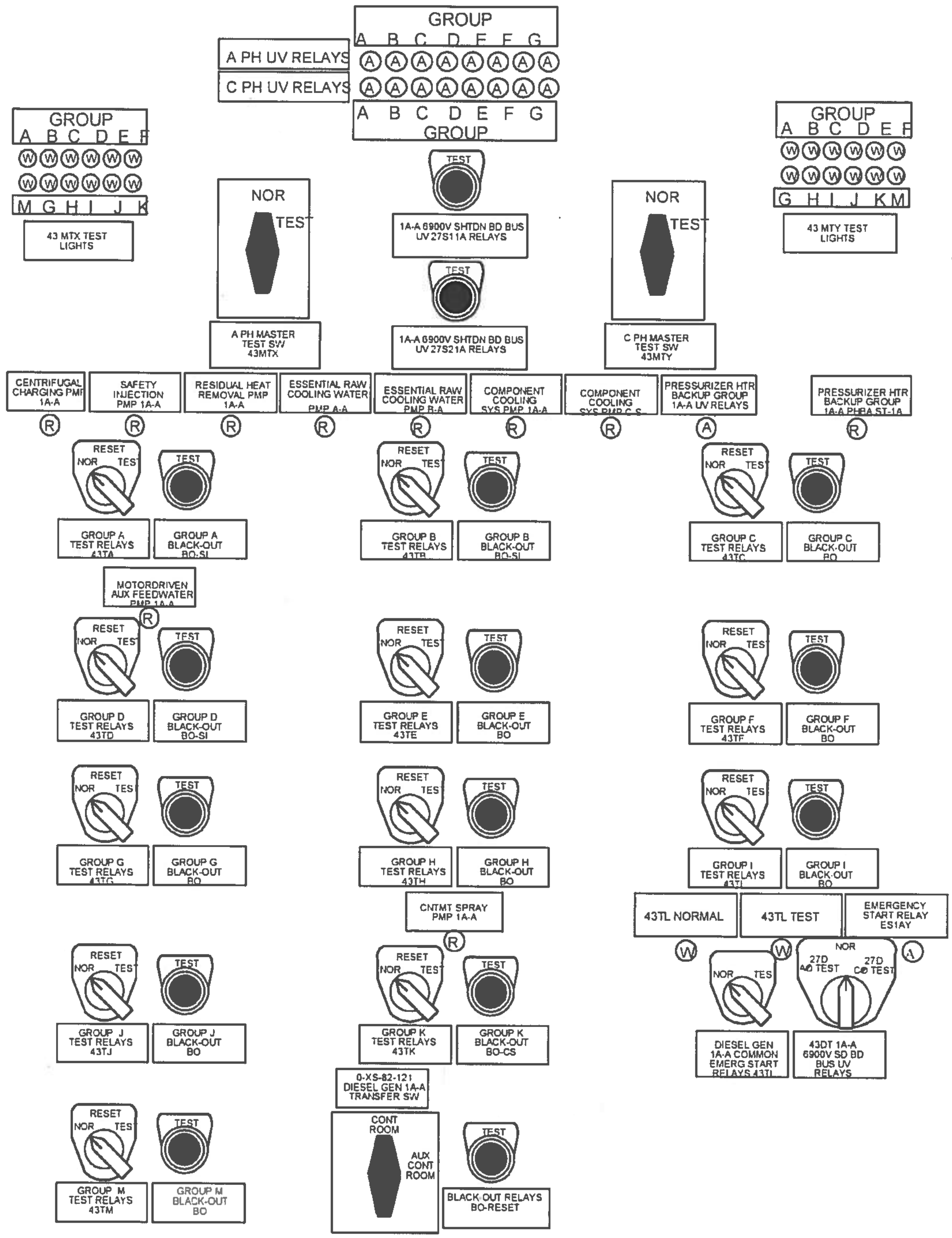
Appendix A
(Page 2 of 2)

480V Loads Stripped by Blackout Relay Operation

16. Diesel Aux Bd 1A2-A Compt 2E2 - DGB CO_2 STOR RM HTR.
17. Diesel Aux Bd 1A2-A Compt 3EI - DG 1A-A ELEC BD RM HTR.
18. Diesel Aux Bd 1A2-A Compt 3F1 - DG 1A-A ROOM HTR 1A.
19. Diesel Aux Bd 1A2-A Compt 3F2 - DG 1A-A ROOM HTR 1B.
20. Diesel Aux Bd 1A2-A Compt 5A - DG ENG 1A1 AIR COMPR.
21. Diesel Aux Bd 1A2-A Compt 5EI - DGB RAD SHELTER HTR.
22. Diesel Aux Bd 1A2-A Compt 6D - DIESEL GENRATOR 1A-A HEATER.

Attachment 1
(Page 1 of 2)

Shutdown Board 1A A Logic Relay Panel, 1 PNL 211 A A



Attachment 1
(Page 2 of 2)

Shutdown Board 1A A Logic Relay Panel, 1 PNL 211 A A

NOTE

Red lights on Logic Panel are LIT when that equipment is running, a Red light LIT is **NOT** necessarily an off normal condition.

SWITCH / EQUIPMENT / UNID	CONDITION / POSITION	PERF INITIALS	VERIFIER INITIALS
A PH UV RELAYS	LIGHTS (Amber) LIT		IV
C PH UV RELAYS	LIGHTS (Amber) LIT		IV
43 MTX TEST LIGHTS	LIGHTS (White) OFF (bulb good)		IV
43 MTY TEST LIGHTS	LIGHTS (White) OFF (bulb good)		IV
PRESSURIZER HTR BACKUP GROUP 1A-A UV RELAYS	LIGHT (Amber) OFF		IV
A PH MASTER TEST SW 43MTX	NOR		IV
C PH MASTER TEST SW 43MTY	NOR		IV
GROUP A TEST RELAYS 43TA	NOR		IV
GROUP B TEST RELAYS 43TB	NOR		IV
GROUP C TEST RELAYS 43TC	NOR		IV
GROUP D TEST RELAYS 43TD	NOR		IV
GROUP E TEST RELAYS 43TE	NOR		IV
GROUP F TEST RELAYS 43TF	NOR		IV
GROUP G TEST RELAYS 43TG	NOR		IV
GROUP H TEST RELAYS 43TH	NOR		IV
GROUP I TEST RELAYS 43TI	NOR		IV
GROUP J TEST RELAYS 43TJ	NOR		IV
GROUP K TEST RELAYS 43TK	NOR		IV
GROUP M TEST RELAYS 43TM	NOR		IV
0-XS-82-121, DIESEL GEN 1A-A TRANSFER SW	CONT ROOM		IV
DIESEL GEN 1A-A COMMON EMERG START RELAYS 43TL	NOR		IV
43 TL NORMAL	LIGHT (White) LIT		IV
43 TL TEST	LIGHT (White) OFF		IV
43DT 1A-A 6900V SD BD BUS UV RELAYS	NOR		IV
EMERGENCY START RELAY ES1AY	LIGHT (Amber) LIT		IV

Source Notes
(Page 1 of 1)

Requirements Statement	Source Document	Implementing Statement
Commitment to transfer dc Control Buses without causing ESF actuation.	LER 89-003-01	C.1
WBN Seismic Concern.	WBPER880728	C.2
Ensure 6.9kV and 480v breaker closing spring charged when breakers are initially made operable and after each breaker operation.	SOER 82-16, Rec 2	C.3
Caution will be placed in SOIs associated with SD Bd transfers, warning the operator that swapping SD Bd could cause Aux Blr trip.	WBPER 950459, CA #2	C.4
Spare breakers found NOT in the seismic restrained position.	WBPER 950300	C.5
Loss of voltage on “B” Shutdown Boards due to loss of “A” Hydro 161 KV line.	II-W-95-013	C.6

SPARE - B.1.c
Shutdown "A" Train Upper Containment Purge.

NOTE: This JPM may be conducted on the Simulator OR in the Main Control Room

WATTS BAR NUCLEAR PLANT
JOB PERFORMANCE MEASURE
SPARE B.1.c
06-2011 NRC Exam
EVALUATION SHEET

Task: Shutdown "A" Train Upper Containment Purge.

Alternate Path: n/a

Facility JPM #: New

Safety Function: 8 **Title:** Plant Service Systems

K/A 029 A2.03 Ability to (a) predict the impacts of the following malfunctions or operations on the Containment Purge System; and (b) based on those predictions, use procedures to correct, control, or mitigate the consequences of those malfunctions or operations: Startup operations and the associated required valve lineups.

Rating(s): 2.7/3.1 **CFR:** 41.5 / 43.5 / 45.3 / 45.13

Evaluation Method: Simulator __X__ In-Plant ______ **Classroom** ______

References: SOI-30.02, "Containment Purge System," Rev. 56

Task Number: RO-030-SOI-30-007 **Title:** Purge the Upper Containment.

Task Standard: The applicant shuts down "A" Train upper containment purge using SOI-30.02, "Containment Purge System," Section 7.1, "SHUTDOWN Upper Containment Purge," through Step 10.

Validation Time: 5 minutes **Time Critical:** Yes ____ No __X__

==

Applicant: ______________________ ______________ Time Start: ________
NAME Docket No. Time Finish: ________

Performance Rating: SAT ____ UNSAT ____ Performance Time ___

Examiner: ______________________ ______________________/________
NAME SIGNATURE DATE

==

COMMENTS

____

____

____

____

____

____

SIMULATOR OPERATOR INSTRUCTIONS:

IF CONDUCTED IN THE SIMULATOR, THEN PERFORM THE FOLLOWING:

1. ENSURE NRC Examination Security has been established.
2. RESET to Initial Condition by performing the following actions:
   a. Select ICManager on the THUNDERBAR menu (right hand side of Instructor Console Screen).
   b. Locate IC 319.
   c. Right "click" on IC319.
   d. Select Reset on the drop down menu.
   e. Right "click" on RESET.
   f. Enter the password for IC 319.
   g. Select "Yes" on the INITIAL CONDITION RESET pop-up window.
   h. Perform SWITCH CHECK.
3. Place simulator in RUN and acknowledge any alarms.
4. ENSURE that Train A of Upper Containment Purge is in service, in accordance with SOI-30.02, "Containment Purge System," Section 5.1, "Start Up Upper Containment Purge."
5. ENSURE copies of SOI-30.02,"Containment Purge System" are available for the Examiner.
6. ENSURE "Extra Operator" is present in the simulator.
7. Place simulator in FREEZE until Examiner cue is given.

Tools/Equipment/Procedures Needed:

IF CONDUCTED IN THE MAIN CONTROL ROOM, THEN:

ENSURE that copies of SOI-30.02,"Containment Purge System," available to the EXAMINER, marked as "NRC EXAM MATERIAL, FOR TRAINING ONLY," for each applicant.

Begin the JPM at the Shift Manager's Desk.

READ TO APPLICANT

DIRECTION TO APPLICANT:

I will explain the initial conditions, and state the task to be performed. All control room steps shall be performed for this JPM, including any required communications. I will provide initiating cues and reports on other actions when directed by you. Ensure you indicate to me when you understand your assigned task. To indicate that you have completed your assigned task return the cue sheet I provided you.

INITIAL CONDITIONS:

1. **Unit 1 is at 100% power.**
2. **A purge of the upper containment is in progress, using Train "A" equipment.**
3. **You are an extra operator assigned to the shift.**

INITIATING CUES:

The Unit Supervisor directs you to shutdown Train A upper containment purge using the appropriate procedure.

STEP/STANDARD	SAT/UNSAT

EXAMINER: USE PAGES 6 through 13 if conducting JPM on the Simulator.

SIMULATOR PERFORMANCE

START TIME: _______

STEP 1: Obtain a copy of the procedure. STANDARD: Applicant locates a copy of SOI-30.02, "Containment Purge System," and determines that Section 7.1, "SHUT DOWN Upper Containment Purge," is the appropriate section for the task. COMMENTS:	___ SAT ___ UNSAT

EXAMINER: The following actions are taken from SOI-30.02, "Containment Purge System," Section 7.1, "SHUT DOWN Upper Containment Purge."

CAUTION

Radiological implications (e.g. causing an area to become airborne, or raising the humidity in contaminated areas), should be considered any time Containment Purge is secured.

NOTE

Lower Containment purge is performed following Upper Containment purge to reduce pressure prior to placing Containment Vent Filters in service.

STEP/STANDARD	SAT/UNSAT
STEP 2: [1] **IF** Refueling outage in progress, **THEN, NOTIFY** Radiological Protection of Purge shutdown. STANDARD: Applicant determines from the INITIAL CONDITIONS that a refueling outage is not in progress and marks the step as "N/A." COMMENTS:	___ SAT ___ UNSAT
STEP 3: [2] **INDICATE** which Train(s) being used: Train A Containment Purge Train B Containment Purge STANDARD: Applicant determines from the INITIAL CONDITIONS that Train A is in service and marks the block corresponding to Train A Containment purge. COMMENTS:	___ SAT ___ UNSAT

STEP/STANDARD	SAT/UNSAT
STEP 4: [3] **IF** Wafer Vlv, 1-ISV-78-600, OPEN in Mode 6 WITH SFP & Rx Cavity Full, **THEN MONITOR** SFP and Rx Cavity levels during Purge startup, **AND** SHUT DOWN Purge Fans if Overflow is approached. STANDARD: Applicant determines from the INITIAL CONDITIONS that the plant is at 100% power and 1-ISV-78-600 is CLOSED. COMMENTS:	___ SAT ___ UNSAT

EXAMINER: The steps 4 and 5 are designated as a "Critical Step" in the procedure. The definition of "CRITICAL STEP" is contained in NPG-SPP-01.2, "Administration of Site Technical Procedures," Section 5.0 "Definitions."

STEP/STANDARD	SAT/UNSAT
Start of Critical Step(s)	

STEP 5: [4] **PERFORM** the following (closed first to prevent press imbalance from Opening Ice Cond Doors): (**N/A** for FAN **NOT** running)

___ SAT

___ UNSAT

NOMENCLATURE	LOCATION	POSITION	UNID	PERF INITIAL
PURGE EXH FAN 1A SUCT	1-M-9	CLOSE	1-HS-30-61	
PURGE EXH FAN 1B SUCT	1-M-9	CLOSE	1-HS-30-62	

STANDARD:

___The applicant locates 1-HS-30-61, PURGE EXH FAN 1A SUCT and rotates the handswitch to the left to the "CLOSE" position. Applicant ensures the GREEN indicating light is LIT and the RED indicating light is DARK.

Applicant enters "N/A" for 1-HS-30-62, PURGE EXH FAN 1B SUCT, since the fan was not in service.

COMMENTS:

STEP/STANDARD	SAT/UNSAT

STEP 6: [5] **PERFORM** the following: (**N/A** if **NOT** running)

___ SAT

___ UNSAT

NOMENCLATURE	LOCATION	POSITION	UNID	PERF INITIAL
PURGE SUP & EXH FANS 1A AND FCO-30-1A & 1B	1-M-9	STOP P-T-L	1-HS-30-1A	
PURGE SUP & EXH FANS 1B AND FCO-30-4A & 4B	1-M-9	STOP P-T-L	1-HS-30-4A	

End of Critical Step(s)

STANDARD:

___The applicant locates 1-HS-30-1A, PURGE SUP & EXH FANS 1A and rotates the handswitch to the left to the "STOP" position and then pulls the handswitch out to the "PULL-TO-LOCK" position. Applicant ensures the GREEN indicating light is LIT and the RED indicating light is DARK.

Applicant enters "N/A" for 1-HS-30-4A, PURGE SUP & EXH FANS 1B since the fan was not in service.

COMMENTS:

STEP/STANDARD	SAT/UNSAT
STEP 7: [6] **ENSURE** the following:	___ SAT ___ UNSAT

NOMENCLATURE	LOCATION	POSITION	UNID	PERF INITIAL
DAMPER 1-XI-30-1A	1-M-9	CLOSED	FCO-30-1A	
DAMPER 1-XI-30-1B	1-M-9	CLOSED	FCO-30-1B	
DAMPER 1-XI-30-4A	1-M-9	CLOSED	FCO-30-4A	
DAMPER 1-XI-30-4B	1-M-9	CLOSED	FCO-30-4B	
PURGE SUP SUCT ISOL DAMPER 1-XI-30-294	1-M-9	CLOSED	FCO-30-294	
PURGE SUP SUCT ISOL DAMPER 1-XI-30-295	1-M-9	CLOSED	FCO-30-295	

STANDARD:

Applicant locates each of the listed dampers and ensures that the dampers are CLOSED by observing the GREEN indicating lights are LIT and the RED indicating lights are DARK. Dampers, except for 1-FCO-30-4A and 4B, automatically reposition when the applicant rotates 1-HS-30-1A, PURGE SUP & EXH FANS 1A handswitch to the "STOP" position.

1-FCO-30-4A and 4B are associated with 1-HS-30-4A, PURGE SUP & EXH FANS 4B, and should have the GREEN indicating lights LIT and the RED indicating lights DARK.

COMMENTS:

STEP/STANDARD	SAT/UNSAT

STEP 8: [7] **ENSURE** the following:

NOMENCLATURE	LOCATION	POSITION	UNID	PERF INITIAL
UPR CNTMT PURGE 1-FCV-30-7 & 51	1-M-9	CLOSED	1-HS-30-7	
UPR CNTMT PURGE 1-FCV-30-8 & 50	1-M-9	CLOSED	1-HS-30-8	
UPR CNTMT PURGE 1-FCV-30-9 & 53	1-M-9	CLOSED	1-HS-30-9	
UPR CNTMT PURGE 1-FCV-30-10 & 52	1-M-9	CLOSED	1-HS-30-10	

CRITICAL STEP

___ SAT

___ UNSAT

STANDARD:

___The applicant locates 1-HS-30-7, UPR CNTMT PURGE 1-FCV-30-7 & 51 and rotates the handswitch to the left to the "CLOSED" position.

The applicant observes the GREEN indicating lights labeled "51" and "7" are LIT and the RED indicating lights for "51" and "7" are DARK. The applicant may also check the indicating lights on the PURGE DAMPERS status panel to ensure the GREEN indicating lights are LIT and the RED indicating lights are DARK for dampers 1-FCV-30-7 and 1-FCV-30-51.

___The applicant locates 1-HS-30-8, UPR CNTMT PURGE 1-FCV-30-8 & 50 and rotates the handswitch to the left to the "CLOSED" position.

The applicant observes the GREEN indicating lights labeled "50" and "8" are LIT and the RED indicating lights for "50" and "8" are DARK. The applicant may also check the indicating lights on the PURGE DAMPERS status panel to ensure the GREEN indicating lights are LIT and the RED indicating lights are DARK for dampers 1-FCV-30-8 and 1-FCV-30-50.

The applicant locates 1-HS-30-9, UPR CNTMT PURGE 1-FCV-30-9 & 53 and observes that the GREEN indicating lights are LIT and the RED indicating lights are DARK..

The applicant locates 1-HS-30-10, UPR CNTMT PURGE 1-FCV-30-10 & 52 and observes that the GREEN indicating lights are LIT and the RED indicating lights are DARK.

Step is critical to isolate the purge flowpath from containment.

COMMENTS:

STEP/STANDARD	**SAT/UNSAT**

STEP 9: [[8] **ENSURE** the following:

NOMENCLATURE	LOCATION	POSITION	UNID	PERF INITIAL
PURGE SUP FAN 1A DISCH	1-M-9	CLOSED	1-HS-30-2	
PURGE SUP FAN 1B DISCH	1-M-9	CLOSED	1-HS-30-5	
PURGE EXH FAN 1A TO SHIELD BLDG VNT	1-M-9	CLOSED	1-HS-30-213	
PURGE EXH FAN 1B TO SHIELD BLDG VNT	1-M-9	CLOSED	1-HS-30-216	

CRITICAL STEP

___ SAT

___ UNSAT

STANDARD:

___The applicant locates 1-HS-30-2, PURGE SUP FAN 1A DISCH and rotates the handswitch to the left to the "CLOSED" position.

The applicant observes 1-HS-30-2, PURGE SUP FAN 1A DISCH GREEN indicating light is LIT and the RED indicating light is DARK.

The applicant locates 1-HS-30-5, UPR CNTMT PURGE observes the handswitch is in the "CLOSED" position.

The applicant observes 1-HS-30-5, UPR CNTMT PURGE GREEN indicating light is LIT and the RED indicating light is DARK.

___The applicant locates 1-HS-30-213, PURGE EXH FAN 1A TO SHIELD BDLG VNT and rotates the handswitch to the left to the "CLOSED" position.

The applicant observes 1-HS-30-213, PURGE EXH FAN 1A TO SHIELD BDLG VNT indicating light is LIT and the RED indicating light is DARK.

The applicant locates 1-HS-30-216, PURGE EXH FAN 1B TO SHIELD BDLG VNT and observes the handswitch in the "CLOSED" position.

The applicant observes 1-HS-30-216, PURGE EXH FAN 1B TO SHIELD BDLG VNT indicating light is LIT and the RED indicating light is DARK.

Step is critical to isolate the purge flowpath from containment.

COMMENTS:

STEP/STANDARD	SAT/UNSAT
STEP 10: [9] **IF** in Mode 1 - 5, **THEN N/A** Step 7.1[10], **AND GO TO** Section 5.2 to purge Lower Containment. STANDARD: Applicant determines that this step requires placing the lower containment purge in service and indicates that Section 5.2 is required to be performed. The applicant marks Step 7.10 as "N/A." **EXAMINER: When the applicant states that Lower Containment must be purged, state that "another operator will continue from this point."** COMMENTS:	___ SAT ___ UNSAT

STOP TIME ________

STEP/STANDARD	SAT/UNSAT

EXAMINER: USE PAGES 13 through 19 if conducting JPM in the Control Room.

CONTROL ROOM PERFORMANCE

START TIME: _______

STEP/STANDARD	SAT/UNSAT
STEP 1: Obtain a copy of the procedure. STANDARD: Applicant locates a copy of SOI-30.02, "Containment Purge System," and determines that Section 7.1, "SHUT DOWN Upper Containment Purge," is the appropriate section for the task. COMMENTS:	___ SAT ___ UNSAT

EXAMINER: The following actions are taken from SOI-30.02, "Containment Purge System," Section 7.1, "SHUT DOWN Upper Containment Purge."

CAUTION

Radiological implications (e.g. causing an area to become airborne, or raising the humidity in contaminated areas), should be considered any time Containment Purge is secured.

NOTE

Lower Containment purge is performed following Upper Containment purge to reduce pressure prior to placing Containment Vent Filters in service.

STEP/STANDARD	SAT/UNSAT
STEP 2: [1] **IF** Refueling outage in progress, **THEN, NOTIFY** Radiological Protection of Purge shutdown. STANDARD: Applicant determines from the INITIAL CONDITIONS that a refueling outage is not in progress and marks the step as "N/A." COMMENTS:	___ SAT ___ UNSAT

STEP/STANDARD	SAT/UNSAT
STEP 3: [2] **INDICATE** which Train(s) being used: Train A Containment Purge Train B Containment Purge STANDARD: Applicant determines from the INITIAL CONDITIONS that Train A is in service and marks the block corresponding to Train A Containment purge. COMMENTS:	___ SAT ___ UNSAT
STEP 4: [3] **IF** Wafer Vlv, 1-ISV-78-600, OPEN in Mode 6 WITH SFP & Rx Cavity Full, **THEN MONITOR** SFP and Rx Cavity levels during Purge startup, **AND** SHUT DOWN Purge Fans if Overflow is approached. STANDARD: Applicant determines from the INITIAL CONDITIONS that the plant is at 100% power and 1-ISV-78-600 is CLOSED. COMMENTS:	___ SAT ___ UNSAT

EXAMINER: The steps 4 and 5 are designated as a "Critical Step" in the procedure. The definition of "CRITICAL STEP" is contained in NPG-SPP-01.2, "Administration of Site Technical Procedures," Section 5.0 "Definitions."

STEP/STANDARD	SAT/UNSAT
Start of Critical Step(s) STEP 5: [4] **PERFORM** the following (closed first to prevent press imbalance from Opening Ice Cond Doors): (**N/A** for FAN **NOT** running)	___ SAT ___ UNSAT

NOMENCLATURE	LOCATION	POSITION	UNID	PERF INITIAL
PURGE EXH FAN 1A SUCT	1-M-9	CLOSE	1-HS-30-61	
PURGE EXH FAN 1B SUCT	1-M-9	CLOSE	1-HS-30-62	

STANDARD:

___The applicant locates 1-HS-30-61, PURGE EXH FAN 1A SUCT on panel 1-M-9 and rotates the handswitch to the left to the "CLOSE" position. Applicant ensures the GREEN indicating light is LIT and the RED indicating light is DARK.

Applicant enters "N/A" for 1-HS-30-62, PURGE EXH FAN 1B SUCT, since the fan was not in service.

COMMENTS:

STEP/STANDARD	SAT/UNSAT

STEP 6: [5] **PERFORM** the following: (**N/A** if **NOT** running)

___ SAT

___ UNSAT

NOMENCLATURE	LOCATION	POSITION	UNID	PERF INITIAL
PURGE SUP & EXH FANS 1A AND FCO-30-1A & 1B	1-M-9	STOP P-T-L	1-HS-30-1A	
PURGE SUP & EXH FANS 1B AND FCO-30-4A & 4B	1-M-9	STOP P-T-L	1-HS-30-4A	

End of Critical Step(s)

STANDARD:

___The applicant locates 1-HS-30-1A, PURGE SUP & EXH FANS 1A on panel 1-M-9 and rotates the handswitch to the left to the "STOP" position and then pulls the handswitch out to the "PULL-TO-LOCK" position. Applicant ensures the GREEN indicating light is LIT and the RED indicating light is DARK.

Applicant enters "N/A" for 1-HS-30-4A, PURGE SUP & EXH FANS 1B since the fan was not in service.

COMMENTS:

STEP/STANDARD	SAT/UNSAT

STEP 7: [6] **ENSURE** the following:

___ SAT

___ UNSAT

NOMENCLATURE	LOCATION	POSITION	UNID	PERF INITIAL
DAMPER 1-XI-30-1A	1-M-9	CLOSED	FCO-30-1A	
DAMPER 1-XI-30-1B	1-M-9	CLOSED	FCO-30-1B	
DAMPER 1-XI-30-4A	1-M-9	CLOSED	FCO-30-4A	
DAMPER 1-XI-30-4B	1-M-9	CLOSED	FCO-30-4B	
PURGE SUP SUCT ISOL DAMPER 1-XI-30-294	1-M-9	CLOSED	FCO-30-294	
PURGE SUP SUCT ISOL DAMPER 1-XI-30-295	1-M-9	CLOSED	FCO-30-295	

STANDARD:

Applicant locates each of the listed dampers on panel 1-M-9 and ensures that the dampers are CLOSED by observing the GREEN indicating lights are LIT and the RED indicating lights are DARK. Dampers, except for 1-FCO-30-4A and 4B, automatically reposition when the applicant rotates 1-HS-30-1A, PURGE SUP & EXH FANS 1A handswitch to the "STOP" position.

1-FCO-30-4A and 4B are associated with 1-HS-30-4A, PURGE SUP & EXH FANS 4B, and should have the GREEN indicating lights LIT and the RED indicating lights DARK.

COMMENTS:

STEP/STANDARD	SAT/UNSAT

STEP 8: [7] **ENSURE** the following:

NOMENCLATURE	LOCATION	POSITION	UNID	PERF INITIAL
UPR CNTMT PURGE 1-FCV-30-7 & 51	1-M-9	CLOSED	1-HS-30-7	
UPR CNTMT PURGE 1-FCV-30-8 & 50	1-M-9	CLOSED	1-HS-30-8	
UPR CNTMT PURGE 1-FCV-30-9 & 53	1-M-9	CLOSED	1-HS-30-9	
UPR CNTMT PURGE 1-FCV-30-10 & 52	1-M-9	CLOSED	1-HS-30-10	

CRITICAL STEP

___ SAT

___ UNSAT

STANDARD:

___The applicant locates 1-HS-30-7, UPR CNTMT PURGE 1-FCV-30-7 & 51 on panel 1-M-9 and rotates the handswitch to the left to the "CLOSED" position.

The applicant observes the GREEN indicating lights labeled "51" and "7" are LIT and the RED indicating lights for "51" and "7" are DARK. The applicant may also check the indicating lights on the PURGE DAMPERS status panel to ensure the GREEN indicating lights are LIT and the RED indicating lights are DARK for dampers 1-FCV-30-7 and 1-FCV-30-51.

___The applicant locates 1-HS-30-8, UPR CNTMT PURGE 1-FCV-30-8 & 50 on panel 1-M-9 and rotates the handswitch to the left to the "CLOSED" position.

The applicant observes the GREEN indicating lights labeled "50" and "8" are LIT and the RED indicating lights for "50" and "8" are DARK. The applicant may also check the indicating lights on the PURGE DAMPERS status panel to ensure the GREEN indicating lights are LIT and the RED indicating lights are DARK for dampers 1-FCV-30-8 and 1-FCV-30-50.

The applicant locates 1-HS-30-9, UPR CNTMT PURGE 1-FCV-30-9 & 53 on panel 1-M-9 and observes that the GREEN indicating lights are LIT and the RED indicating lights are DARK..

The applicant locates 1-HS-30-10, UPR CNTMT PURGE 1-FCV-30-10 & 52 on panel 1-M-9 and observes that the GREEN indicating lights are LIT and the RED indicating lights are DARK.

Step is critical to isolate the purge flowpath from containment.

COMMENTS:

STEP/STANDARD	SAT/UNSAT
STEP 9: [[8] **ENSURE** the following:	**CRITICAL STEP** ___ SAT ___ UNSAT

NOMENCLATURE	LOCATION	POSITION	UNID	PERF INITIAL
PURGE SUP FAN 'A DISCH	1-M-9	CLOSED	1-HS-30-2	
PURGE SUP FAN 'B DISCH	1-M-9	CLOSED	1-HS-30-5	
PURGE EXH FAN 'A TO SHIELD BLDG VNT	1-M-9	CLOSED	1-HS-30-213	
PURGE EXH FAN 'B TO SHIELD BLDG VNT	1-M-9	CLOSED	1-HS-30-216	

STANDARD:

___The applicant locates 1-HS-30-2, PURGE SUP FAN 1A DISCH and rotates the handswitch to the left to the "CLOSED" position.

The applicant observes 1-HS-30-2, PURGE SUP FAN 1A DISCH GREEN indicating light is LIT and the RED indicating light is DARK.

The applicant locates 1-HS-30-5, UPR CNTMT PURGE observes the handswitch is in the "CLOSED" position.

The applicant observes 1-HS-30-5, UPR CNTMT PURGE GREEN indicating light is LIT and the RED indicating light is DARK.

___The applicant locates 1-HS-30-213, PURGE EXH FAN 1A TO SHIELD BDLG VNT and rotates the handswitch to the left to the "CLOSED" position.

The applicant observes 1-HS-30-213, PURGE EXH FAN 1A TO SHIELD BDLG VNT indicating light is LIT and the RED indicating light is DARK.

The applicant locates 1-HS-30-216, PURGE EXH FAN 1B TO SHIELD BDLG VNT and observes the handswitch in the "CLOSED" position.

The applicant observes 1-HS-30-216, PURGE EXH FAN 1B TO SHIELD BDLG VNT indicating light is LIT and the RED indicating light is DARK.

Step is critical to isolate the purge flowpath from containment.

COMMENTS:

STEP/STANDARD	SAT/UNSAT
STEP 9: [[8] **ENSURE** the following:	___ SAT ___ UNSAT

NOMENCLATURE	LOCATION	POSITION	UNID	PERF INITIAL
PURGE SUP FAN 'A DISCH	1-M-9	CLOSED	1-HS-30-2	
PURGE SUP FAN 'B DISCH	1-M-9	CLOSED	1-HS-30-5	
PURGE EXH FAN 'A TO SHIELD BLDG VNT	1-M-9	CLOSED	1-HS-30-213	
PURGE EXH FAN 'B TO SHIELD BLDG VNT	1-M-9	CLOSED	1-HS-30-216	

STANDARD:

Applicant determines that this step requires placing the lower containment purge in service and indicates that Section 5.2 is required to be performed. The applicant marks Step 7.10 as "N/A."

EXAMINER: When the applicant states that Lower Containment must be purged, state that "another operator will continue from this point."

COMMENTS:

STEP 10: [9] **IF** in Mode 1 - 5, **THEN N/A** Step 7.1[10], **AND GO TO** Section 5.2 to purge Lower Containment.

___ SAT

___ UNSAT

STANDARD:

Applicant determines that this step requires placing the lower containment purge in service and indicates that Section 5.2 is required to be performed. The applicant marks Step 7.10 as "N/A."

EXAMINER: When the applicant states that Lower Containment must be purged, state that "another operator will continue from this point."

COMMENTS:

STOP TIME ________

APPLICANT CUE SHEET

(RETURN TO EXAMINER UPON COMPLETION OF TASK)

INITIAL CONDITIONS:

1. **Unit 1 is at 100% power.**
2. **A purge of the upper containment is in progress, using Train "A" equipment.**
3. **You are an extra operator assigned to the shift.**

INITIATING CUES:

The Unit Supervisor directs you to shutdown Train A upper containment purge using the appropriate procedure.

TVA

Watts Bar Nuclear Plant

Unit 1

System Operating Instruction

SOI-30.02

Containment Purge System

Revision 0056

Quality Related

Level of Use: Continuous Use

Effective Date: 07-28-2010

Responsible Organization: OPS, Operations

Prepared By: Nicholas Armour

Approved By: Greg Evans

Revision Log

Rev or Change Number	Effective Date	Affected Page Numbers	Description of Revision/Change
49	02/13/08	2, 8, 12-13, 20, 27, 34, 37	Implemented DCN 52220, ABI/CVI Crosstie.
50	02/19/08	62 14, 21	Added Section 7.7, Shutdown Purge Fan A or B With Two Fans Running (Modes 5 & 6) Corrected cross reference errors.
51	03/19/08	7, 10, 20, 24, 46	TACF 1-07-0006-090 RTN-deleted 2.2 N; 3.0 T & U; 5.2 [4], [5], [17], 7.2 [12].
52	07/11/08	2, 21, 22, 29, 30, 50	Incorporated DCN 52631.
53	07/15/08	2, 21, 29	Deleted information about operability when setpoint is in alarm based on operator feedback. Added PM number for calibration of monitors 1-RM-90-106 and 112.
54	03/18/09	2, 8, 13, 20, 28, 36	Added Precaution and Notes stating the SSPS train must be maintained operable for whatever train is supporting the ABI/CVI functions. (PER Action 138858-006)
55	07/23/10	4, 9, 10, 12, 14, 17, 19, 22, 25, 27, 30, 35, 37, 40, 44, 45, 49, 50, 54, 55, 58, 59, 62, 64, 65, 68	Added end of section closeouts Deleted checklists and replaced with external attachments Updated commitment formatting Added Precaution Q and R (PER 161559) Added 4.3[2] (PER 161559)
56	07/28/10	2, 4, 11, 20, 27, 47, 53, 56, 57, 60	Deleted Step 6 and 7 from Sections 5.2 and 5.3 (along with preceding NOTES) and Step 13 from Section 7.2. Corrected UNIDs for 1-RE-90-130 and 1-RE-90-131 (PER 238421).

Table of Contents

Table of Contents (continued)

ATTACHMENTS

Attachment 1P: Containment Purge System Power Checklist 30.02-1P

Attachment 1V: Containment Purge System Valve Checklist 30.02-1V

1.0 INTRODUCTION

1.1 Purpose

To provide instructions for Operation of the Containment (Cntmt) Purge System.

1.2 Scope

This Instruction includes the following Operations:

A. Startup

B. Normal Operation

C. Shutdown

2.0 REFERENCES

2.1 Performance References

A. 0-PI-OPS-17.0, 18 Month Locked Valve Verification

B. 1-ODI-90-15, Containment Purge Release

C. 1-ODI-90-18, Incore Instrument Room Purge Release

D. 1-SI-0-2-00, Shift and Daily Surveillance Master Log

E. 1-SI-30-701, Containment Isolation Valve Local Leak Rate Test Purge Air

2.2 Developmental References

A. Offsite Dose Calculation Manual (ODCM)

B. 1-SI-30-11-A. Containment Purge Air Cleanup System Train - A Test

C. 1-SI-30-11-B. Containment Purge Air Cleanup System Train - B Test

D. SOI-26.01, High Pressure Fire Protection System

E. SOI-30.03, Containment HVAC and Pressure Control

F. SOI-31.03, Auxiliary Bldg Cooling System

G. SOI-44.01, HTHW Building Heating System

H. SOI-90.02, Gaseous Radiation Monitoring System

I. FSAR 9.4.6, Reactor Building Purge Ventilation System

J. N3-30RB-4002, Reactor Building Ventilation System

K. N3-30AB-4002, Auxiliary Building - Heating, Ventilation, and Air Conditioning System

L. TVA Drawings:

45W600-30-8, 9, 10, 11, 12
45W760-30-16
47W610-30-1
47W610-90-1, -3
47W611-30-1
47W866-1, -2

2.2 Developmental References (continued)

M. WBN Tech Specs: 3.4.15 (RCS Leakage Instruments) 3.6.3 (Containment Isol Valves) 3.6.5 (Containment Temperature) 3.9.4 (Containment Penetrations) 3.9.8 (Refueling Containment Purge Requirements)

3.0 PRECAUTIONS AND LIMITATIONS

A. In Modes 1-4, the containment purge system is operated only when the Reactor Building equipment and personnel access hatches are CLOSED.

B. During refueling operation when ABI/CVI crosstie is required, the following conditions apply: (Refer to Tech Spec Bases 3.3.6, 3.3.8, 3.7.12, & 3.9.8.)

1. 1-HS-90-410-A & 415-B are placed in the REFUEL position prior to the beginning of refuel operations (Mode 5) when the Containment and/or Annulus is open to the Auxiliary Bldg ABSCE spaces and returned to NORMAL position prior to entering Mode 4 from Mode 5 unless repositioned by another approved configuration document (e.g. 18 Month GO Test, DG Blackout Test, etc.). When moving irradiated fuel inside Containment, both trains of the Containment Purge System must be operable and at least one train must be operating, or Containment must be isolated.

2. If 1-HS-90-410-A & 415-B are required to be placed in the NORMAL position during movement of irradiated fuel in containment or the auxiliary bldg, then fuel movement must be stopped or containment must be isolated.

3. When moving irradiated fuel in the Auxiliary Bldg with the Containment open to the Auxiliary Bldg ABSCE spaces, Containment Purge System may be operated, but all Containment ventilation isolation valves and associated instrumentation must remain operable.

4. Both trains of ABGTS must remain operable if Containment and/or Annulus is open to the Auxiliary Bldg ABSCE spaces during movement of irradiated fuel inside Containment.

5. SSPS train must be maintained operable for whatever train is supporting the ABI/CVI functions.

C. Max Containment Purge HEPA and Charcoal filter combined ΔP is 4.7 in. H20.

D. Containment Purge & Vent with normal purge dampers is **NOT** to be done when Containment press is above atmospheric. With Annulus ΔP 5.4 in. H20, Containment press above 0.2 psi is above atmospheric (SOI-30.03 is used reduce Containment press).

E. Ice Condenser Door positions should be monitored when purging Containment. A slight upper-to-lower Containment press imbalance will open the doors.

3.0 PRECAUTIONS AND LIMITATIONS (continued)

F. For lower compartment purge, the following sequence should be followed to prevent Upper-to-Lower Containment press imbalance from opening the Ice Condenser Doors:

1. Upper compartment purge should be started first and operated for 5 to 10 minutes to permit air pressures to stabilize.
2. Stop upper compartment purge, close associated dampers and stop fans.
3. Start lower compartment purge.

G. Containment Vent Isol (CVI) or Aux Bldg Isol (ABI) should **NOT** be reset UNTIL all initiating signals are reset or blocked.

H. Smoke detected in U1 Aux Bldg air intake will **SHUT DOWN** Containment Purge Sys.

I. When outside air temp is 35°F or less, Purge Supply Preheat/Cooling Coils should be drained, or in service per SOI-44.01.

J. In Modes 1-4 only ONE set of supply and exhaust valves may be open to Containment at a time.

K. In Mode 2, 3, or 4, minimum Containment temp is 60°F (62.5°°F), Tech Spec 3.6.5 (and 1-SI-0-2-00 with instrument error).

L. Both Purge Air Cleanup Units are required Operable during Movement of Irradiated Fuel in Containment.

M. In Mode 6, with 1-ISV-78-600 (Wafer Vlv) Open, Containment Purge startup or shutdown can cause SFP/Rx Cavity overflow due to Containment press changes. [C.1]

N. Operation of 1-FCV-30-54, 61, 62, 213, or 216 creates a local PERSONNEL HAZARD while FCV is in motion due to the location of valve components. An Operator should be sent to ensure Safe Conditions during operation of each FCV.

O. Perform 1-SI-30-701, Containment Isolation Valve Local Leak Rate Test Purge Air, every 6 months or within 92 days after opening any Purge Air CIV.

P. Radiological implications (e.g.: causing an area to become airborne or raising the humidity in contaminated areas) should be considered any time Containment Purge is secured.

3.0 PRECAUTIONS AND LIMITATIONS (continued)

Q. Containment purge shall be aligned during certain outage activities that pose a high potential for generation of airborne radioactivity. Such activities include: lifting and setting the Rx Vessel Head, movement of upper and lower internals, venting Rx Vessel Head, opening Steam Generator primary manways and Pressurizer manways, draining and filling reactor cavity, reactor cavity and equipment pit decontamination, thimble tube cleaning and eddy current testing, dumping SI accumulators to the Rx cavity, and major RCS system breaches.

R. Instrument Room purge shall be aligned during system breaches of the incore detector system during plant operating modes 1-4.

S. 1-FCV-30-37 and 1-FCV-30-40 must be closed for all containment purge operations.

T. Specific instrument alignments must be made to the applicable Containment Purge monitors RM-90-130 & 131. SOI-90.02 contains the procedural guidance.

U. Precautions related to two train operation:

1. PER 78024 has documented that annulus delta-P indication, and annulus vacuum, are impacted by higher Unit 1 Shield Bldg Vent flows. Operation of the A Train ABGTS in combination with both trains of Containment Purge Is **NOT** presently acceptable. At 22,000 cfm flow through the Unit 1 Shield Bldg Vent, the annulus vacuum fans may automatically control annulus vacuum below the Tech Spec minimum. The 1-SI-0-2-(series) contains the corrected Tech Spec indicated limit.

2. EGTS (either train) should **NOT** be operated at the same time both containment purge exhaust fans are in operation to prevent over-ranging the Shield Bldg stack rad monitor.

3. During Modes 1-4, upper and lower (complete) containment purge is **NOT** allowed simultaneously.

Date________

INITIALS

4.0 PREREQUISITE ACTIONS

NOTES

1) Throughout Instruction where **IF/THEN** exists, the step is **N/A** if stated condition does **NOT** exist
2) Signoffs/information in unused Sections may be left blank.
3) Throughout this instruction, Concurrent Verification (CV) may be marked **N/A** for breaker or fuse steps where no manipulation is performed

4.1 Preliminary Actions

[1] **INDICATE** Section to be performed and Reason for use:

5.0	Startup	________	7.0	Shutdown	________
6.0	Normal Operation	N/A	8.0	Infrequent Operations	________

Section/ Reason/ Remarks: ____________________

____

____

____

4.2 Field Preparations

[1] **ENSURE** CVI and ABI Signals NOT present [1-M-6]. ________

[2] **ENSURE** the following Rad Monitors IN SERVICE or compensatory measures established: ________

[2.1] 1-RE-90-400A, B, C- for Shield Bldg Vent Mon and its associated isokinetic sampler. ________

[2.2] 1-RE-90-130 for Containment Purge Exhaust, aligned to Purge Exhaust Fan(s) to be started per SOI-90.02. ________

[2.3] 1-RE-90-131 for Containment Purge Exhaust, aligned to Purge Exhaust Fan(s) to be started per SOI-90.02. ________

Date________ **INITIALS**

5.2 Start Up Lower Containment Purge

> **NOTE**
>
> Upper containment should be purged before lower containment to avoid a pressure imbalance that could open the Ice Condenser Doors.

[1] **ENSURE** Section 4.0, Prerequisite Actions, COMPLETE. ________

> **NOTE**
>
> SSPS train must be maintained operable for whatever train is supporting the ABI/CVI functions.

[2] **PERFORM** the following prior to moving irradiated fuel with containment open to ABSCE spaces:

[2.1] **IF** in Mode 5 or 6, **THEN**

COORDINATE with SM/SRO to determine if ABI/CVI crosstie handswitches are in the appropriate position for plant conditions per Precaution 3.0B. ________ SM/SRO

[2.2] **IF** applicable in Mode 5 or 6, **THEN**

PLACE 1-HS-90-410-A [back of 1-R-73] and 1-HS-90-415-B [back of 1-R-78] in REFUEL position. ________

________ CV

[3] **OBTAIN** SRO approval. ________

[4] **OBTAIN** Release Permit from Chemistry Countroom. ________

[5] **ENSURE** appropriate heating/cooling water to Containment Purge supply per SOI-44.01/SOI-31.03. (**N/A** if **NOT** desired) ________

> **NOTE**
>
> SOI-90.02, Gaseous Process Radiation Monitors, provides specific RM-90-130 & 131 alignments for using either A, B, or both trains of containment purge.

[6] **ENSURE** Section 5.10 of SOI-90.02, Gaseous Process Radiation Monitors, has been completed for specific train(s) of containment purge to be placed in service. ________

Date________ INITIALS

5.2 **Start Up Lower Containment Purge (continued)**

[7] **INDICATE** which Train(s) will be used:

Train A Containment Purge ☐

Train B Containment Purge ☐

Both Trains A and B Containment Purge (Modes 5 & 6 only) (see Precaution and Limitations 3.0U) ☐

[8] **IF** Wafer Vlv, 1-ISV-78-600, OPEN in Mode 6 WITH SFP & Rx Cavity Full, **THEN**

MONITOR SFP and Rx Cavity levels during Purge startup,

AND

SHUT DOWN Purge Fans if Overflow is approached. [C.1] ________

[9] **IF** aligning for 2-Train operation,

THEN CHECK A Train ABGTS is **NOT** running. ________

Start of Critical Step(s)

[10] **CLOSE** Containment vent filter flowpath:

NOMENCLATURE	LOCATION	POSITION	UNID	PERF INITIAL
LWR CNTMT PURGE EXH PRESS RLF	1-M-9	CLOSED	1-HS-30-37	
LWR CNTMT PURGE EXH PRESS RLF	1-M-9	CLOSED	1-HS-30-40	

Date________

INITIALS

5.2 Start Up Lower Containment Purge (continued)

NOTE

The following dampers must be closed when moving irradiated fuel with Containment open.

[11] **PERFORM** the following: (**N/A** HS **NOT** used)

NOMENCLATURE	LOCATION	POSITION	UNID	PERF INITIAL
PURGE EXH FAN A SUCT	1-M-9	OPEN	1-HS-30-61	
PURGE EXH FAN B SUCT	1-M-9	OPEN	1-HS-30-62	

CAUTION

If Lower Containment is purged during modes 1-4, only one set of supply isolation valves may be opened. This means supply valves 1-FCV-30-16 and -17 must remain closed.

[12] **PERFORM** the following:

NOMENCLATURE	LOCATION	POSITION	UNID	PERF INITIAL
LWR CNTMT PURGE 1-FCV-30-14 & 56	1-M-9	OPEN	1-HS-30-14	
LWR CNTMT PURGE 1-FCV-30-15 & 57	1-M-9	OPEN	1-HS-30-15	

[13] **ALIGN** Exh Fans Disch Flood dampers per 5.2[13.1], 5.2[13.2], or 5.2[13.3]: (**N/A** subsection **NOT** performed)

Date________ INITIALS

5.2 Start Up Lower Containment Purge (continued)

[13.1] **IF** Train A will be run, **THEN**

PERFORM the following:

NOMENCLATURE	LOCATION	POSITION	UNID	PERF INITIAL
PURGE EXH FAN 1A TO SHIELD BLDG VNT	1-M-9	OPEN	1-HS-30-213	
PURGE EXH FAN 1B TO SHIELD BLDG VNT	1-M-9	CLOSED	1-HS-30-216	

[13.2] **IF** Train B will be run, **THEN**

PERFORM the following:

NOMENCLATURE	LOCATION	POSITION	UNID	PERF INITIAL
PURGE EXH FAN 1A TO SHIELD BLDG VNT	1-M-9	CLOSED	1-HS-30-213	
PURGE EXH FAN 1B TO SHIELD BLDG VNT	1-M-9	OPEN	1-HS-30-216	

[13.3] **IF** Both Train A and B will be run, **THEN**

PERFORM the following:

NOMENCLATURE	LOCATION	POSITION	UNID	PERF INITIAL
PURGE EXH FAN 1A TO SHIELD BLDG VNT	1-M-9	OPEN	1-HS-30-213	
PURGE EXH FAN 1B TO SHIELD BLDG VNT	1-M-9	OPEN	1-HS-30-216	

End of Critical Step(s)

Date________ **INITIALS**

5.2 Start Up Lower Containment Purge (continued)

NOTE

Opening 1-FCV-30-2 (Tr A) and/or -5 (Tr B) LAST, ensures negative press in Lower Containment compared to Upper Containment during the Startup transient.

CAUTIONS

1) PER 78024 has documented that annulus delta-P indication, and annulus vacuum, are impacted by higher Unit 1 Shield Bldg Vent flows. Operation of the A Train ABGTS in combination with both trains of Containment Purge is **NOT** presently acceptable. At 22,000 cfm flow through the Unit 1 Shield Bldg Vent, the annulus vacuum fans may automatically control annulus vacuum below the Tech Spec minimum. The 1-SI-0-2-(series) contains the corrected Tech Spec indicated limit.

2) Due to proximity of Service Bldg access to air intake, the area outside Unit 1 intake should be checked for potential fumes or running vehicle exhaust prior to starting fans. [C.2]

3) For normal plant operations, purge should **NOT** be placed in service unless the U1 shield bldg. exhaust monitor and its associated isokinetic sampler are operable.

Start of Critical Step(s)

[14] **START** Selected Sup & Exh Fan: (**N/A** if **NOT** started)

NOMENCLATURE	LOCATION	POSITION	UNID	PERF INITIAL
CNTMT PURGE SUP & EXH FANS 1A AND FCO-30-1A & 1B	1-M-9	START	1-HS-30-1A	
CNTMT PURGE SUP & EXH FANS 1B AND FCO-30-4A & 4B	1-M-9	START	1-HS-30-4A	

Date________ INITIALS

5.2 Start Up Lower Containment Purge (continued)

CAUTION

If Ice Condenser doors open after opening FCV-30-2 and/or 30-5, an out-of-balance flow may exist. System Engineering should be notified to evaluate flowrates.

[15] **OPEN** Selected Sup Fan Disch damper: (**N/A** if **NOT** selected)

NOMENCLATURE	LOCATION	POSITION	UNID	PERF INITIAL
PURGE SUP FAN 1A DISCH	1-M-9	OPEN	1-HS-30-2	
PURGE SUP FAN 1B DISCH	1-M-9	OPEN	1-HS-30-5	

[16] **ENSURE** the following: (**N/A** Train **NOT** used)

NOMENCLATURE	LOCATION	POSITION	UNID	PERF INITIAL
PURGE SUP SUCT ISOL DAMPER 1-XI-30-294	1-M-9	OPEN	FCO-30-294	
PURGE SUP SUCT ISOL DAMPER 1-XI-30-295	1-M-9	OPEN	FCO-30-295	
Train A				
DAMPER 1-XI-30-1A	1-M-9	OPEN	FCO-30-1A	
DAMPER 1-XI-30-1B	1-M-9	OPEN	FCO-30-1B	
Train B				
DAMPER 1-XI-30-4A	1-M-9	OPEN	FCO-30-4A	
DAMPER 1-XI-30-4B	1-M-9	OPEN	FCO-30-4B	

End of Critical Step(s)

[17] **CHECK** flow on 1-FI-90-400, SHIELD BLDG VT FLOW [1-M-9]. (**N/A** if FI **NOT** available) ________

[18] **IF** FI-90-400 is **NOT** available, **THEN**

ENSURE Flow being estimated per 1-SI-0-2.00, Shift & Daily Log. ________

Date________ **INITIALS**

5.2 Start Up Lower Containment Purge (continued)

NOTE
Ice Condenser vent curtain should be checked for proper vertical position and repositioned if necessary after starting CONTAINMENT purge.

[19] **NOTIFY** the Chemistry Countroom of the purge start date and time. ________

[20] **IF** containment approaches or exceeds Tech Spec value (+0.27 psid in Modes 1-4), **THEN**

PERFORM Section 7.2, SHUT DOWN Lower Containment Purge. ________

[21] Section 5.2, Start Up Lower Containment Purge complete. ________

6.0 NORMAL OPERATION

The Containment Purge System is designed to:

A. Maintain the primary and secondary Containment environment within acceptable limits for equipment operation.

B. Maintain the primary and secondary Containment environment within acceptable limits for personnel access during inspection, testing, maintenance, and refueling.

C. Filter outleakage from Containment to limit radioactivity release to the environment.

The Purge function of the Containment Purge System is **NOT** safety-related. However, the cleanup units are required to provide a safety-related filtration path after a fuel-handling accident.

The design bases include provisions to:

A. Supply fresh air for breathing and contamination control when Containment or Annulus is occupied.

B. Exhaust Containment/Annulus air to outdoors when the Purge Supply System is operated.

C. Clean up Containment exhaust during normal operation by routing air through HEPA-Carbon filters before release to atmosphere, keeping releases below 10 CFR 20 limits and complying with 10 CFR 50 Appendix I.

D. Provide a reduced quantity of ventilation air to permit occupancy of Instrument Room during reactor operation.

E. Assure closure of Containment Isol Valves after accidents which result in initiation of Containment Vent Isolation (CVI) signal.

F. Assure closure of system air intake dampers, which form part of ABSCE, on Aux Bldg Isolation (ABI) signal.

Items E and F are Safety-related functions.

In modes 1-4 when limited to one 24-inch flowpath, the flow through the single line will be greater than design, which is based on a full containment purge using all available purge paths and both purge supply and exhaust fans. This will reduce the wait required to enter containment if the containment atmosphere needs to cleaned prior to personnel entry.

6.0 NORMAL OPERATION (continued)

The Containment Purge System Exhaust is monitored by redundant fast-response Rad detectors which auto-isolate Containment Purge System on high radiation.

The system supply & exhaust ducts are routed thru the annulus to several Containment penetrations. Two air supplies are provided for lower and upper compts and one for the instrument room. Air is supplied to areas of low radioactivity potential and flows to air pickup points in areas of higher radioactivity potential. The air pickup points that exhaust from the lower compt and instrument room also provide an air sweep across the refueling canal.

The Purge Air System is **NOT** normally in service.

The CVI/ABI crosstie installed by DCN 52220 modified the control circuits for the Containment Air Purge Exhaust High Radiation CVI Input Signal and the ABI & High Radiation in Refueling Area Logic Bus to allow fuel movement in the auxiliary building while the containment and/or the annulus are open to the auxiliary building ABSCE spaces. The modifications to these electrical circuits are implemented in Auxiliary Relay Racks 1-R-73 (Train A) and 1-R-78 (Train B). Two new handswitches, one per train, were added to each relay rack to allow these circuits to be switched from a NORMAL position to a REFUEL position. When operating in NORMAL mode the circuits will provide the same logic as they currently provide even though these circuits are permanently modified. During NORMAL operation, a high radiation signal in the fuel handling area of the auxiliary building will close the same dampers and start/stop the same fans as the high radiation signal currently closes and starts/stops. Also, a high radiation signal in the purge air exhaust will initiate a CVI, which is no different than the current configuration. The new handswitches are placed in REFUEL mode prior to the beginning of refueling operations and returned to NORMAL mode prior to entering Mode 4 from Mode 5 after completion of refueling operations. REFUEL mode allows either the high radiation signal in the fuel handling area or the high radiation signal in the purge air exhaust to close dampers, stop or start fans, and initiate a CVI in order to properly maintain the ABSCE and allow the Auxiliary Building Gas Treatment System (ABGTS) to perform its safety function.

18 month testing of ABI/CVI individual circuits may require these handswitches to be in the NORMAL position which will require fuel movement to be stopped or containment to be isolated.

Date________ **INITIALS**

7.0 SHUTDOWN

7.1 SHUT DOWN Upper Containment Purge

CAUTION

Radiological implications (e.g. causing an area to become airborne, or raising the humidity in contaminated areas), should be considered any time Containment Purge is secured.

NOTE

Lower Containment purge is performed following Upper Containment purge to reduce pressure prior to placing Containment Vent Filters in service.

[1] **IF** Refueling outage in progress, **THEN,**

NOTIFY Radiological Protection of Purge shutdown. ________

[2] **INDICATE** which Train(s) being used:

Train A Containment Purge ☐

Train B Containment Purge ☐

[3] **IF** Wafer Vlv, 1-ISV-78-600, OPEN in Mode 6 WITH SFP & Rx Cavity Full, **THEN**

MONITOR SFP and Rx Cavity levels during Purge startup,

AND SHUT DOWN Purge Fans if Overflow is approached. [C.1]

Start of Critical Step(s)

[4] **PERFORM** the following (closed first to prevent press imbalance from Opening Ice Cond Doors):
(**N/A** for FAN **NOT** running)

NOMENCLATURE	LOCATION	POSITION	UNID	PERF INITIAL
PURGE EXH FAN 1A SUCT	1-M-9	CLOSE	1-HS-30-61	
PURGE EXH FAN 1B SUCT	1-M-9	CLOSE	1-HS-30-62	

Date________ INITIALS

7.1 SHUT DOWN Upper Containment Purge (continued)

[5] **PERFORM** the following: (**N/A** if **NOT** running)

NOMENCLATURE	LOCATION	POSITION	UNID	PERF INITIAL
PURGE SUP & EXH FANS 1A AND FCO-30-1A & 1B	1-M-9	STOP P-T-L	1-HS-30-1A	
PURGE SUP & EXH FANS 1B AND FCO-30-4A & 4B	1-M-9	STOP P-T-L	1-HS-30-4A	

End of Critical Step(s)

[6] **ENSURE** the following:

NOMENCLATURE	LOCATION	POSITION	UNID	PERF INITIAL
DAMPER 1-XI-30-1A	1-M-9	CLOSED	FCO-30-1A	
DAMPER 1-XI-30-1B	1-M-9	CLOSED	FCO-30-1B	
DAMPER 1-XI-30-4A	1-M-9	CLOSED	FCO-30-4A	
DAMPER 1-XI-30-4B	1-M-9	CLOSED	FCO-30-4B	
PURGE SUP SUCT ISOL DAMPER 1-XI-30-294	1-M-9	CLOSED	FCO-30-294	
PURGE SUP SUCT ISOL DAMPER 1-XI-30-295	1-M-9	CLOSED	FCO-30-295	

[7] **ENSURE** the following:

NOMENCLATURE	LOCATION	POSITION	UNID	PERF INITIAL
UPR CNTMT PURGE 1-FCV-30-7 & 51	1-M-9	CLOSED	1-HS-30-7	
UPR CNTMT PURGE 1-FCV-30-8 & 50	1-M-9	CLOSED	1-HS-30-8	
UPR CNTMT PURGE 1-FCV-30-9 & 53	1-M-9	CLOSED	1-HS-30-9	
UPR CNTMT PURGE 1-FCV-30-10 & 52	1-M-9	CLOSED	1-HS-30-10	

Date________ **INITIALS**

7.1 SHUT DOWN Upper Containment Purge (continued)

[8] **ENSURE** the following:

NOMENCLATURE	LOCATION	POSITION	UNID	PERF INITIAL
PURGE SUP FAN 1A DISCH	1-M-9	CLOSED	1-HS-30-2	
PURGE SUP FAN 1B DISCH	1-M-9	CLOSED	1-HS-30-5	
PURGE EXH FAN 1A TO SHIELD BLDG VNT	1-M-9	CLOSED	1-HS-30-213	
PURGE EXH FAN 1B TO SHIELD BLDG VNT	1-M-9	CLOSED	1-HS-30-216	

[9] **IF** in Mode 1 - 5, **THEN**

N/A Step 7.1[10], **AND**

GO TO Section 5.2 to purge Lower Containment. ________

NOTE

Ice Condenser vent curtain should be checked for proper vertical position and repositioned if necessary after stopping CONTAINMENT purge.

[10] **NOTIFY** the Chemistry Countroom of the purge end date and time. ________

Date________ **INITIALS**

7.1 SHUT DOWN Upper Containment Purge (continued)

[11] **CALCULATE** total elapsed time (since last sample removal) for CNTMT PURGE AIR EXHAUST FAN 1A:

[11.1] **RECORD** STOP time from 1-II-30-1E, CNTMT PURGE AIR EXHAUST FAN 1A TIME TOTALIZING METER (located in rear of Panel 16 on Rx Vent Bd 1A-A):

________hrs ________

[11.2] **RECORD** Time value for tag on 1-II-30-1E:

________hrs ________

[11.3] **CALCULATE** elapsed run time:

________hrs- ________hrs= ________(total elapsed hrs)

Step 7.1[11.1] Step 7.1[11.2] ________

[11.4] **IF** elapsed time in 7.1[11.3] is greater than or equal to 720 hrs., **THEN**

NOTIFY System Engineering to perform 1-SI-30-11-A. ________

[12] **CALCULATE** total elapsed time (since last sample removal) for CNTMT PURGE AIR EXHAUST FAN 1B:

[12.1] **RECORD** STOP time from 1-II-30-4E, CNTMT PURGE AIR EXHAUST FAN 1B TIME TOTALIZING METER (located in rear of Panel 16 on Rx Vent Bd 1B-B).

________hrs ________

[12.2] **RECORD** Time value for tag on 1-II-30-4E

________hrs ________

Date________ INITIALS

7.1 SHUT DOWN Upper Containment Purge (continued)

[12.3] **CALCULATE** elapsed run time:

________hrs- ________hrs= ________(total elapsed hrs)

Step [7.1[12.1] Step 7.1[12.2] ________

[12.4] **IF** elapsed time in 7.1[12.3] is greater than or equal to 720 hrs., **THEN**

NOTIFY System Engineering to perform 1-SI-30-11-B. ________

[13] Section 7.1, SHUT DOWN Upper Containment Purge complete. ________

SPARE B.1.d
Establish Reactor Coolant System Bleed Paths per FR-H.1, "Loss of Secondary Heat Sink."

WATTS BAR NUCLEAR PLANT
JOB PERFORMANCE MEASURE
SPARE B.1.d
06-2011 NRC Exam
EVALUATION SHEET

Task: Establish Reactor Coolant System Bleed Paths per FR-H.1, "Loss of Secondary Heat Sink."

Alternate Path: Failure of 1-PCV-68-334, PZR PORV 334 to open requires use of the Reactor Vessel Head Vent System to create adequate bleed path for RCS heat removal.

Facility JPM #: 3-OT-JPMR093

Safety Function: 4P **Title:** Heat Removal from Reactor Core - Primary System

K/A E05 EA1.1 Ability to operate and / or monitor the following as they apply to the (Loss of Secondary Heat Sink): Components, and functions of control and safety systems, including instrumentation, signals, interlocks, failure modes, and automatic and manual features.

Rating(s): 4.1/4.0 **CFR:** 41.7 / 45.5 / 45.6

Evaluation Method: Simulator __X__ In-Plant ________ **Classroom** ________

References: FR-H.1, "Loss of Secondary Heat Sink," Rev. 18.

Task Number: RO-113-FR-H.1-001 **Title:** Respond to a loss of secondary heat sink.

Task Standard: The applicant performs the actions and contingency actions required to establish a "bleed" path by performing Steps 18 through 20 of FR-H.1, "Loss of Secondary Heat Sink."

Validation Time: 9 minutes **Time Critical:** Yes ____ No __X__

===

Applicant: ____________________ ______________ Time Start: ________
NAME Docket No. Time Finish: ________

Performance Rating: SAT ____ UNSAT ____ Performance Time ___

Examiner: ____________________ ____________________/________
NAME SIGNATURE DATE

===

COMMENTS

SIMULATOR OPERATOR INSTRUCTIONS:

1. ENSURE NRC Examination Security has been established.
2. RESET to Initial Condition 350 by performing the following actions:
   a. Select ICManager on the THUNDERBAR menu (right hand side of Instructor Console Screen).
   b. Locate IC 350.
   c. Right "click" on IC 350.
   d. Select Reset on the drop down menu.
   e. Right "click" on RESET.
   f. Enter the password for IC 350.
   g. Select "Yes" on the INITIAL CONDITION RESET pop-up window.
   h. Perform SWITCH CHECK.
3. Place simulator in RUN and acknowledge any alarms.
4. ENSURE Steam Generator wide range levels are 24-25% (less than 26%) to meet entry conditions for FR-H.1, "Loss of Secondary Heat Sink," " Bleed-and-Feed."
4. ENSURE a marked-up copy of FR-H.1, "Loss of Secondary Heat Sink," signed (circled-and-slashed) through Step 3. CAUTIONS prior to Step 18 are also circled and slashed,
5. ENSURE "Extra Operator" is present in the simulator.
6. Place simulator in FREEZE until Examiner cue is given.
7. When requested to restore power to RV Head Vents, set remote function rcr06 on.

WATTS BAR NUCLEAR PLANT
JOB PERFORMANCE MEASURE
SPARE B.1.d
06-2011 NRC Exam

READ TO APPLICANT

DIRECTION TO APPLICANT:

I will explain the initial conditions, and state the task to be performed. All control room steps shall be performed for this JPM, including any required communications. I will provide initiating cues and reports on other actions when directed by you. Ensure you indicate to me when you understand your assigned task. To indicate that you have completed your assigned task return the cue sheet I provided you.

INITIAL CONDITIONS:

1. **The unit was at 100% RTP when a MFW line break caused a reactor trip.**
2. **All AFW pumps were removed due to cavitation; operators have been dispatched to investigate.**
3. **Wide range levels on all SGs are < 26%.**
4. **You are the Operator at the Controls**

INITIATING CUES:

The Unit Supervisor directs you to perform actions of FR-H.1, "Loss of Heat Sink" to establish bleed and feed, beginning at Step 18.

START TIME: _______

STEP 1: Obtain a copy of the procedure. STANDARD: A copy of FR-H.1 is obtained. **Cue:** **After the applicant has demonstrated the method of obtaining the correct instruction, the evaluator can provide a copy of the instruction** COMMENTS:	___ SAT ___ UNSAT
STEP 2: 18. **ACTUATE** SI. STANDARD: Applicant determines Safety Injection is initiated by 1-HS-63-133A or 1-HS-63-133B. **Step is critical to ensure necessary equipment running for inventory control of the RCS.** COMMENTS:	**CRITICAL STEP** ___ SAT ___ UNSAT

STEP 3: 19. **ENSURE** at least one of the following RCS feed paths: • At least one charging pump injecting thru BIT, **OR** • At least one SI Pump running with its injection valves open. STANDARD: At least one charging pump is checked to be running and 1-FI-63-170 is determined to indicate flow or At least one SI pump is checked to be running and injection valve open by red light on 1-HS-63-22A COMMENTS:	___ SAT ___ UNSAT

CAUTION

- When the reactor vessel head vent block valve is opened, the throttle valve will cycle open and closed.
- Slowly opening (5 seconds stroke time) the head vent valve will prevent water hammer and pipe damage.

STEP 4: 20. **ENSURE** adequate RCS bleed path: a. **ENSURE** all pzr PORVs and pzr PORV block valves OPEN. STANDARD: Applicant locates and determines that 1-FCV-68-333, BLOCK VALVE FOR PORV 340A is OPEN based on GREEN indicating light DARK and RED indicating light LIT on 1-HS-68-68-333A. Applicant locates and determines that 1-FCV-68-333A, BLOCK VALVE FOR PORV 340A is OPEN based on GREEN indicating light DARK and RED indicating light LIT on 1-HS-68-68-332A. ___Applicant locates and then rotates 1-HS-69-340A, PZR PORV 340 to the right to the OPEN position. Applicant observes GREEN indicating light is DARK and the RED indicating light is LIT on 1-HS-68-340AA. ___Applicant locates and then rotates 1-HS-69-334A, PZR PORV 334 to the right to the OPEN position. Applicant observes GREEN indicating light is LIT and the RED indicating light is DARK on 1-HS-69-334A. Based on the failure of 1-PCV-68-334 to OPEN, the applicant enters Step 20.a. **RESPONSE NOT OBTAINED** column for actions. **Step is critical because the relief capacity of one PORV is inadequate to pass sufficient fluid to depressurize the RCS and allow adequate core cooling via inventory addition. Transition to RNO establishes alternate/ additional depressurization path.** COMMENTS:	**CRITICAL STEP** ___ SAT ___ UNSAT

STEP 5: **RESPONSE NOT OBTAINED** a. **PERFORM** the following: 1) **RESTORE** power to head vents: • **PLACE** 1-SW-68-394-A disconnect switch to ON [125V Vital Batt Bd Rm I]. • **PLACE** 1-SW-68-395-B disconnect switch to ON [125V Vital Batt Bd Rm II]. STANDARD: Applicant contacts the Control Building AUO to perform the required actions to energize the head vent valves. **Step is critical because power will not be restored without the request being made. Unless power is restored, the valves cannot be opened and no bleed path can be established.** **Note to Evaluator:** When AUO contacted to energize head vent valves, cue simulator operator to **insert Remote Function RCR06 to on.** COMMENTS:	**CRITICAL STEP** ___ SAT ___ UNSAT

STEP 5: **RESPONSE NOT OBTAINED** a. **PERFORM** the following: 2) **OPEN** all reactor vessel head vent and block valves. STANDARD: The applicant opens the vent isolation valves by using 1-HS-68-394 & 1-HS-68-395 and the vent control valves by using 1-HIC-68-396 & 1-HIC-68-397. **Opening the vent valves establishes the RCS bleed path and is therefore critical.** COMMENTS:	**CRITICAL STEP** ___ SAT ___ UNSAT

STEP 5: **RESPONSE NOT OBTAINED** a. **PERFORM** the following: 3) **OPEN** ERCW valves to AFW pump suction, **OR ALIGN** HPFP to at least one Intact S/G USING the following: • AOI-7.06, Alignment of HPFP Water to the Steam Generators. • MI-17.018, Flood Preparation - HPFP System Spool Pieces.) STANDARD: 1-HS-3-116A/A, 1-HS-3-126A/A, and either 1-HS-3-136A/A, 1-HS-3-179A/A or both are turned to the open position or Applicant refers to AOI-7.06 for alignment of HPFP water to the Steam Generators. **CUE: If the applicant refers to AOI-7.06, state that another operator will complete AOI-7.06 for establishing flow to SGs #3 and #4.** **Step is critical to ensure a source of water is established to at least one intact S/G.** COMMENTS:	**CRITICAL STEP** ___ SAT ___ UNSAT

STEP 5: **RESPONSE NOT OBTAINED** a. **PERFORM** the following: 4) **WHEN** one of the above low press water sources is aligned to the S/Gs, **THEN DEPRESSURIZE** at least one intact S/G to atmospheric press with S/G PORV. STANDARD: The PORV on at least ONE steam generator is opened by placing hand switch to open or PIC to 100% to depressurize the S/G to atmospheric pressure. **Step is critical because it ensures at least one S/G which can be filled from a low pressure source to supply a heat sink for the RCS.** COMMENTS:	**CRITICAL STEP** ___ SAT ___ UNSAT
STEP 10: Notify the Unit Supervisor that bleed and feed has been established. STANDARD: The Unit Supervisor is notified that bleed and feed has been established. **Cue: Acknowledge the report using repeat back. State "another operator will continue from here."** COMMENTS: **END OF TASK**	___ SAT ___ UNSAT

STOP TIME ________

APPLICANT CUE SHEET

(RETURN TO EXAMINER UPON COMPLETION OF TASK)

INITIAL CONDITIONS:

1. The unit was at 100% RTP when a MFW line break caused a reactor trip.

2. All AFW pumps were removed due to cavitation; operators have been dispatched to investigate.

3. Wide range levels on all SGs are < 26%.

4. You are the Operator at the Controls

INITIATING CUES:

The Unit Supervisor directs you to perform actions of FR-H.1, "Loss of Heat Sink" to establish bleed and feed, beginning at Step 18.

TVA

Watts Bar Nuclear Plant

Unit 1

Emergency Operating Instruction

FR-H.1

Loss of Secondary Heat Sink

Revision 0018

Quality Related

Level of Use: Continuous Use

Effective Date: 12-20-2010

Responsible Organization: OPS, Operations

Prepared By: Nicholas Armour

Approved By: Brian McIlnay

Current Revision Description

Minor/editorial revision: Converted to Word 2007 (PCR 4894). Corrected "total AFW flow" to "total feed flow" in Section 2.1, Indications, to match following CAUTION (PCR 3453). Added E-1, E-3, and ECA-3.3 to Section 2.2, Transitions, as all three procedures transition to FR-H.1 (PCR 3452). Added Vault Room Flood Level to NOTE before Step 12 to address all reasons that RTBs need to be cycled (PER 280872).

1.0 PURPOSE

This Instruction provides actions to respond to a loss of secondary heat sink in all steam generators.

2.0 SYMPTOMS AND ENTRY CONDITIONS

2.1 Indications

All S/G NR levels less than or equal to 29% [39% ADV] and total feed flow less than or equal to 410 gpm.

2.2 Transitions

A. E-0, Reactor Trip or Safety Injection.

B. E-1, Loss of Reactor or Secondary Coolant

C. E-3, Steam Generator Tube Rupture

D. ECA-3.3, SGTR Without PZR Pressure Control

E. ES-0.1, Reactor Trip Response.

F. FR-0, Status Trees, FR-H in RED condition.

Step	Action/Expected Response	Response Not Obtained

3.0 OPERATOR ACTIONS

CAUTION

- If total feed flow CAPABILITY of 410 gpm is available, this Instruction should **NOT** be performed.
- If an Intact S/G is available, feed flow should **NOT** be reestablished to any faulted S/G.

Step	Action/Expected Response	Response Not Obtained
1.	**CHECK** if secondary heat sink is required:	
	a. RCS pressure greater than any Intact S/G pressure.	a. **RETURN TO** Instruction in effect.
	b. RCS temperature greater than 375°F [360°F ADV].	b. **PLACE** RHR System in service while continuing in this instruction. • **REFER TO** SOI-74.01, Residual Heat Removal System. **WHEN** adequate RHR shutdown cooling established, **THEN** **RETURN TO** Instruction in effect.
2.	**ENSURE** at least one charging pump RUNNING.	**IF** at least one charging pump **NOT** RUNNING, **THEN** **STOP** all RCPs **AND** ** **GO TO** Cautions prior to Step 18 to initiate RCS bleed and feed.

Step	Action/Expected Response	Response Not Obtained
	CAUTION RCS bleed and feed criteria must be monitored for immediate response if the criteria is exceeded.	
3	**DETERMINE** if RCS bleed and feed required:	
	a. **CHECK** RCS bleed and feed required: • Any THREE S/G WR levels less than or equal to 26% [36% ADV]. **OR** • RCS pressure greater than or equal to 2335 psig.	a. **MONITOR** RCS bleed and feed criteria: **WHEN** criteria are met, **THEN** **PERFORM** Substep 3b. ** **GO TO** Step 4.
	b. **STOP** all RCPs, **AND** ** **GO TO** Cautions prior to Step 18 to initiate RCS bleed and feed.	

Step	Action/Expected Response	Response Not Obtained
4.	**ENSURE** S/G blowdown ISOLATED.	Manually **CLOSE** valves.
5.	**MONITOR** CST volume greater than 200,000 gal.	**INITIATE** CST refill USING SOI-59.01, Demineralized Water System. **IF** CST volume drops to less than 5000 gal, **THEN** **MONITOR** AFW pumps to ensure suction transfer.

NOTE If the use of condensate flow is anticipated, then a higher pzr level will better accommodate the level shrink from S/G cooldown and depressurization.

6.	**CONTROL** pzr level between 29% and 63% [47% and 58% ADV].	

Step	Action/Expected Response	Response Not Obtained
7.	**ESTABLISH** MD AFW pump flow:	
	a. **CHECK** MD AFW pump AVAILABLE.	a. ** **GO TO** Step 8.
	b. **ENSURE** both MD AFW pumps RUNNING.	b. **START** pumps from the shutdown boards.
	c. **ENSURE** MD AFW LCVs OPEN.	c. **OPEN** MD LCVs from the auxiliary control room, **OR** Locally **OPEN** MD LCVs and manual isolation valves USING SOI-3.02, Auxiliary Feedwater System.
	d. **CHECK** MD AFW pump flow greater than 410 gpm.	d. **ENSURE** AFW valve alignment USING SOI-3.02, Auxiliary Feedwater System.
	e. **CHECK** NR level in at least one S/G greater than 29% [39% ADV].	e. **MAINTAIN** total feed flow to S/Gs greater than 410 gpm UNTIL NR level in at least one S/G greater than 29% [39% ADV]. **WHEN** NR level in at least one S/G greater than 29% [39% ADV], **THEN** **RETURN TO** instruction in effect. ** **GO TO** Step 8.
	f. **RETURN TO** Instruction in effect.	

Step	Action/Expected Response	Response Not Obtained
8.	**ESTABLISH** TD AFW pump flow:	
	a. **CHECK** TD AFW pump AVAILABLE.	a. ** **GO TO** Step 9.
	b. **ENSURE** turbine steam supply valves OPEN: • Either 1-FCV-1-15 or 1-FCV-1-16. • 1-FCV-1-17 and 1-FCV-1-18 • Trip and throttle valve.	b. **OPEN** steam supply valves from reactor MOV boards. **IF** trip and throttle valve 1-FCV-1-51 closed, **THEN** **CHECK** the following: • Valve latched to motor operator. • Mechanical overspeed reset. • Thermal overloads reset.
	c. **ENSURE** TD AFW LCVs OPEN.	c. **OPEN** TD LCVs at auxiliary control panel [TD pump room, 692], **OR** Locally **OPEN** TD LCVs and manual isolation valves: • S/G 1 and 4 [south vlv room]. • S/G 2 and 3 [Aux Bldg 737].
	d. **CHECK** TD AFW pump speed NORMAL.	d. Locally **CONTROL** TD AFW pump.
	e. **CHECK** TD AFW pump flow greater than 410 gpm.	e. **ENSURE** AFW valves aligned USING SOI-3.02, Auxiliary Feedwater System.

Step continued on next page

Step	Action/Expected Response	Response Not Obtained
8.	(continued)	
	f. **CHECK** NR level in at least one S/G greater than 29% [39% ADV].	f. **MAINTAIN** total feed flow to S/Gs greater than 410 gpm UNTIL NR level in at least one S/G greater than 29% [39% ADV]. **WHEN** NR level in at least one S/G greater than 29% [39% ADV], **THEN** **RETURN TO** Instruction in effect. ** **GO TO** Step 9.
	g. **RETURN TO** Instruction in effect.	
9.	**STOP** all four RCPs.	
10.	**IF** Secondary pumps will be used to feed S/Gs, **THEN** **REFER TO** Appendix A (FR-H.1), Establishing MFW following Reactor Trip, while continuing this Instruction.	

CAUTION

- If offsite power is lost after SI reset, manual action will be required to restart the SI pumps and RHR pumps due to loss of SI start signal.
- If plant conditions degrade after automatic SI is blocked, manual actuation may be required.

NOTE After the low steamline pressure SI signal is blocked, main steamline isolation will occur if the high steam pressure rate setpoint is exceeded.

Step	Action/Expected Response	Response Not Obtained
11.	**BLOCK** SI signals:	
	a. **INITIATE** RCS depressurization to less than 1912 psig:	
	1) **IF** letdown in service, **THEN** **ALIGN** aux spray USING Appendix B (FR-H.1), ALIGN AUX SPRAY.	1) **IF** letdown is **NOT** in service, **THEN** **USE** one pzr PORV.
	b. **BLOCK** auto SI actuation signals [68-B], and [69-B]:	
	1) **NOTIFY** IMs to block auto SI USING IMI-99.040, AUTO SI Block.	
	2) **WHEN** RCS pressure is less than 1962 psig (P-11), **THEN** • **BLOCK** low pzr pressure SI. • **BLOCK** low steam pressure SI.	

Step continued on next page

Step	Action/Expected Response	Response Not Obtained
11.	(continued)	
	c. **ENSURE** high cntmt pressure SI signal CLEARED [78-G].	
	d. **CHECK** SI actuated.	d. ** **GO TO** Substep 11f.
	e. **RESET** SI, **AND** **CHECK** the following: • SI ACTUATED permissive DARK. • AUTO SI BLOCKED permissive LIT.	
	f. **MAINTAIN** RCS pressure less than 1912 psig.	

NOTE

- Cycling reactor trip breakers to allow MFW Isolation reset is required if SI, HI-HI S/G level, or Valve Vault Room Flooding has occurred.
- If any valid SI signal has occurred since SI reset, cycling reactor trip breakers will initiate SI.

12. **PREPARE** for MFW startup:

    a. **PLACE** MFW pump controllers in MANUAL, **AND**

    SET to zero.

    b. **PLACE** MFW reg valve controllers in MANUAL, **AND**

    SET to zero.

    c. **PLACE** MFW reg bypass valve controllers in MANUAL, **AND**

    SET to zero.

Step continued on next page.

Step	Action/Expected Response	Response Not Obtained
12.	(continued)	
	d. **CHECK** FW bypass isolation valves OPEN.	d. **PERFORM** the following: 1) **WHEN** SI signals are blocked or cleared, **THEN** **CYCLE** reactor trip breakers to allow MFW Isolation reset. 2) **RESET** MFW isolation: • **PLACE** both MFW isol reset switches to RESET [M-3]. • **ENSURE** MFW isol signal clears [M-6 Master Panel]. • **PUSH** MFW isol reset pushbuttons [M-3]. • **ENSURE** MFW bypass isol valves OPEN. 3) **PLACE** 1-HS-3-45 in LONG CYCLE RECIRC. **IF** no FW bypass isolation valve can be opened, **THEN** ** **GO TO** Step 17.

Step	Action/Expected Response	Response Not Obtained
	NOTE If the standby feed pump will be used, only the hotwell pumps should be started to prevent an overpressure condition.	
13.	**ESTABLISH** feedwater flow:	
	a. **START** secondary plant pumps as necessary: 1) Hotwell pumps. 2) Condensate booster pumps. 3) Cond DI booster pumps.	a. **IF** secondary plant pumps are **NOT** available, **THEN** ** **GO TO** Step 17.
	b. **CHECK** MSIVs OPEN.	b. **IF** MSIVs can be OPENED, **THEN**: 1) **OPEN** MSIV bypass valves. 2) **OPEN** MSIVs as necessary.
	c. **ESTABLISH** MFW pump flow: 1) **START** MFW pump turbine or standby feed pump. 2) **CONTROL** MFW pump and bypass reg valve(s) to restore S/G level(s).	c. **IF** MFW pump flow is **NOT** established, **THEN**: • **START** additional secondary plant pumps as necessary. • ** **GO TO** Step 15.

Step	Action/Expected Response	Response Not Obtained
14.	**CHECK** secondary heat sink restored:	
	a. NR level in at least one S/G greater than 29% [39% ADV].	a. **IF** feed flow established to at least one S/G: • S/G Wide Range level rising, **OR** • Incore T/C dropping. **THEN** **MAINTAIN** flow to restore NR level to greater than 29% [39% ADV]. **IF** feed flow **NOT** established to at least one S/G, **THEN** ** **GO TO** Step 15.
	b. **RETURN TO** Instruction in effect.	

Step	Action/Expected Response	Response Not Obtained
15.	**ESTABLISH** condensate flow:	
	a. **ENSURE** condensate aligned to S/Gs: 1) **OPEN** MFW pump bypass valve 1-FCV-3-86. 2) **THROTTLE OPEN** bypass reg valves.	
	b. **DEPRESSURIZE** at least one S/G at maximum rate (25% demand) USING steam dump to condenser UNTIL condensate flow established.	b. **IF** condenser **NOT** available, **THEN** **USE** S/G PORV(s) for at least one intact S/G at maximum rate.
	c. **WHEN** condensate flow is established, **THEN** **STOP** S/G depressurization **AND** **MAINTAIN** S/G press (using steam dump or PORV) low enough to ensure condensate flow is maintained.	

Step	Action/Expected Response	Response Not Obtained
16.	**CHECK** secondary heat sink restored:	
	a. NR level in at least one S/G greater than 29% [39% ADV]	a. **IF** feed flow established to at least one S/G, • S/G Wide Range level rising, **OR** • Incore T/C dropping. **THEN** **MAINTAIN** flow to restore NR level to greater than 29% [39% ADV]. **IF** feed flow **NOT** established to at least one S/G, **THEN** ** **GO TO** Step 17.
	b. **RETURN TO** Instruction in effect.	
17.	**DETERMINE** if RCS bleed and feed required:	
	a. **MONITOR** RCS bleed and feed criteria: • Any THREE S/G WR levels less than or equal to 26% [36% ADV]. **OR** • RCS pressure greater than or equal to 2335 psig.	a. **RETURN TO** Cautions prior to Step 1.

Step	Action/Expected Response	Response Not Obtained
	CAUTION Step 18 Through 20 must be performed quickly in order to establish RCS heat removal by RCS bleed and feed. Termination of bleed and feed is required prior to transitioning out of FR-H.1 when heat sink is restored.	
18	**ACTUATE** SI.	
19.	**ENSURE** at least one of the following RCS feed paths: • At least one charging pump injecting thru BIT, **OR** • At least one SI Pump running with its injection valves open.	Manually **START** pumps **AND** **ALIGN** valves as necessary to establish feed path. **IF** feed path **NOT** available, **THEN**: 1) **CONTINUE** attempt to establish RCS feed path. 2) ** **GO TO** Step 4.

Step	Action/Expected Response	Response Not Obtained

CAUTION

- When the reactor vessel head vent block valve is opened, the throttle valve will cycle open and closed.
- Slowly opening (5 seconds stroke time) the head vent valve will prevent water hammer and pipe damage.

Step	Action/Expected Response	Response Not Obtained
20.	**ENSURE** adequate RCS bleed path:	
	a. **ENSURE** all pzr PORVs and pzr PORV block valves OPEN.	a. **PERFORM** the following: 1) **RESTORE** power to head vents: • **PLACE** 1-SW-68-394-A disconnect switch to ON [125V Vital Batt Bd Rm I]. • **PLACE** 1-SW-68-395-B disconnect switch to ON [125V Vital Batt Bd Rm II]. 2) **OPEN** all reactor vessel head vent and block valves.

Step continued on next page

Step	Action/Expected Response	Response Not Obtained

20. (continued)

3) **OPEN** ERCW valves to AFW pump suction,

   OR

   ALIGN HPFP to at least one Intact S/G USING the following:

   - AOI-7.06, Alignment of HPFP Water to the Steam Generators.
   - MI-17.018, Flood Preparation - HPFP System Spool Pieces.

4) **WHEN** one of the above low press water sources is aligned to the S/Gs, **THEN**

   DEPRESSURIZE at least one intact S/G to atmospheric press with S/G PORV.

CAUTION WHEN feedwater source is AVAILABLE, THEN feed rate will be controlled by Steps 30 and 31.

NOTE The details of Steps 4 through 15 may be referred to as necessary to establish feed flow in the following step but procedure performance must continue to terminate RCS bleed and feed.

21. **RESET** SI, **AND**

    CHECK the following:

    - SI ACTUATED permissive DARK.
    - AUTO SI BLOCKED permissive LIT.

22. **RESET** Containment Isolation Phase A and Phase B.

Step	Action/Expected Response	Response Not Obtained
23.	**ENSURE** cntmt air in service:	
	a. Aux air press greater than 75 psig [M-15].	a. **DISPATCH** Operator to aux air compressors: 1) **ENSURE** affected compressor(s) running. 2) **ENSURE** affected train isolation valve CLOSED: • Train A, 0-FCV-32-82. • Train B, 0-FCV-32-85.
	b. Cntmt air supply valves OPEN [M-15]: • 1-FCV-32-80. • 1-FCV-32-102. • 1-FCV-32-110.	
24.	**PERFORM** Steps 1 through 6 of E-0, REACTOR TRIP OR SAFETY INJECTION, while continuing with this Instruction.	
25.	**MAINTAIN** RCS bleed and feed paths: • **MAINTAIN** charging pump injection thru BIT. • **MAINTAIN** SI pump flow. • **MAINTAIN** both pzr PORVs and block valves OPEN.	

Step	Action/Expected Response	Response Not Obtained
	CAUTION If containment pressure rises to greater than 2.8 psig, containment spray should be verified.	
26.	**DETERMINE** if cntmt spray should be stopped:	
	a. Spray pumps running.	a. **IF** both spray pumps stopped, **THEN** ** **GO TO** Step 27.
	b. **MONITOR** cntmt pressure less than 2.0 psig.	b. **WHEN** cntmt pressure is less than 2.0 psig, **THEN** ** **PERFORM** Substeps 26c thru 26e.
	c. **RESET** containment spray signal.	
	d. **STOP** cntmt spray pumps **AND** **PLACE** in A-AUTO.	
	e. **CLOSE** cntmt spray discharge valves 1-FCV-72-2 and 1-FCV-72-39.	
27.	**WHEN** RWST level is less than 34%, **THEN** ** **GO TO** ES-1.3, TRANSFER TO RHR CONTAINMENT SUMP.	

Step	Action/Expected Response	Response Not Obtained

28. **ENSURE** CCS alignment for RHR operation:

    a. RHR heat exchanger B outlet 1-FCV-70-153 OPEN.

    b. RHR heat exchanger A outlet 1-FCV-70-156 OPEN.

    c. SFP heat exchanger A supply 0-FCV-70-197 CLOSED.

NOTE The details of Steps 4 through 15 may be referred to as necessary to establish feed flow in the following step but procedure performance must continue to terminate RCS bleed and feed.

29. **EVALUATE** the following to restore level in at least one S/G:

    a. AFW pumps.

    b. MFW pumps.

    c. Condensate pumps.

    d. ERCW valves to AFW suction.

    e. HPFP spool piece (AOI-7.06).

Step	Action/Expected Response	Response Not Obtained
	CAUTION Feedwater flow rates should be controlled to prevent excessive RCS cooldown.	
	NOTE If possible, a S/G should be selected to feed which has WR level greater than 15% [25% ADV] and RCS Loop WR hot leg temperature less than 550°F.	
30.	**ESTABLISH** feedflow to one Selected S/G:	
	a. Feed source - AVAILABLE	a. **GO TO** Step 33.
	b. Selected S/G WR level - less than 15% [25% ADV]	b. **ESTABLISH** feedflow to selected S/G at a rate which causes S/G WR level to rise and RCS Loop WR hot leg temperature to drop. **GO TO** Step 31.
	c. Selected S/G RCS Loop WR hot leg temperature - greater than 550°F	c. **ESTABLISH** feedflow to selected S/G at a rate which causes S/G WR level to rise and RCS Loop WR hot leg temperature to drop. **GO TO** Step 31.

Step continued on next page

Step	Action/Expected Response	Response Not Obtained
30.	(continued)	
	d. Core exit TCs - RISING	d. **ESTABLISH** feedflow to selected S/G at less than 100 GPM (40,000 PPH) UNTIL selected S/G WR level is greater than 15% [25% ADV], **THEN** **ADJUST** feedflow as necessary to obtain S/G NR level greater than 29% [39% ADV]. **GO TO** Step 31.
	e. **ESTABLISH** feedflow to selected S/G at maximum rate.	

Step	Action/Expected Response	Response Not Obtained
31.	**CHECK** Selected S/G:	
	a. Selected S/G RCS Loop WR hot leg temperature - less than 550°F	a. **MAINTAIN** feedflow to selected S/G at rate established in Step 30. **WHEN** selected S/G RCS Loop Hot Leg temperature less than 550°F, **THEN** **PERFORM** Steps 31b, c and d. ** **GO TO** Step 33.
	b. **CHECK** selected S/G pressure: • Selected S/G pressure controlled or rising • Selected S/G pressure greater than 120 PSIG	b. **ESTABLISH** feedflow to another INTACT S/G. **IF** no INTACT S/G exists, **THEN** **USE** FAULTED or RUPTURED S/G. **CONSULT** TSC for S/G selection. ** **GO TO** Step 32.

Step continued on next page

Step	Action/Expected Response	Response Not Obtained
31.	(continued)	
	c. **CHECK** selected S/G radiation: • S/G discharge monitors normal • Steamline surveys normal • Chemistry sample normal	c. **ESTABLISH** feedflow to another INTACT S/G. **IF** no INTACT S/G exists, **THEN** **USE** FAULTED or RUPTURED S/G. **CONSULT** TSC for S/G selection. ** **GO TO** Step 32.
	d. **GO TO** Step 33	

Step	Action/Expected Response	Response Not Obtained
32.	**IF** feedflow has been established to a second intact S/G in Step 31, **THEN** **ISOLATE** FAULTED or RUPTURED S/G: a. **ENSURE** the following valves CLOSED on FAULTED or RUPTURED S/G(s): • MSIV and MSIV bypasses • Feedwater isolation and bypass isolation valves • Feed reg and bypass reg valves • AFW level control valves • Local manual isolation for steam supply To TD AFP • PORV • S/G blowdown valve	
33.	**CHECK** all RCS bleed and feed termination criteria met: • At least one S/G NR level greater than 29% [39% ADV]. • Incore T/C dropping. • T-hot dropping.	**CONTINUE** RCS bleed and feed UNTIL all criteria met. **CONTINUE** actions to restore secondary heat sink. ** **GO TO** Note prior to Step 29.

CAUTION

- The reactor head vent throttle valve position indication may **NOT** be accurate. Monitoring of the PRT level, pressure, and temperature is required to confirm throttle valve position.
- Isolation of a failed throttle valve requires both reactor vessel head vent block valves to be closed.

34. **ENSURE** reactor head vent and block valves CLOSED.

35. **IF** head vents previously opened, **THEN**

    REMOVE power from head vents:

    - **PLACE** 1-SW-68-394-A disconnect switch to OFF [125V Vital Batt Bd Rm I]
    - **PLACE** 1-SW-68-395-B disconnect switch to OFF [125V Vital Batt Bd Rm II].

NOTE After closing a pzr PORV, it may be necessary to wait for RCS pressure to rise before checking if SI can be terminated.

36. **CHECK** if SI can be terminated:

a. RVLIS greater than 60%. — a. ** **GO TO** Step 37.

b. RCS subcooling greater than required from Table: — b. ** **GO TO** Step 37.

RCS PRESSURE BETWEEN	REQUIRED SUBCOOLING
285 AND 585 psig	65°F [85°F ADV]
585 AND 1085 psig	52°F [73°F ADV]
1085 AND 1885 psig	47°F [67°F ADV]
Greater than 1885 psig	44°F [64°F ADV]

c. ** **GO TO** Step 38.

Step	Action/Expected Response	Response Not Obtained
37.	**CHECK** RCS bleed path status:	
	a. **CHECK** any pzr PORV and associated block valve OPEN.	a. ** **GO TO** E-1, LOSS OF REACTOR OR SECONDARY COOLANT.
	b. **CLOSE** one pzr PORV **AND** **PLACE** in P-AUTO.	b. **CLOSE** PORV block valve. **IF** block valve can **NOT** be closed, **THEN** ** **GO TO** E-1, LOSS OF REACTOR OR SECONDARY COOLANT.
	c. **RETURN TO** Note prior to Step 36.	
38.	**STOP** ECCS Pumps, **AND** **PLACE** in standby: • SI pumps. • All but one Charging Pump.	

Step	Action/Expected Response	Response Not Obtained
	CAUTION Steps 39 through 41 should be performed quickly to prevent excessive RCS repressurization.	
39.	**CHECK** RCS bleed path status:	
	a. **CHECK** any pzr PORV and associated block valve OPEN.	a. ** **GO TO** Step 40.
	b. **CHECK** pzr pressure - less than 2335 psig.	b. **WHEN** pzr pressure less than 2335 psig, **THEN** **PERFORM** Step 39c. ** **GO TO** Step 40.
	c. **CLOSE** all but one pzr PORV **AND** **PLACE** in P-AUTO.	c. **CLOSE** associated PORV block valves. **IF** block valves can **NOT** be closed, **THEN** ** **GO TO** E-1, LOSS OF REACTOR OR SECONDARY COOLANT.

Step	Action/Expected Response	Response Not Obtained
40.	**TERMINATE** RCS bleed path:	
	a. **CHECK** pzr pressure - less than 2335 psig.	a. **WHEN** pzr pressure less than 2335 psig, **THEN** **PERFORM** Step 40b. ** **GO TO** Step 41.
	b. **CLOSE** both pzr PORVs **AND** **PLACE** in P-AUTO.	b. **CLOSE** associated PORV block valves. **IF** block valve can **NOT** be closed, **THEN** ** **GO TO** E-1, LOSS OF REACTOR OR SECONDARY COOLANT.
41.	**CLOSE** BIT outlet isolation valves 1-FCV-63-25 and 1-FCV-63-26.	
42.	**ENSURE** Containment Isolation Phase B RESET.	

Step	Action/Expected Response	Response Not Obtained
43.	**ENSURE** cntmt air in service:	
	a. Aux air press greater than 75 psig [M-15].	a. **DISPATCH** Operator to aux air compressors: 1) **ENSURE** affected compressor(s) running. 2) **ENSURE** affected train isolation valve CLOSED: • Train A, 0-FCV-32-82. • Train B, 0-FCV-32-85.
	b. Cntmt air supply valves OPEN [M-15]: • 1-FCV-32-80. • 1-FCV-32-102. • 1-FCV-32-110.	
44.	**ALIGN** Charging:	
	a. **CLOSE** RCP seal flow control 1-FCV-62-89.	
	b. **OPEN** charging isolations 1-FCV-62-90 and 1-FCV-62-91.	
	c. **ENSURE** charging valve 1-FCV-62-85 or 1-FCV-62-86 OPEN.	
	d. **OPEN** seal return valves 1-FCV-62-61 and 1-FCV-62-63.	
	e. **ADJUST** 1-FCV-62-89 and 1-FCV-62-93 to maintain seal injection flow between 8 and 13 gpm for each RCP.	

Step	Action/Expected Response	Response Not Obtained
45.	**CHECK** RCS hot leg temperatures STABLE or DROPPING.	**CONTROL** feed flow and steam dump as necessary to establish stable RCS hot leg temperatures.
46.	**CHECK** if RHR pumps should be stopped:	
	a. **CHECK** RHR suction aligned from RWST.	a. ** **GO TO** Step 47.
	b. **CHECK** RCS Pressure: 1) Pressure greater than 150 psig. 2) Pressure stable or rising.	b. ** **GO TO** E-1, LOSS OF REACTOR OR SECONDARY COOLANT.
	c. **STOP** RHR Pumps, **AND** **PLACE** in A-AUTO.	
47.	**CONTROL** charging flow to maintain pzr level.	
48.	** **GO TO** ES-1.1, SI TERMINATION, Step 13.	

End of Section

Appendix A
(Page 1 of 1)

Establishing MFW Following Reactor Trip

1.0 INSTRUCTIONS

CAUTIONS

1) Rx trip breakers must be cycled to allow reset of MFW when isolated by SI or HI-HI S/G level or Valve Vault Room level switches.
2) If any valid SI signal has occurred since SI reset, cycling Rx trip breakers may initiate SI actuation, if signal has **NOT** yet been blocked by IMs.

A. **ENSURE** MFW reg valves controllers in MANUAL, **AND**

SET to ZERO demand.

B. **ENSURE** bypass reg valves controllers in MANUAL, **AND**

SET to ZERO demand.

C. **WHEN** SI signals blocked **OR** cleared, **THEN**

CYCLE reactor trip breakers to allow MFW Isolation reset.

D. **RESET** MFW isolation:

1. **PLACE** both MFW isolation reset switches to RESET [M-3].
2. **ENSURE** MFW isolation signal clears [M-6 Master Panel].
3. **PUSH** MFW isolation reset push-buttons [M-3].

E. **ENSURE** MFW mode switch 1-HS-3-45 in LONG CYCLE RECIRC.

F. **ENSURE** MFW bypass isolation valves OPEN.

G. **ENSURE** standby MFW pump RUNNING, if available, **AND**

CONTROL S/G levels with MFW bypass reg controllers.

Appendix B
(Page 1 of 1)

Align Aux Spray

1.0 INSTRUCTIONS

A. **ENSURE** at least one charging pump running.

B. **IF** charging is **NOT** aligned, **THEN**

ALIGN charging:

1. **CLOSE** RCP seal flow control 1-FCV-62-89.
2. **OPEN** charging isolation 1-FCV-62-90 and 1-FCV-62-91.
3. **ENSURE** charging 1-FCV-62-85 or 1-FCV-62-86 OPEN.

CAUTION

If RCS is on cold leg recirc, seal return isolation valves should **NOT** be opened (prevents sump inventory from diverting to VCT).

4. **OPEN** seal return 1-FCV-62-61 and 1-FCV-62-63.

C. **ENSURE** BIT outlet valves 1-FCV-63-25 and 1-FCV-63-26 CLOSED.

NOTE

Aux spray flow can be maximized by closing the normal pzr spray valve(s).

D. **CONTROL** aux spray flow:

1. **OPEN** aux spray 1-FCV-62-84.
2. **CLOSE** charging 1-FCV-62-85 and 1-FCV-62-86.
3. **MODULATE** Pzr Spray valves as needed to control Pzr pressure.
4. **ADJUST** aux spray flow rate with 1-FCV-62-93 and 1-FCV-62-89 as needed.

A.1-1 SRO
Perform GO-10, Appendix HH, "RCS Void Determination."

WATTS BAR NUCLEAR PLANT
JOB PERFORMANCE MEASURE
A.1-1 SRO
06-2011 NRC Exam

EVALUATION SHEET

Task: Perform GO-10, Appendix HH, "RCS Void Determination."

Alternate Path: n/a

Facility JPM #: New

Safety Function: n/a **Title:** Conduct of Operations

K/A 2.1.7 Ability to evaluate plant performance and make operational judgments based on operating characteristics, reactor behavior, and instrument interpretation.

Rating(s): 4.4/4.7 **CFR:** 41.5 / 43.5 / 45.12 / 45.13

Evaluation Method: Simulator ________ In-Plant ____________ **Classroom** X

References: GO-10, "Reactor Coolant System Drain and Fill Operations, "Rev. 44.

Task Number: RO-068-SOI-68-001 **Title:** Fill and vent the Reactor Coolant System.

Task Standard: The applicant

1. Determines that the volume required to pressurize the RCS from 50 to 325 psig is 1733 gallons (± 5 gallons).
2. Determines that Step 15.1 actions are required to be taken based on the results of the original calculation.

Validation Time: 10 minutes **Time Critical:** Yes _____ No X

==

Applicant: ______________________ ________________ Time Start: ________

NAME Docket No. Time Finish: ________

Performance Rating: SAT ____ UNSAT ____ Performance Time ___

Examiner: ______________________ ______________________/________

NAME SIGNATURE DATE

==

COMMENTS

____

____

____

____

____

DIRECTIONS TO APPLICANT

DIRECTION TO APPLICANT:

I will explain the initial conditions, and state the task to be performed. All control room steps shall be performed for this JPM, including any required communications. I will provide initiating cues and reports on other actions when directed by you. Ensure you indicate to me when you understand your assigned task. To indicate that you have completed your assigned task return the cue sheet I provided you.

INITIAL CONDITIONS:

1. **Reactor Coolant System "sweeps and vents" is in progress per GO-10," Reactor Coolant System Drain and Fill Operations," Section 5.4.2, "RCP Sweeps and Vents."**
2. **The 30 second run of RCP 4 has been completed.**
3. **Venting steps of Appendix II are complete.**
4. **GO-10," Reactor Coolant System Drain and Fill Operations," Section 5.4.2, "RCP Sweeps and Vents," Step 11 is complete.**
5. **GO-10," Reactor Coolant System Drain and Fill Operations," Section 5.4.2, "RCP Sweeps and Vents," Step 12 directs the performance of Appendix HH.**

INITIATING CUE:

1. **You are to perform GO-10," Reactor Coolant System Drain and Fill Operations," Appendix HH, "RCS Void Determination," Step 12 to determine the volume required to pressurize the RCS from 50 psig to 325 psig, based on the data provided below.**

INITIAL VALUES

Computer Point OR	L0112A/	
VCT Level Indicator	**1-LI-62-139**	60.6%
Boric Acid Batch Counter Totalizer	1-FQ-62-139	794441
Primary Water Batch Totalizer	1-FQ-62-142	018453

FINAL VALUES

Computer Point OR	L0112A/	
VCT Level Indicator	**1-LI-62-139**	29.7%
Boric Acid Batch Counter Totalizer	1-FQ-62-139	795150
Primary Water Batch Totalizer	1-FQ-62-142	018882

2. **Based on the results of your total makeup calculation, determine the actions of GO-10," Reactor Coolant System Drain and Fill Operations," Section 5.4.2, "RCP Sweeps and Vents," which are required to be taken.**

STEP/STANDARD	SAT/UNSAT

START TIME: _______

EXAMINER: The following actions are taken from GO-10," Reactor Coolant System Drain and Fill Operations," Appendix HH, "RCS Void Determination."

STEP/STANDARD	SAT/UNSAT
STEP 1: [12] **DETERMINE** volume required to pressurize the RCS from 50 psig to 325 psig as follows [12.1] **DETERMINE** makeup volume added based on change in Boric Acid Batch Counter 1-FQ-62-139 totalizer readings. __________ - __________ = __________ Final reading Step 1.0[11] / Initial reading Step 1.0[7] / gallons STANDARD: Applicant enters **795150** as the final reading, **794441** as the initial reading, and calculates the change in volume to be **709** gallons. **Step is critical to ensure proper void calculation is performed.** COMMENTS:	**CRITICAL STEP** ___ SAT ___ UNSAT

STEP/STANDARD	SAT/UNSAT
STEP 2: [12.2] **DETERMINE** makeup volume added based on change in Primary Water Batch Counter 1-FQ-62-142 totalizer readings ________ - ________ = ________ Final reading Step 1.0[11] - Initial reading Step 1.0[7] = gallons STANDARD: Applicant enters **18882** as the final reading, **18453** as the initial reading, and calculates the change in volume to be **429** gallons. **Step is critical to ensure proper void calculation is performed.** COMMENTS:	**CRITICAL STEP** ___ SAT ___ UNSAT
STEP 3: [12.3] **DETERMINE** change in VCT level. ________ % - ________ % = +/- ________ Initial reading Step 1.0[7] - Final reading 1.0[11] = % change +/- STANDARD: Applicant enters **60.6%** as the final reading, **29.7** as the initial reading, and calculates the change in level to be **30.9**. **Step is critical to ensure proper void calculation is performed.** COMMENTS:	**CRITICAL STEP** ___ SAT ___ UNSAT

STEP/STANDARD	SAT/UNSAT
STEP 4: [12.4] **CONVERT** VCT level change to gallons as follows: ______ +/- X 19.27 = +/- ______ % change gallons/% gallons STANDARD: Applicant multiplies **30.9** times **19.27** and calculates the change in volume to be **595.4** gallons. **Step is critical to ensure proper void calculation is performed.** COMMENTS:	**CRITICAL STEP** ___ SAT ___ UNSAT

NOTE

A higher final VCT level will result in the change in VCT level being subtracted from total totalizer change

STEP/STANDARD	SAT/UNSAT
STEP 5: [13] **DETERMINE** total volume required to pressurize RCS. ______ + ______ +/- ______ = ______ change in Boric Acid totalizer (step 10.1); change in PMW totalizer (Step 10.2); change in VCT level (Step 10.3); Total makeup required STANDARD: Applicant adds **709** gallons, **429** gallons and **595.4** gallons and determines the total makeup required to be **1733.4** gallons. **Step is critical to evaluate if the total void volume is an acceptable value** COMMENTS:	**CRITICAL STEP** ___ SAT ___ UNSAT

STEP/STANDARD	SAT/UNSAT
EXAMINER: The following actions are taken from GO-10," Reactor Coolant System Drain and Fill Operations," Section 5.4.2, "RCP Sweeps and Vents."	
STEP 6: [13] **IF** total makeup required in APPENDIX HH is less than or equal to 465 GAL, **THEN** [13.1] **RECORD** further sweeps and vents are **NOT** required in Operations Narrative Log: [13.2] **GO TO** restoration section, Step 5.4.4[1] STANDARD: Applicant determines that Step 13 actions are not applicable, since the total makeup required was greater than 1723 gallons. COMMENTS:	___ SAT ___ UNSAT

NOTES

1) Total void volume of 465 gallons is an acceptable void following venting of the RCS. 1723 gallons is the acceptable total volume of voids related to Vacuum fill. When fill and venting is done in Section 4.4.1, distribution of the remaining gas volume in S/G s is unknown. For the purpose of natural circulation, the gas volume must be less than 200 SCF/S/G. A range of 465 to 1723 gallons of void meets the overall acceptance criteria but does not ensure that two individual loop can support natural circulation in Mode 4.
2) For voids in the range of 465 to 1723 gallon, two opposing RCPs must be run concurrently before declaring RCS loops properly filled for Mode 4 operation. This can be accomplished by running #1 AND # 3 OR #4 and #2 RCP for heatup to Mode 4.

STEP/STANDARD	**SAT/UNSAT**
STEP 7: [14] **IF** total makeup required in APPENDIX HH is between 465 GAL and 1723 GAL, choose one of the following paths: [14.1] **IF** Additional sweeps and vents are desired **THEN GO TO** Step 5.4.2[1] and start next RCP. [14.2] **IF** no further sweeps and vents are desired, **THEN RECORD** sweeps and vents are NOT required in Operations Narrative Log **AND GO TO** restoration section, Step 5.4.4[1]. STANDARD: Applicant determines that Step 14 actions are not applicable, since the total makeup required was greater than 1723 gallons. COMMENTS:	___ SAT ___ UNSAT

STEP/STANDARD	SAT/UNSAT
STEP 9: [15] **IF** total makeup required in APPENDIX HH greater than 1723 GAL, **THEN PERFORM** the following: [15.1] **IF** sweeps and vents have **NOT** been completed for all four individual RCS loops, **THEN GO TO** Step 5.4.2[1] [15.2] **IF** sweeps and vents are complete for all four individual RCS loops, **THEN PERFORM** 5.4.2[16] to run all four RCPs. STANDARD: Applicant determines that Step 15.1 is applicable, since RCP 4 is the first RCP to be run in the "sweeps and vents" process. **Step is critical to ensure proper actions are taken to reduce the RCS void to an acceptable volume.** COMMENTS: **END OF TASK**	**CRITICAL STEP** ___ SAT ___ UNSAT

STOP TIME ________

APPLICANT CUE SHEET

(RETURN TO EXAMINER UPON COMPLETION OF TASK)

DIRECTION TO APPLICANT:

I will explain the initial conditions, and state the task to be performed. All control room steps shall be performed for this JPM, including any required communications. I will provide initiating cues and reports on other actions when directed by you. Ensure you indicate to me when you understand your assigned task. To indicate that you have completed your assigned task return the cue sheet I provided you.

INITIAL CONDITIONS:

1. **Reactor Coolant System "sweeps and vents" is in progress per GO-10," Reactor Coolant System Drain and Fill Operations," Section 5.4.2, "RCP Sweeps and Vents."**
2. **The 30 second run of RCP 4 has been completed.**
3. **Venting steps of Appendix II are complete.**
4. **GO-10," Reactor Coolant System Drain and Fill Operations," Section 5.4.2, "RCP Sweeps and Vents," Step 11 is complete.**
5. **GO-10," Reactor Coolant System Drain and Fill Operations," Section 5.4.2, "RCP Sweeps and Vents," Step 12 directs the performance of Appendix HH.**

INITIATING CUE:

1. **You are to perform GO-10," Reactor Coolant System Drain and Fill Operations," Appendix HH, "RCS Void Determination," Step 12 to determine the volume required to pressurize the RCS from 50 psig to 325 psig, based on the data provided below.**

INITIAL VALUES

Computer Point OR	L0112A/	
VCT Level Indicator	**1-LI-62-139**	60.6%
Boric Acid Batch Counter Totalizer	1-FQ-62-139	794441
Primary Water Batch Totalizer	1-FQ-62-142	018453

FINAL VALUES

Computer Point OR	L0112A/	
VCT Level Indicator	**1-LI-62-139**	29.7%
Boric Acid Batch Counter Totalizer	1-FQ-62-139	795150
Primary Water Batch Totalizer	1-FQ-62-142	018882

2. **Based on the results of your total makeup calculation, determine the actions of GO-10," Reactor Coolant System Drain and Fill Operations," Section 5.4.2, "RCP Sweeps and Vents," which are required to be taken.**

TVA

KEY

Watts Bar Nuclear Plant

Unit 1

General Operating Instructions

GO-10

Reactor Coolant System
Drain And Fill Operations

Revision 0044

Quality Related

Level of Use: Continuous Use

Level of Use or Other Information: 5.3.4 (Midloop), 5.4.2 RCP Sweeps and Vents and 5.4.3 (Vacuum Refill) are CIPTE

Critical Procedure

Effective Date: 02-15-2011

Responsible Organization: OPS, Operations

Prepared By: R. A. O'Rear

Approved By: Brian McIlnay

Revision Log

Revision or Change Number	Effective Date	Affected Page Numbers	Description of Revision/Change
44	02/15/11	2, 3,10, 11, 23, 24, 25, 27, 31, 32, 36-41, 43, 49, 52, 56, 64- 68, 70, 72, 76, 79, 81, 84, 86, 87, 91, 92, 101, 105, 107, 108, 110, 156, 160-174, 177,180, 240, 260, 261, 259, 297, 301, 303, 307, 313, 328, 331, 335, 355, 356	Added safety related power source for Mansell in setup of Appendix BB, added print ref and Caution Order for supply breaker.[EDC 57026-A] Revised Appendix W to provide contingency instructions on raising RCS level if level instruments are lost during Reduced Inventory/Midloop operation . [PER 218865-2, PCR 4323] Removed extra performance of Appendix HH Void Determination based on successful first performance of section 5.4.1 in RFO9. [PCR 5097] Separated steps for changing RCS/cavity water level, flushing of crossunder drains and lowering RCS level to below loops based on Reactor condition (Mode 6 vs. Defueled) to limit Human Performance Error traps. [PCR 4215] Added step to evaluate CCS, ERCW, SFP temperature for impact on RCS heat up and to referenced RCS min temp for performance of MI-68.025. [PCR 4228] Revised coast down time in Section 5.4.2 to provide a time band Operator should wait to allow RCP to coast down before lowering pressure. [PCR 5075] Revised isolation of gas analyzer to PRT to de-select PRT first then isolate manual valve at PRT following RCS clean up to limit dose. [PCR 4211] • Format improvements for recorded data. • Revised Section 5.2.2 allow Chemistry to request use Aux spray for cleanup. [PCR 4315] • Revised Section titles to clarify performance in Mode 6 or Defueled. • Removed actions from notes or revised and consolidated notes and cautions to comply with writers guide. [PCR 4442] • Added locations for system 77 valves and checks of valve positions for verification of configuration.

			• Enhanced steps in Section 5.4.2 to provide a time band Operator should wait to allow RCP to coast down before lowering pressure. [PCR 5075] • Listed RHR flow blocking devices on Attachment 1 [PCR-4216] • Corrected Section titles, nomenclature, and organization titles. . [PCR 5004, 4751, 4322] • Added note addressing level response when draining below el 731 using the RCS-PZR cross connect based on Operator comment.. [PCR 4212] • Added End of Section markers.

Table of Contents

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1.0 INTRODUCTION

1.1 Purpose

This Instruction provides guidance and directives for plant operations during RCS drain down conditions and the subsequent refilling of the RCS. The following sections of this instruction are considered Complex Infrequently Performed Test or Evolutions (CIPTE):

- Section 5.3.4, Reduced Inventory / Midloop Conditions
- Section 5.4.2, RCP Sweeps and Vents
- Section 5.4.3, RCS Vacuum Refill

A. Scope

1. RCS Initial Drain Operations
2. Water (RCS or Cavity) Level Adjustments
3. RCS Final Refilling Operations
4. RCS Sweeps and Vents
5. RCS Vacuum Refill
6. S/G U-Tube Draining Via N_2 Injection

2.0 REFERENCES

2.1 Performance References

A. 0-SI-0-3, Weekly Log

B. MI-61.05, Blocking Of Ice Condenser Lower Inlet Doors During Cold Shutdown.

C. MI-68.001, Disassembly and Reassembly of the Reactor Pressure Vessel and Attachments.

D. OPDP-2, Switchyard Access And Switching Order Execution.

E. SOI-62.01, CVCS-Charging (1-HIC-62-93) and Letdown (1-HIC-62-81A).

F. TI-68.002, Containment Penetrations and Closure Control.

G. 1-TRI-62-3, Boric Acid Flow Paths: Valve Position Verification

H. SOI-30.02, Containment Purge System

I. SOI-62.02, Boron Concentration Control

J. SOI-68.02, Reactor Coolant Pumps

K. SOI-77.01, Liquid Waste Disposal

L. SOI-78.01, Spent Fuel Pool Cooling and Cleaning System

M. AOI-14, Loss of RHR Shutdown Cooling

N. CM-3.01, System Chemistry Specifications

O. GO-7, Refueling Operations

P. 1-SI-63-7, ECCS Throttle Valve Position Verification

Q. TI-31.022, Ultrasonic Flow Measurement

R. 1-SI-68-81, Offline Channel Calibration of RVLIS Transmitters and RCS Wide Range Pressure Transmitters

S. IMI-68.005, Calibration of Ultrasonic Level Measuring System

T. 1-SI-63-907, Residual Heat Removal Hot Leg and Cold Leg Injection Check Valve Testing

2.1 Performance References (continued)

U. 1-SI-63-917, Non-Intrusive Testing of Cold Leg Accumulator Check Valves

V. EPRI PWR Primary Water Chemistry Guidelines, Revision 6.

W. NPG-SPP-01.3, Housekeeping

X. 0-PI-OPS-17.1, 18 Month Lock Breaker Verification

Y. NPG-SPP-10.3, Verification Program

Z. NPG-SPP-10.1, System Status Control

AA. N-UT-72, Measuring Fluid Levels on Number 4 Hot Leg

BB. 1-SI-63-10.1-A, ECCS Discharge Pipes Venting - Train A Inside Containment

CC. 1-SI-63-10.2-A, ECCS Pumps and Discharge Pipes Venting - Train A Outside Containment

DD. 1-SI-63-10-B, ECCS Pumps Venting Train B

EE. 0-TRI-100-1, Flood Protection Communications

FF. 0-PI-OPS-1.1, Jumper Control Process

GG. NPG-SPP-06.9.1, Conduct of Testing

2.2 Developmental References

A. TI-68.012, Installation and Removal of the Mansell Level Monitoring System During Refueling Outages

B. SOI-68.01, Reactor Coolant System

C. SOI-74.01, Residual Heat Removal System

D. WAT-D-10451, Letter from Westinghouse Dated September 24, 1997 (T28970925801,) which considers RCS Loops filled via Vacuum Refill an effective means of ensuring natural circulation capability.

E. NPG-SPP-10.4, Reactivity Management Program

F. WAT-D-10044 (RIMS T33 950714 804 for Rev 0 & T33 950714 803 for Rev 1) PLS for Preheat S/G Feedwater System Interface Operation

G. FSAR Section 2.4.14.11, Special Conditions Allowance

H. Drawings:

- 48W935-19 Reactor Well and Refueling Canal Ladders
- 47W915-6 & 7 Reactor Building - Heating, Ventilating and Air Conditioning

I. EDC 51869-A

J. EDC 51673

K. EDC 57026-A

L. 45N1645-3 & -2 Connection Diagrams showing approved Mansell power source.

3.0 PRECAUTIONS AND LIMITATIONS

3.1 Partial Draindown / Reduced Inventory / Mid-Loop Operation Mode 6

A. Partial Draindown / Reduced Inventory / Mid-Loop (RI/M) operation exists as described in the following:

1. Partial Draindown is below el. 725'.

2. Reduced Inventory is defined as a condition with fuel in Reactor Vessel and water level below el. 722'.

3. Mid-Loop is defined as a condition with fuel in Reactor Vessel and water level below the top of the Hot Legs. (el. 719' 2 1/2") and above el. 718' 6".

B. Reduced Inventory/Midloop operations.

1. Level should be greater than 6" above centerline of RCS loop piping for one RHR pump operation, limited to two-loop injection.

2. Running RHR pump should be stopped BEFORE starting Standby RHR pump.

3. If RHR pump cavitates, RHR flow shall be reduced (normal just over 2000 gpm); continued cavitation could damage the RHR pump.

C. During RI/M operations, only one RHR Pump should be in service at a time.

D. RHR flow & motor amps should be closely monitored during Midloop operations. The RHR pump shall be checked locally for unusual sounds once every two hours during Midloop operations. Any erratic indications in flow, amps or sounds are indications of pump cavitation. Reducing the flow on the pump should slow air intake at the suction of the pump. This should help until RCS level can be raised. [C.1][C.2]

E. No work shall be performed on the operating train of RHR during Mid-Loop evolutions. This includes electrical supplies (Diesel included) to pump, valves and instrumentation. This also includes R panels associated with systems 62 and 74, CVCS, CCS to the RHR pump or any other system with the potential to impact RCS level or cooling. The standby train of RHR shall also remain OPERABLE. [C.3]

F. No work shall be performed on CCP(s) used in establishing makeup capability for postulated loss of RHR Cooling (See Precaution N.2.e.)

3.1 Partial Draindown / Reduced Inventory / Mid-Loop Operation Mode 6 (continued)

G. Scheduling of activities that could lead to perturbations to the RCS or RHR system while the RCS is in a reduced inventory condition should be avoided.

H. While in a Reduced Inventory/Midloop condition, continuous indication of RCS level shall be provided by at least two level instruments. The two level instruments used shall agree to within 2 inches below el. 722', and should agree to within 1 inch below el. 719' 2 1/2". Level reduction should be suspended if the 1-inch criterion is **NOT** met and an evaluation of level instrumentation performed prior to continued level reduction. The evaluation should consider:

1. The rate of level change versus letdown flow rate as compared with the values of APPENDIX G or APPENDIX H,
2. Consistent incremental changes between available RCS level instruments, and,
3. Confidence in the most conservative RCS level instrument being used for monitoring. This evaluation shall be documented in the unit log.
4. Walk down of the PZR cross connect hosing should be considered to verify no flow restrictions/crimps.

I. Unexplained RCS level changes are to be investigated immediately (REFER TO AOI-6, Small RCS Leak, and 1-SI-68-32, "Measurement of Identified and Unidentified RCS Leakage"). [C.9][C.12]

J. Inventory balances should be performed prior to any RCS level changes and expected responses discussed.

K. RCS temperature (RHR inlet) shall be less than or equal to 140°F for entry into Mid-Loop operation.

L. If the Reactor head is to remain installed during RI/M operations, then two core exit thermocouples are to be in service and frequently monitored.

M. Communications between the MCR and SG platform shall be maintained from the time nozzle dam is removed until the primary manway has been installed.

3.1 Partial Draindown / Reduced Inventory / Mid-Loop Operation Mode 6 (continued)

N. While in RI/M, it is necessary to have proper hot leg venting paths in the event of a loss of RHR cooling. This is necessary to prevent the boil off from the core decay heat pressurizing the RCS above two psig. [C.2] The requirements are applicable until Cold Leg breaches are closed. (e.g. CL S/G manways closed, system openings, which cannot be isolated, CL injection check valve bonnet replaced, High-pressure seal on thimble guides, RCPs coupled up or properly blocked.)

1. Prior to refueling, the vent path shall be either:

   a. Reactor vessel head removed.

   b. One or more SG Hot Leg manways removed. (Hot Leg nozzle dam **NOT** installed on applicable SG loop)

2. After refueling, any of the following combinations are adequate vent paths:

   a. Reactor vessel head removed.

   b. One or more SG Hot Leg manways removed. (Hot Leg nozzle dam **NOT** installed on applicable SG loop)

   c. One Hot Leg SIS check valve bonnet removed and at least two Pressurizer safety valves removed.

   d. One Hot Leg SIS check valve bonnet removed and the Pressurizer manway removed.

   e. With Reactor Vessel head installed, all nozzle dams installed, and only one Pressurizer Safety valve removed, two CCPs shall be available with only one aligned for injection to comply with TS 3.4.12. The second CCP can only be aligned for injection if the other becomes unavailable.

O. The Maintenance supply is an unqualified feed to the shutdown board and can only be used in Mode 5 or 6. Anytime the maintenance feed is used to supply the shutdown board, the board is inoperable. [C.6]

1. The RHR pump aligned and operating to support RI / M operation should NOT be supplied from a shutdown board aligned to its maintenance supply.

3.1 Partial Draindown / Reduced Inventory / Mid-Loop Operation Mode 6 (continued)

2. The idle pump should **NOT** be supplied from a shutdown board utilizing the maintenance feed. If it can **NOT** be avoided, the following should occur:

   a. Both the Load Dispatcher and Watts Bar Hydro Plant Personnel should be informed of the "additional challenge this presents during Reduced Inventory / Mid-Loop operation,"

   b. The Load Dispatcher shall be informed of the need to "maintain 500kV system voltage as stable as possible" and,

   c. Every effort shall be made to limit the time the shutdown board remains on its maintenance feed.

P. The tygon hose (APPENDIX E) is the least preferred method of RCS level indication but can be used to provide comparison of level indications.

Q. Level instruments LG-68-399, LT-68-399A and LT-68-399B share the same lower tap. In addition, the two MLMS channels and tygon tube also share a common lower tap. Two instruments off the same tap may be used as the operable and backup channel of APPENDIX C as long as periodic checks with other level instruments are performed to confirm level is trending in the same direction for all instruments during a transient or remaining steady when required. This does **NOT** impose any accuracy requirements, just a trend to ensure all instruments are responding in the same direction for given plant condition. The common root valves to these instruments will be locked open by this instruction when in use.

R. Prior to lowering RCS level, three level instruments should be tracking properly. In the event of an instrument drift or failure, this gives the ability to determine which instrument is no longer tracking properly. During draindown evolutions, some variations in level indications are possible due to pressure variations within the Reactor Vessel. These variations have been experienced when approaching el 731' and below. Unexpected level changes should be investigated using the guidance of precaution 3.1.H above.

3.1 Partial Draindown / Reduced Inventory / Mid-Loop Operation Mode 6 (continued)

S. Channel II of Mansell, if in use for level indication, will be affected by use of auxiliary spray.

T. Activities included in this procedure may change radiological conditions in the plant and coordination of these activities with Radiation Protection (RADPRO) is essential.

U. Steps within this instruction may require venting, draining or breaching radioactive components or systems to the atmosphere. Appropriate radiation protection controls must be established to prevent the spread of contamination and avoid the generation of airborne radioactivity.

3.2 RCS Operation (General)

A. Makeup water to the RCS shall have a C_B greater than or equal to the minimum required shutdown margin C_B.

B. One RHR Pump or RCP shall be in service during C_B changes or Chemical additions to ensure mixing.

C. RCP Seal injection should be in service when RCS level is above RCP seals or RCS press is above atmospheric, unless impellers are back seated. The leakoff valves shall be closed when the injection water is **NOT** supplied and the RCS pressure is less than 100 psig.

D. Before starting the first RCP, RCS should be evaluated for the possibility of lower C_B areas (such as hot legs, cold legs, etc.) by sampling RCS/VCT/RHR, and action taken as necessary to assure affects of starting RCP are acceptable. If the evaluation reveals a possibility of reducing shutdown margin, RCS C_B should be raised before starting first RCP. [C.10]

E. During RCS draining, expect a difference between Hot and Cold Calibrated Pressurizer level instruments. This is the results of the instruments being calibrated at different temperatures. [C.12]

F. During plant cooldown, only two RCPs should be operated below RCS temperature of 160°F.

G. For sweeps and vents, only one RCP should be operated below 80°F and only two RCPs should be operated between 80 and 105°F. Exception: Four RCPs should be operated below 105°F for approximately 5 minutes for sweeping and venting.

H. Prior to reducing below Reduced Inventory level of EL 722', the RHR System SHALL be in one-loop operation. [C.2]

I. When the refueling cavity is flooded, RCS purification should be maintained by the CVCS demineralizers via the RHR letdown.

3.3 Solid Water Operations

A. A dedicated operator will be stationed in the control room and will act as the Solid Plant Operator who will monitor and mitigate, as necessary, any over pressurization event. The Solid Water Operator will be released from their duties when the RCS is no longer in solid operations.

B. Solid water operations should be considered as transitionary and time spent in a solid water condition minimized as reasonably practical. Approach to solid water operations begins when pressurizer level is greater than 80% and ends when the pressurizer is water solid

C. Plant evolutions that may cause pressurizer level or RCS pressure or temperature to become unstable should be prohibited during approach to solid water operations.

D. If pressurizer level, RCS pressure or temperature, or charging flow become unstable during approach to solid water operations, pressurizer level should be reduced to less than 80% and investigate cause.

E. Configuration changes to either CVCS or RHR should be prohibited during approach to solid water operations.

F. 1-PCV-62-81, LETDOWN PRESSURE CONTROL, should be maintained near the middle of its control range during approach to solid water operations.

G. RHR inlet from RCS loop 4 should **NOT** be isolated unless there is a Pressurizer bubble OR Normal Charging / Letdown are stopped to ensure a relief path when RCS pressure is low (below 450 psig). (LCO 3.4.12).

H. With letdown from RHR, FCV-62-83, RHR LETDOWN FLOW CNTL, should be full **OPEN** and RCS pressure controlled by 1-PCV-62-81, CVCS LETDOWN HX PRESS CNTL. During this time, normal letdown, including all orifices, shall remain in service.

3.3 Solid Water Operations (continued)

I. After RCS heatup has begun, using RCP(s), if all RCPs are stopped for greater than 5 minutes and RCS temperature is greater than charging and seal injection temperature, do NOT restart a pump until a PZR steam bubble exists. This will minimize a pressure transient, due to previously injected cold water, when the first RCP is started

J. If all RCPs are stopped and RCS is being cooled down by RHR, a non-uniform RCS temperature distribution could occur. RCPs should **NOT** be started UNLESS a Pressurizer bubble exists.

K. When RCS pressure is being maintained by 1-PCV-62-81, CVCS LETDOWN HX PRESS CNTL, flow-rate changes through the RHR loop by throttling valves or starting/stopping the RHR Pumps will result in changes to RCS pressure. Stopping RHR pumps can cause a pressure spike of 100 to 150 psig.

L. An evaluation of the potential for RCS pressure and/or temperature transients must be performed prior to any evolution that will be performed when approaching or during solid water operations.

3.4 RCS Vacuum Refill

A. During RCS Vacuum Refill (Section 5.4.3), maximum vacuum level is dependent on RCS temperature and RHR flow rate. Vacuum should be determined using the graph in APPENDIX CC.

B. During RCS Vacuum Refill, in the event of a loss of an operating RHR pump, vacuum shall be immediately broken at the vacuum skid by the performance of Section 4.0 of local Vacuum Skid operating instructions contained in APPENDIX AA. When RCS is at atmospheric pressure, AOI-14, Loss of RHR Shutdown Cooling, should be entered. If level exists in the Pressurizer, natural circulation should be considered an option. Use the following parameters for verifying natural circulation conditions exist:

1. RCS Subcooling based on core exit TCs - Greater than 4°F,
2. SG Pressures - STABLE OR DROPPING,
3. RCS hot leg temperatures - STABLE OR DROPPING,
4. Core Exit TCs - STABLE OR DROPPING,
5. RCS Cold Leg Temperatures - AT SATURATION TEMPERATURE FOR SG PRESSURE.

3.5 RHR Operability / Availability

A. In Mode 6 with the water level ≥ 23 ft above the top of reactor vessel flange (≥ el. 748'), one RHR loop shall be operable and in operation with flow greater than or equal to 2500 gpm. (T.S. 3.9.5) REFER TO SOI-74.01, APPENDIX A, for operating pump flow limits.

B. In Mode 6 with the water level less than 23 ft above the top of Reactor vessel flange (less than el. 748'), two RHR loops shall be operable, and one RHR loop shall be in operation with flow greater than or equal to 2000 gpm. (T.S. 3.9.6)

C. In Mode 5 with the loops **NOT** filled, two RHR loops shall be operable and one RHR loop shall be in operation. (T.S. 3.4.8)

D. In Mode 5 with the loops **NOT** filled, all RHR pumps may be de-energized for less than or equal to 15 minutes when switching from one train to another (T.S. 3.4.8.1)(provided all the following conditions are met):

1. The core outlet temperature is maintained greater than 10°F below saturation temperature, and

2. No operations are permitted that would cause a reduction of the RCS C_B, and

3. No draining operations (to further reduce RCS water volume are permitted.

E. In Mode 5 with the loops **NOT** filled, one RHR loop may be inoperable for less than or equal to 2 hours for surveillance testing provided that the other RHR loop is operable and in operation. (T.S. 3.4.8.2)

F. The Charging pump may be SHUT DOWN during Mid-Loop operation if CVCS is **NOT** needed for RCS cleanup. However, the Charging pump shall remain operable along with the normal charging line for RCS makeup if there is a loss of RHR cooling. [C.2]

3.5 RHR Operability / Availability (continued)

G. 1-FCV-63-1, RWST TO RHR SUCT, shall remain operable for gravity fill of the RCS if there is a loss of RHR cooling. [C.2]

H. The following equipment should remain available during mid-loop operations:

1. One train Containment Air Return fans, two bays of the ice condenser, and divider barrier, OR

2. Required train(s) of Containment Purge supply and exhaust fans. (REFER TO TI-68.002.).

I. If RHR cooling is lost at any time during RI/M operations then AOI-14, Loss of RHR Shutdown Cooling, shall be implemented. If nozzle dams removed and primary manways **NOT** installed, ensure SG platforms are cleared of personnel.

J. Failure to have RHR System C_B greater than RCS C_B before placing the RHR System in service can reduce shutdown margin.

K. With RCPs off, if RHR Letdown is removed from service, the VCT C_B shall be sampled periodically and compared to RHR system C_B to ensure that a boron reduction event does **NOT** occur. [C.16]

L. Both RHR Pumps should **NOT** be operated together on miniflow with both letdown isolation valves [1-SPV-74-530 (-531), RHR HX 1A (1B) OUTLET TO CVCS] and/or both HX bypasses open [1-HCV-74-36 (-37), RHR HEAT EXCHANGER 1A (1B) MANUAL BYPASS.] This will help prevent pump-to-pump head interaction and possible pump damage. [C.17]

M. Valves 1-SPV-74-530 and 531, RHR HX 1A (1B) OUTLET TO CVCS are Kerotest packless valves and are **NOT** designed for reverse flow conditions. Reverse flow will cause severe piping, valve, and support damage due to excessive piping vibration. [C.15]

Date________ **INITIALS**

4.0 PREREQUISITES

NOTES

1) Throughout this Instruction, where an **IF/THEN** statement exists, the step should be **N/A** if condition does **NOT** exist.
2) Steps in Section 4.0 may be performed in any order.
3) Throughout this instruction, Concurrent Verification (CV) for breaker or fuse manipulations may be marked **N/A** if no manipulation is performed.

[1] **ENSURE** Precautions & Limitations of Section 3.0 have been reviewed. ________

[2] **ENSURE** RADPRO has been briefed on the activity to be performed and is prepared to monitor radiological conditions and control personnel access to affected areas. ________

[3] **ENSURE** RCS is cooled down and depressurized as controlled by the applicable section(s) of GO-6. ________

CAUTIONS

1) Installation of the Mansell instrumentation involves breaching of the RCS and potential exposure to highly radioactive material. RCS system flush at the drain connection may be required prior to system breach.
2) Do **NOT** open the temporary valves for Mansell instrumentation until RCS pressure is below 85 psig.

NOTE

APPENDIX U shows the various uses for the valves installed with these manifolds and the locations of the manifolds.

[4] **INITIATE** APPENDIX BB, Mansell Level Monitor System Installation and Removal installation of temporary connection manifolds to support Mansell Level Monitoring System (MLMS). ________

Date________ **INITIALS**

4.0 PREREQUISITES (continued)

[5] **PLACE** a Caution Order on 1-BKR-235-3/28, MCR PANEL 1-M-6 INSTR CNTL BUS 1 PLUGMOLD to identify breaker as Mansell power source. [120V Vital Instrument Bd 1-III] (CO may be placed prior to entry into GO-10) ________

NOTES

1) Final installation of the RCS / PZR Cross-Connect will be delayed until first Reactor Vessel Shield Block removal.

2) Cross connect requires the temporary manifold to be installed by APPENDIX BB

[6] **INITIATE** installation of RCS / PZR Cross-Connect:

[6.1] **ENSURE** a sufficient quantity of 3/4 in diameter, 1/4 in wall thickness minimum, vacuum rated reinforced type clear tygon tubing is available for installation as the RCS/PZR cross-connect. ________

[6.2] **PERFORM** Steps 1.0[1] through 1.0[6] of APPENDIX R. ________

NOTES

1) Holdup Tank (HUT) A the vessel designated for receipt of RCS inventory during draindown.

2) RCS draining is performed via CVCS demin. Any variation from the CVCS demin flowpath must be coordinated with RADPRO.

[7] **NOTIFY** RADPRO prior to draining RCS to the HUT to monitor radiation levels and radiological conditions at the HUT and RCS drain pathway. ________

[8] **IF** draining RCS to HUT, **THEN**

MONITOR (O_2) concentration in the HUT. ________

[9] **IF** RCS to be drained, **THEN**

ENSURE one holdup tank (HUT) with capacity to receive approximately 50,000-60,000 GALs. of letdown is available. ________

Date________ **INITIALS**

4.0 PREREQUISITES (continued)

[10] **ENSURE** Containment Closure Control has been established in accordance with TI-68.002, Containment Penetrations and Closure Control. ________

NOTE

Instrument Maintenance (IM) maintains the N_2 Injection Equipment to support performance of APPENDIX S, and APPENDIX V.

[11] **INITIATE** Attachment 1,1.0, Long Term Storage Of RCS Outage Support Equipment ________

NOTE

Since the vapor space of the Pressurizer is diluted by drawing in nitrogen concurrent with RCS draindown, purging the PZR/RCS is **NOT** expected to be necessary. If Chemistry indicates a need to take Pressurizer samples (beyond their routine samples) and their samples indicate high activity, purging of the PZR/RCS as directed in Section 5.2.2 of this instruction, may be useful in limiting personnel dose.

[12] **IF** RCS is to be opened during outage, **THEN**

ENSURE Chemistry and RADPRO are notified to EVALUATE the need for additional PZR sampling to determine need for RCS/PZR purge (vent) ________

[13] **NOTIFY** RADPRO prior to breaching RHR to monitor radiological conditions. ________

[14] **ENSURE** Mechanical Maintenance/RMO notified to remove cap and install hose on 1-TV-74-543, RHR SUCTION HEADER TEST VENT [IC/716-Az 301 #4 Acc Rm]

RECORD WO#____________________(If any) ________

Date________ **INITIALS**

4.0 PREREQUISITES (continued)

NOTE

The management oversight individual specified in the following step may be a member of any WBN or SQN organization provided that he or she is familiar with Operations expectations for control room operations. The management oversight required to support draindown activities is similar but in addition to the management oversight required for a CIPTE. If a CIPTE is in effect, the CIPTE manager may perform both functions.

[15] **ENSURE** Management oversight individual is available on 24-hour coverage to ensure crew maintains appropriate focus whenever SGs are **NOT** available for cooling through the time the upper internals are removed (and time to boil increases substantially). [C.23] ________

[16] **INITIATE** 0-TRI-100-1, Flood Protection Communications, when the reactor is drained down in Modes 5 or 6 with the vessel head on. ________

Appendix HH
(Page 1 of 4)

RCS Void Determination

Date TODAY ________ **INITIALS**

1.0 VOID DETERMINATION

NOTES

1) This appendix will raise RCS pressure to 325 psig and measure the total volume of borated water needed and calculate the voids that remain in RCS. Some voids are expected, such as in the CRD housing on the vessel head.

2) This appendix may be performed multiple times, requiring additional copies

3) Multiple performances of APPENDIX HH can be compared to determine the effectiveness of sweeps and vents

[1] **RECORD** time to establish chronological order to correlate sequence of vents to performances of APPENDIX HH

2251 Time DAH

[2] **MONITOR** RCS pressure by using any of the following:

EQUIPMENT	INDICATION NUMBER
RCS Hot Leg Press Wide Range	1-PI-68-66A
	1-PT-68-68 (ICS P0498A)
MLMS Channel I or II	

[3] **ADJUST** 1-HIC-62-81A, and/or 1-HIC-62-93A as necessary to maintain RCS pressure stable at approximately 50 psig DAH

[4] **ENSURE** RCS temperature is between 85°F and 105°F DAH

[5] **ENSURE** VCT makeup system is aligned for AUTO operation IAW SOI-62.02 DAH

CAUTION

Charging flow must be maintained within makeup capacity. CCP suction must remain aligned to VCT to allow accurate measurements of volume changed.

[6] **ENSURE** CVCS is aligned to the VCT DAH

Appendix HH
(Page 2 of 4)

RCS Void Determination

Date TODAY________ **INITIALS**

1.0 VOID DETERMINATION (continued)

[7] **RECORD** the following initial values:

Computer Point OR VCT Level Indicator	L0112A/ 1-LI-62-139	60.6 %		
Boric Acid Batch Counter Totalizer	1-FQ-62-139	794441 gallons		DAH
[Primary Water Batch Counter	1-FQ-62-142	018453 gallons		DAH

[8] **BEGIN** raising RCS pressure slowly to 325 psig with 1-PCV-62-81, and 1-FCV-62-93 DAH

[9] **WHEN** 100 psig RCS pressure is achieved, **THEN**

PERFORM the following:

NOMENCLATURE	LOCATION	POSITION	UNID	PERF INITIAL
RCP 1 SEAL RETURN	1-M-5	OPEN	1-FCV-62-9	DAH
RCP 2 SEAL RETURN	1-M-5	OPEN	1-FCV-62-22	DAH
RCP 3 SEAL RETURN	1-M-5	OPEN	1-FCV-62-35	DAH
RCP 4 SEAL RETURN	1-M-5	OPEN	1-FCV-62-48	DAH

[10] **WHEN** RCS pressure is 325 psig, **THEN**

ADJUST 1-HIC-62-93A AND 1-HIC-62-81A as necessary to maintain RCS pressure stable at approximately 325 psig. DAH

[11] **RECORD** the following final values:

Computer Point OR VCT Level Indicator	L0112A/ 1-LI-62-139	29.7 %		
Boric Acid Batch Counter Totalizer	1-FQ-62-139	795150 gallons		DAH
[Primary Water Batch Counter	1-FQ-62-142	018882 gallons		DAH

Appendix HH
(Page 3 of 4)
RCS Void Determination

Date TODAY **INITIALS**

1.0 VOID DETERMINATION (continued)

[12] **DETERMINE** volume required to pressurize the RCS from 50 psig to 325 psig as follows

[12.1] **DETERMINE** makeup volume added based on change in Boric Acid Batch Counter 1-FQ-62-139 totalizer readings. DAH

795150	-	794441	=	709
Final reading Step 1.0[11]		Initial reading Step 1.0[7]		gallons

[12.2] **DETERMINE** makeup volume added based on change in Primary Water Batch Counter 1-FQ-62-142 totalizer readings DAH

018882	-	018453	=	429
Final reading Step 1.0[11]		Initial reading Step 1.0[7]		gallons

[12.3] **DETERMINE** change in VCT level DAH

60.6 %	-	29.7 %	=	+/- 30.9
Initial reading Step 1.0[7]		Final reading 1.0[11]		% change +/-

[12.4] **CONVERT** VCT level change to gallons as follows: DAH

30.9 +/-	X	19.27	=	+/- 595.4
% change		gallons/%		gallons

Appendix HH
(Page 4 of 4)

RCS Void Determination

Date TODAY   **INITIALS**

1.0 VOID DETERMINATION (continued)

> **NOTE**
>
> A higher final VCT level will result in the change in VCT level being subtracted from total totalizer change

[13] **DETERMINE** total volume required to pressurize RCS. DAH

709	+	429	+/-	595.4	=	1733.4
change in Boric Acid totalizer (step 10.1)		change in PMW totalizer (Step 10.2)		change in VCT level (Step 10.3)		Total makeup required

End of Section

TVA

Watts Bar Nuclear Plant

Unit 1

General Operating Instructions

GO-10

Reactor Coolant System Drain And Fill Operations

Revision 0044

Quality Related

Level of Use: Continuous Use

Level of Use or Other Information: 5.3.4 (Midloop), 5.4.2 RCP Sweeps and Vents and 5.4.3 (Vacuum Refill) are CIPTE

Critical Procedure

Effective Date: 02-15-2011

Responsible Organization: OPS, Operations

Prepared By: R. A. O'Rear

Approved By: Brian McIlnay

Revision Log

Revision or Change Number	Effective Date	Affected Page Numbers	Description of Revision/Change
44	02/15/11	2, 3,10, 11, 23, 24, 25, 27, 31, 32, 36-41, 43, 49, 52, 56, 64- 68, 70, 72, 76, 79, 81, 84, 86, 87, 91, 92, 101, 105, 107, 108, 110, 156, 160-174, 177,180, 240, 260, 261, 259, 297, 301, 303, 307, 313, 328, 331, 335, 355, 356	Added safety related power source for Mansell in setup of Appendix BB, added print ref and Caution Order for supply breaker.[EDC 57026-A] Revised Appendix W to provide contingency instructions on raising RCS level if level instruments are lost during Reduced Inventory/Midloop operation . [PER 218865-2, PCR 4323] Removed extra performance of Appendix HH Void Determination based on successful first performance of section 5.4.1 in RFO9. [PCR 5097] Separated steps for changing RCS/cavity water level, flushing of crossunder drains and lowering RCS level to below loops based on Reactor condition (Mode 6 vs. Defueled) to limit Human Performance Error traps. [PCR 4215] Added step to evaluate CCS, ERCW, SFP temperature for impact on RCS heat up and to referenced RCS min temp for performance of MI-68.025. [PCR 4228] Revised coast down time in Section 5.4.2 to provide a time band Operator should wait to allow RCP to coast down before lowering pressure. [PCR 5075] Revised isolation of gas analyzer to PRT to de-select PRT first then isolate manual valve at PRT following RCS clean up to limit dose. [PCR 4211] • Format improvements for recorded data. • Revised Section 5.2.2 allow Chemistry to request use Aux spray for cleanup. [PCR 4315] • Revised Section titles to clarify performance in Mode 6 or Defueled. • Removed actions from notes or revised and consolidated notes and cautions to comply with writers guide. [PCR 4442] • Added locations for system 77 valves and checks of valve positions for verification of configuration.

			• Enhanced steps in Section 5.4.2 to provide a time band Operator should wait to allow RCP to coast down before lowering pressure. [PCR 5075] • Listed RHR flow blocking devices on Attachment 1 [PCR-4216] • Corrected Section titles, nomenclature, and organization titles. . [PCR 5004, 4751, 4322] • Added note addressing level response when draining below el 731 using the RCS-PZR cross connect based on Operator comment.. [PCR 4212] • Added End of Section markers.

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1.0 INTRODUCTION

1.1 Purpose

This Instruction provides guidance and directives for plant operations during RCS drain down conditions and the subsequent refilling of the RCS. The following sections of this instruction are considered Complex Infrequently Performed Test or Evolutions (CIPTE):

- Section 5.3.4, Reduced Inventory / Midloop Conditions
- Section 5.4.2, RCP Sweeps and Vents
- Section 5.4.3, RCS Vacuum Refill

A. Scope

1. RCS Initial Drain Operations
2. Water (RCS or Cavity) Level Adjustments
3. RCS Final Refilling Operations
4. RCS Sweeps and Vents
5. RCS Vacuum Refill
6. S/G U-Tube Draining Via N_2 Injection

2.0 REFERENCES

2.1 Performance References

A. 0-SI-0-3, Weekly Log

B. MI-61.05, Blocking Of Ice Condenser Lower Inlet Doors During Cold Shutdown.

C. MI-68.001, Disassembly and Reassembly of the Reactor Pressure Vessel and Attachments.

D. OPDP-2, Switchyard Access And Switching Order Execution.

E. SOI-62.01, CVCS-Charging (1-HIC-62-93) and Letdown (1-HIC-62-81A).

F. TI-68.002, Containment Penetrations and Closure Control.

G. 1-TRI-62-3, Boric Acid Flow Paths: Valve Position Verification

H. SOI-30.02, Containment Purge System

I. SOI-62.02, Boron Concentration Control

J. SOI-68.02, Reactor Coolant Pumps

K. SOI-77.01, Liquid Waste Disposal

L. SOI-78.01, Spent Fuel Pool Cooling and Cleaning System

M. AOI-14, Loss of RHR Shutdown Cooling

N. CM-3.01, System Chemistry Specifications

O. GO-7, Refueling Operations

P. 1-SI-63-7, ECCS Throttle Valve Position Verification

Q. TI-31.022, Ultrasonic Flow Measurement

R. 1-SI-68-81, Offline Channel Calibration of RVLIS Transmitters and RCS Wide Range Pressure Transmitters

S. IMI-68.005, Calibration of Ultrasonic Level Measuring System

T. 1-SI-63-907, Residual Heat Removal Hot Leg and Cold Leg Injection Check Valve Testing

2.1 Performance References (continued)

U. 1-SI-63-917, Non-Intrusive Testing of Cold Leg Accumulator Check Valves

V. EPRI PWR Primary Water Chemistry Guidelines, Revision 6.

W. NPG-SPP-01.3, Housekeeping

X. 0-PI-OPS-17.1, 18 Month Lock Breaker Verification

Y. NPG-SPP-10.3, Verification Program

Z. NPG-SPP-10.1, System Status Control

AA. N-UT-72, Measuring Fluid Levels on Number 4 Hot Leg

BB. 1-SI-63-10.1-A, ECCS Discharge Pipes Venting - Train A Inside Containment

CC. 1-SI-63-10.2-A, ECCS Pumps and Discharge Pipes Venting - Train A Outside Containment

DD. 1-SI-63-10-B, ECCS Pumps Venting Train B

EE. 0-TRI-100-1, Flood Protection Communications

FF. 0-PI-OPS-1.1, Jumper Control Process

GG. NPG-SPP-06.9.1, Conduct of Testing

2.2 Developmental References

A. TI-68.012, Installation and Removal of the Mansell Level Monitoring System During Refueling Outages

B. SOI-68.01, Reactor Coolant System

C. SOI-74.01, Residual Heat Removal System

D. WAT-D-10451, Letter from Westinghouse Dated September 24, 1997 (T28970925801,) which considers RCS Loops filled via Vacuum Refill an effective means of ensuring natural circulation capability.

E. NPG-SPP-10.4, Reactivity Management Program

F. WAT-D-10044 (RIMS T33 950714 804 for Rev 0 & T33 950714 803 for Rev 1) PLS for Preheat S/G Feedwater System Interface Operation

G. FSAR Section 2.4.14.11, Special Conditions Allowance

H. Drawings:

- 48W935-19 Reactor Well and Refueling Canal Ladders
- 47W915-6 & 7 Reactor Building - Heating, Ventilating and Air Conditioning

I. EDC 51869-A

J. EDC 51673

K. EDC 57026-A

L. 45N1645-3 & -2 Connection Diagrams showing approved Mansell power source.

3.0 PRECAUTIONS AND LIMITATIONS

3.1 Partial Draindown / Reduced Inventory / Mid-Loop Operation Mode 6

A. Partial Draindown / Reduced Inventory / Mid-Loop (RI/M) operation exists as described in the following:

1. Partial Draindown is below el. 725'.

2. Reduced Inventory is defined as a condition with fuel in Reactor Vessel and water level below el. 722'.

3. Mid-Loop is defined as a condition with fuel in Reactor Vessel and water level below the top of the Hot Legs. (el. 719' 2 1/2") and above el. 718' 6".

B. Reduced Inventory/Midloop operations.

1. Level should be greater than 6" above centerline of RCS loop piping for one RHR pump operation, limited to two-loop injection.

2. Running RHR pump should be stopped BEFORE starting Standby RHR pump.

3. If RHR pump cavitates, RHR flow shall be reduced (normal just over 2000 gpm); continued cavitation could damage the RHR pump.

C. During RI/M operations, only one RHR Pump should be in service at a time.

D. RHR flow & motor amps should be closely monitored during Midloop operations. The RHR pump shall be checked locally for unusual sounds once every two hours during Midloop operations. Any erratic indications in flow, amps or sounds are indications of pump cavitation. Reducing the flow on the pump should slow air intake at the suction of the pump. This should help until RCS level can be raised. [C.1][C.2]

E. No work shall be performed on the operating train of RHR during Mid-Loop evolutions. This includes electrical supplies (Diesel included) to pump, valves and instrumentation. This also includes R panels associated with systems 62 and 74, CVCS, CCS to the RHR pump or any other system with the potential to impact RCS level or cooling. The standby train of RHR shall also remain OPERABLE. [C.3]

F. No work shall be performed on CCP(s) used in establishing makeup capability for postulated loss of RHR Cooling (See Precaution N.2.e.)

3.1 Partial Draindown / Reduced Inventory / Mid-Loop Operation Mode 6 (continued)

G. Scheduling of activities that could lead to perturbations to the RCS or RHR system while the RCS is in a reduced inventory condition should be avoided.

H. While in a Reduced Inventory/Midloop condition, continuous indication of RCS level shall be provided by at least two level instruments. The two level instruments used shall agree to within 2 inches below el. 722', and should agree to within 1 inch below el. 719' 2 1/2". Level reduction should be suspended if the 1-inch criterion is **NOT** met and an evaluation of level instrumentation performed prior to continued level reduction. The evaluation should consider:

1. The rate of level change versus letdown flow rate as compared with the values of APPENDIX G or APPENDIX H,
2. Consistent incremental changes between available RCS level instruments, and,
3. Confidence in the most conservative RCS level instrument being used for monitoring. This evaluation shall be documented in the unit log.
4. Walk down of the PZR cross connect hosing should be considered to verify no flow restrictions/crimps.

I. Unexplained RCS level changes are to be investigated immediately (REFER TO AOI-6, Small RCS Leak, and 1-SI-68-32, "Measurement of Identified and Unidentified RCS Leakage"). [C.9][C.12]

J. Inventory balances should be performed prior to any RCS level changes and expected responses discussed.

K. RCS temperature (RHR inlet) shall be less than or equal to 140°F for entry into Mid-Loop operation.

L. If the Reactor head is to remain installed during RI/M operations, then two core exit thermocouples are to be in service and frequently monitored.

M. Communications between the MCR and SG platform shall be maintained from the time nozzle dam is removed until the primary manway has been installed.

3.1 Partial Draindown / Reduced Inventory / Mid-Loop Operation Mode 6 (continued)

N. While in RI/M, it is necessary to have proper hot leg venting paths in the event of a loss of RHR cooling. This is necessary to prevent the boil off from the core decay heat pressurizing the RCS above two psig. [C.2] The requirements are applicable until Cold Leg breaches are closed. (e.g. CL S/G manways closed, system openings, which cannot be isolated, CL injection check valve bonnet replaced, High-pressure seal on thimble guides, RCPs coupled up or properly blocked.)

1. Prior to refueling, the vent path shall be either:

a. Reactor vessel head removed.

b. One or more SG Hot Leg manways removed. (Hot Leg nozzle dam **NOT** installed on applicable SG loop)

2. After refueling, any of the following combinations are adequate vent paths:

a. Reactor vessel head removed.

b. One or more SG Hot Leg manways removed. (Hot Leg nozzle dam **NOT** installed on applicable SG loop)

c. One Hot Leg SIS check valve bonnet removed and at least two Pressurizer safety valves removed.

d. One Hot Leg SIS check valve bonnet removed and the Pressurizer manway removed.

e. With Reactor Vessel head installed, all nozzle dams installed, and only one Pressurizer Safety valve removed, two CCPs shall be available with only one aligned for injection to comply with TS 3.4.12. The second CCP can only be aligned for injection if the other becomes unavailable.

O. The Maintenance supply is an unqualified feed to the shutdown board and can only be used in Mode 5 or 6. Anytime the maintenance feed is used to supply the shutdown board, the board is inoperable. [C.6]

1. The RHR pump aligned and operating to support RI / M operation should NOT be supplied from a shutdown board aligned to its maintenance supply.

3.1 Partial Draindown / Reduced Inventory / Mid-Loop Operation Mode 6 (continued)

2. The idle pump should **NOT** be supplied from a shutdown board utilizing the maintenance feed. If it can **NOT** be avoided, the following should occur:

   a. Both the Load Dispatcher and Watts Bar Hydro Plant Personnel should be informed of the "additional challenge this presents during Reduced Inventory / Mid-Loop operation,"

   b. The Load Dispatcher shall be informed of the need to "maintain 500kV system voltage as stable as possible" and,

   c. Every effort shall be made to limit the time the shutdown board remains on its maintenance feed.

P. The tygon hose (APPENDIX E) is the least preferred method of RCS level indication but can be used to provide comparison of level indications.

Q. Level instruments LG-68-399, LT-68-399A and LT-68-399B share the same lower tap. In addition, the two MLMS channels and tygon tube also share a common lower tap. Two instruments off the same tap may be used as the operable and backup channel of APPENDIX C as long as periodic checks with other level instruments are performed to confirm level is trending in the same direction for all instruments during a transient or remaining steady when required. This does **NOT** impose any accuracy requirements, just a trend to ensure all instruments are responding in the same direction for given plant condition. The common root valves to these instruments will be locked open by this instruction when in use.

R. Prior to lowering RCS level, three level instruments should be tracking properly. In the event of an instrument drift or failure, this gives the ability to determine which instrument is no longer tracking properly. During draindown evolutions, some variations in level indications are possible due to pressure variations within the Reactor Vessel. These variations have been experienced when approaching el 731' and below. Unexpected level changes should be investigated using the guidance of precaution 3.1.H above.

3.1 Partial Draindown / Reduced Inventory / Mid-Loop Operation Mode 6 (continued)

S. Channel II of Mansell, if in use for level indication, will be affected by use of auxiliary spray.

T. Activities included in this procedure may change radiological conditions in the plant and coordination of these activities with Radiation Protection (RADPRO) is essential.

U. Steps within this instruction may require venting, draining or breaching radioactive components or systems to the atmosphere. Appropriate radiation protection controls must be established to prevent the spread of contamination and avoid the generation of airborne radioactivity.

3.2 RCS Operation (General)

A. Makeup water to the RCS shall have a C_B greater than or equal to the minimum required shutdown margin C_B.

B. One RHR Pump or RCP shall be in service during C_B changes or Chemical additions to ensure mixing.

C. RCP Seal injection should be in service when RCS level is above RCP seals or RCS press is above atmospheric, unless impellers are back seated. The leakoff valves shall be closed when the injection water is **NOT** supplied and the RCS pressure is less than 100 psig.

D. Before starting the first RCP, RCS should be evaluated for the possibility of lower C_B areas (such as hot legs, cold legs, etc.) by sampling RCS/VCT/RHR, and action taken as necessary to assure affects of starting RCP are acceptable. If the evaluation reveals a possibility of reducing shutdown margin, RCS C_B should be raised before starting first RCP. [C.10]

E. During RCS draining, expect a difference between Hot and Cold Calibrated Pressurizer level instruments. This is the results of the instruments being calibrated at different temperatures. [C.12]

F. During plant cooldown, only two RCPs should be operated below RCS temperature of 160°F.

G. For sweeps and vents, only one RCP should be operated below 80°F and only two RCPs should be operated between 80 and 105°F. Exception: Four RCPs should be operated below 105°F for approximately 5 minutes for sweeping and venting.

H. Prior to reducing below Reduced Inventory level of EL 722', the RHR System SHALL be in one-loop operation. [C.2]

I. When the refueling cavity is flooded, RCS purification should be maintained by the CVCS demineralizers via the RHR letdown.

3.3 Solid Water Operations

A. A dedicated operator will be stationed in the control room and will act as the Solid Plant Operator who will monitor and mitigate, as necessary, any over pressurization event. The Solid Water Operator will be released from their duties when the RCS is no longer in solid operations.

B. Solid water operations should be considered as transitionary and time spent in a solid water condition minimized as reasonably practical. Approach to solid water operations begins when pressurizer level is greater than 80% and ends when the pressurizer is water solid

C. Plant evolutions that may cause pressurizer level or RCS pressure or temperature to become unstable should be prohibited during approach to solid water operations.

D. If pressurizer level, RCS pressure or temperature, or charging flow become unstable during approach to solid water operations, pressurizer level should be reduced to less than 80% and investigate cause.

E. Configuration changes to either CVCS or RHR should be prohibited during approach to solid water operations.

F. 1-PCV-62-81, LETDOWN PRESSURE CONTROL, should be maintained near the middle of its control range during approach to solid water operations.

G. RHR inlet from RCS loop 4 should **NOT** be isolated unless there is a Pressurizer bubble OR Normal Charging / Letdown are stopped to ensure a relief path when RCS pressure is low (below 450 psig). (LCO 3.4.12).

H. With letdown from RHR, FCV-62-83, RHR LETDOWN FLOW CNTL, should be full **OPEN** and RCS pressure controlled by 1-PCV-62-81, CVCS LETDOWN HX PRESS CNTL. During this time, normal letdown, including all orifices, shall remain in service.

3.3 Solid Water Operations (continued)

I. After RCS heatup has begun, using RCP(s), if all RCPs are stopped for greater than 5 minutes and RCS temperature is greater than charging and seal injection temperature, do NOT restart a pump until a PZR steam bubble exists. This will minimize a pressure transient, due to previously injected cold water, when the first RCP is started

J. If all RCPs are stopped and RCS is being cooled down by RHR, a non-uniform RCS temperature distribution could occur. RCPs should **NOT** be started UNLESS a Pressurizer bubble exists.

K. When RCS pressure is being maintained by 1-PCV-62-81, CVCS LETDOWN HX PRESS CNTL, flow-rate changes through the RHR loop by throttling valves or starting/stopping the RHR Pumps will result in changes to RCS pressure. Stopping RHR pumps can cause a pressure spike of 100 to 150 psig.

L. An evaluation of the potential for RCS pressure and/or temperature transients must be performed prior to any evolution that will be performed when approaching or during solid water operations.

3.4 RCS Vacuum Refill

A. During RCS Vacuum Refill (Section 5.4.3), maximum vacuum level is dependent on RCS temperature and RHR flow rate. Vacuum should be determined using the graph in APPENDIX CC.

B. During RCS Vacuum Refill, in the event of a loss of an operating RHR pump, vacuum shall be immediately broken at the vacuum skid by the performance of Section 4.0 of local Vacuum Skid operating instructions contained in APPENDIX AA. When RCS is at atmospheric pressure, AOI-14, Loss of RHR Shutdown Cooling, should be entered. If level exists in the Pressurizer, natural circulation should be considered an option. Use the following parameters for verifying natural circulation conditions exist:

1. RCS Subcooling based on core exit TCs - Greater than 4°F,
2. SG Pressures - STABLE OR DROPPING,
3. RCS hot leg temperatures - STABLE OR DROPPING,
4. Core Exit TCs - STABLE OR DROPPING,
5. RCS Cold Leg Temperatures - AT SATURATION TEMPERATURE FOR SG PRESSURE.

3.5 RHR Operability / Availability

A. In Mode 6 with the water level ≥ 23 ft above the top of reactor vessel flange (≥ el. 748'), one RHR loop shall be operable and in operation with flow greater than or equal to 2500 gpm. (T.S. 3.9.5) REFER TO SOI-74.01, APPENDIX A, for operating pump flow limits.

B. In Mode 6 with the water level less than 23 ft above the top of Reactor vessel flange (less than el. 748'), two RHR loops shall be operable, and one RHR loop shall be in operation with flow greater than or equal to 2000 gpm. (T.S. 3.9.6)

C. In Mode 5 with the loops **NOT** filled, two RHR loops shall be operable and one RHR loop shall be in operation. (T.S. 3.4.8)

D. In Mode 5 with the loops **NOT** filled, all RHR pumps may be de-energized for less than or equal to 15 minutes when switching from one train to another (T.S. 3.4.8.1)(provided all the following conditions are met):

   1. The core outlet temperature is maintained greater than 10°F below saturation temperature, and

   2. No operations are permitted that would cause a reduction of the RCS C_B, and

   3. No draining operations (to further reduce RCS water volume are permitted.

E. In Mode 5 with the loops **NOT** filled, one RHR loop may be inoperable for less than or equal to 2 hours for surveillance testing provided that the other RHR loop is operable and in operation. (T.S. 3.4.8.2)

F. The Charging pump may be SHUT DOWN during Mid-Loop operation if CVCS is **NOT** needed for RCS cleanup. However, the Charging pump shall remain operable along with the normal charging line for RCS makeup if there is a loss of RHR cooling. [C.2]

3.5 RHR Operability / Availability (continued)

G. 1-FCV-63-1, RWST TO RHR SUCT, shall remain operable for gravity fill of the RCS if there is a loss of RHR cooling. [C.2]

H. The following equipment should remain available during mid-loop operations:

1. One train Containment Air Return fans, two bays of the ice condenser, and divider barrier, OR

2. Required train(s) of Containment Purge supply and exhaust fans. (REFER TO TI-68.002.).

I. If RHR cooling is lost at any time during RI/M operations then AOI-14, Loss of RHR Shutdown Cooling, shall be implemented. If nozzle dams removed and primary manways **NOT** installed, ensure SG platforms are cleared of personnel.

J. Failure to have RHR System C_B greater than RCS C_B before placing the RHR System in service can reduce shutdown margin.

K. With RCPs off, if RHR Letdown is removed from service, the VCT C_B shall be sampled periodically and compared to RHR system C_B to ensure that a boron reduction event does **NOT** occur. [C.16]

L. Both RHR Pumps should **NOT** be operated together on miniflow with both letdown isolation valves [1-SPV-74-530 (-531), RHR HX 1A (1B) OUTLET TO CVCS] and/or both HX bypasses open [1-HCV-74-36 (-37), RHR HEAT EXCHANGER 1A (1B) MANUAL BYPASS.] This will help prevent pump-to-pump head interaction and possible pump damage. [C.17]

M. Valves 1-SPV-74-530 and 531, RHR HX 1A (1B) OUTLET TO CVCS are Kerotest packless valves and are **NOT** designed for reverse flow conditions. Reverse flow will cause severe piping, valve, and support damage due to excessive piping vibration. [C.15]

Date________ **INITIALS**

4.0 PREREQUISITES

NOTES

1) Throughout this Instruction, where an **IF/THEN** statement exists, the step should be **N/A** if condition does **NOT** exist.
2) Steps in Section 4.0 may be performed in any order.
3) Throughout this instruction, Concurrent Verification (CV) for breaker or fuse manipulations may be marked **N/A** if no manipulation is performed.

[1] **ENSURE** Precautions & Limitations of Section 3.0 have been reviewed. ________

[2] **ENSURE** RADPRO has been briefed on the activity to be performed and is prepared to monitor radiological conditions and control personnel access to affected areas. ________

[3] **ENSURE** RCS is cooled down and depressurized as controlled by the applicable section(s) of GO-6. ________

CAUTIONS

1) Installation of the Mansell instrumentation involves breaching of the RCS and potential exposure to highly radioactive material. RCS system flush at the drain connection may be required prior to system breach.
2) Do **NOT** open the temporary valves for Mansell instrumentation until RCS pressure is below 85 psig.

NOTE

APPENDIX U shows the various uses for the valves installed with these manifolds and the locations of the manifolds.

[4] **INITIATE** APPENDIX BB, Mansell Level Monitor System Installation and Removal installation of temporary connection manifolds to support Mansell Level Monitoring System (MLMS). ________

Date________ **INITIALS**

4.0 PREREQUISITES (continued)

[5] **PLACE** a Caution Order on 1-BKR-235-3/28, MCR PANEL 1-M-6 INSTR CNTL BUS 1 PLUGMOLD to identify breaker as Mansell power source. [120V Vital Instrument Bd 1-III] (CO may be placed prior to entry into GO-10) ________

NOTES

1) Final installation of the RCS / PZR Cross-Connect will be delayed until first Reactor Vessel Shield Block removal.

2) Cross connect requires the temporary manifold to be installed by APPENDIX BB

[6] **INITIATE** installation of RCS / PZR Cross-Connect:

[6.1] **ENSURE** a sufficient quantity of 3/4 in diameter, 1/4 in wall thickness minimum, vacuum rated reinforced type clear tygon tubing is available for installation as the RCS/PZR cross-connect. ________

[6.2] **PERFORM** Steps 1.0[1] through 1.0[6] of APPENDIX R. ________

NOTES

1) Holdup Tank (HUT) A the vessel designated for receipt of RCS inventory during draindown.

2) RCS draining is performed via CVCS demin. Any variation from the CVCS demin flowpath must be coordinated with RADPRO.

[7] **NOTIFY** RADPRO prior to draining RCS to the HUT to monitor radiation levels and radiological conditions at the HUT and RCS drain pathway. ________

[8] **IF** draining RCS to HUT, **THEN**

MONITOR (O_2) concentration in the HUT. ________

[9] **IF** RCS to be drained, **THEN**

ENSURE one holdup tank (HUT) with capacity to receive approximately 50,000-60,000 GALs. of letdown is available. ________

Date________ **INITIALS**

4.0 PREREQUISITES (continued)

[10] **ENSURE** Containment Closure Control has been established in accordance with TI-68.002, Containment Penetrations and Closure Control. ________

NOTE
Instrument Maintenance (IM) maintains the N_2 Injection Equipment to support performance of APPENDIX S, and APPENDIX V.

[11] **INITIATE** Attachment 1,1.0, Long Term Storage Of RCS Outage Support Equipment ________

NOTE
Since the vapor space of the Pressurizer is diluted by drawing in nitrogen concurrent with RCS draindown, purging the PZR/RCS is **NOT** expected to be necessary. If Chemistry indicates a need to take Pressurizer samples (beyond their routine samples) and their samples indicate high activity, purging of the PZR/RCS as directed in Section 5.2.2 of this instruction, may be useful in limiting personnel dose.

[12] **IF** RCS is to be opened during outage, **THEN**

ENSURE Chemistry and RADPRO are notified to EVALUATE the need for additional PZR sampling to determine need for RCS/PZR purge (vent) ________

[13] **NOTIFY** RADPRO prior to breaching RHR to monitor radiological conditions. ________

[14] **ENSURE** Mechanical Maintenance/RMO notified to remove cap and install hose on 1-TV-74-543, RHR SUCTION HEADER TEST VENT [IC/716-Az 301 #4 Acc Rm]

RECORD WO#____________________(If any) ________

Date________ **INITIALS**

4.0 PREREQUISITES (continued)

NOTE

The management oversight individual specified in the following step may be a member of any WBN or SQN organization provided that he or she is familiar with Operations expectations for control room operations. The management oversight required to support draindown activities is similar but in addition to the management oversight required for a CIPTE. If a CIPTE is in effect, the CIPTE manager may perform both functions.

[15] **ENSURE** Management oversight individual is available on 24-hour coverage to ensure crew maintains appropriate focus whenever SGs are **NOT** available for cooling through the time the upper internals are removed (and time to boil increases substantially). [C.23] ________

[16] **INITIATE** 0-TRI-100-1, Flood Protection Communications, when the reactor is drained down in Modes 5 or 6 with the vessel head on. ________

Date________ **INITIALS**

5.4.2 RCP Sweeps and Vents CIPTE

CIPTE

NOTES

1) RCP Sweeps and Vents while plant is in solid water operations is a Complex Infrequently Performed Test or Evolution (CIPTE). All steps in this section are considered critical steps.

2) Each RCP will need individual copy of this subsection for each sweep performed on a loop, Steps 5.4.2[1] to 5.4.2[15]

3) Starting RCP #4 FIRST is preferred in order to sweep potential air AWAY from RHR suction on the Loop 4 hot leg.

4) The following is a summary of actions performed in this section:
   - Run each RCP for 30 seconds
   - Drop pressure and vent RCS at head and through PORVs
   - Press up to 325 psig and determine voids
   - If warranted, repeat 30 second run for each RCP
   - Run all four RCPs at same time
   - Vent RCS at head and through PORVs following each run
   - Transition to GO-1 to pull steam bubble

[1] **SELECT** RCP to be **STARTED**. ________

PUMP	√
RCP No. 4	☐
RCP No. 3	☐
RCP No. 2	☐
RCP No. 1	☐

Date________ INITIALS

5.4.2 RCP Sweeps and Vents CIPTE (continued)

[2] **ENSURE** RCS press between 325-370 psig with 1-PCV-62-81, and 1-FCV-62-93, ________

[3] **ANNOUNCE** start of RCP over PA system. ________

CAUTIONS

1) Operators should be alert for pressure changes when RCP is started. Expected response is an initial drop of pressure followed by an increase of pressure as water is heated by core. With air voids in RCS, pressure drop will be a function of compression of voids and cooling by secondary side water of the S/Gs

2) If any uncontrollable RCS pressure changes occur, RCP should be immediately stopped to allow restoring RCS pressure.

3) RCP Seal PRECAUTIONS in SOI-68.02 are to be followed.

[4] **START** selected RCP per SOI-68.02. ________

[5] **CONTROL** Charging (1-HIC-62-93A/1-HIC-62-89A) and Letdown (1-HIC-62-81A) to **MAINTAIN** ________

- Greater than 200 PSID across running RCP's #1 seal ☐
- Seal flow between 8-13 GPM ☐
- RCS pressure less than COMS setpoint to open PORVs ☐

NOTE

When forced flow stops, RCS pressure will rise.

[6] **WHEN** selected RCP has operated for 30 sec, **THEN**

[6.1] **STOP** RCP

[6.2] **WAIT** three to five minutes for pump to coast to a stop.

[6.3] **CONTINUE** to next step. ________

Date________ **INITIALS**

5.4.2 RCP Sweeps and Vents CIPTE (continued)

[7] **LOWER** RCS pressure to 100 psig gradually, **THEN**

PERFORM the following:

NOMENCLATURE	LOCATION	POSITION	UNID	PERF INITIAL
RCP 1 SEAL RETURN	1-M-5	CLOSED	1-FCV-62-9	
RCP 2 SEAL RETURN	1-M-5	CLOSED	1-FCV-62-22	
RCP 3 SEAL RETURN	1-M-5	CLOSED	1-FCV-62-35	
RCP 4 SEAL RETURN	1-M-5	CLOSED	1-FCV-62-48	

[8] **LOWER** RCS press gradually to 40 to 60 psig with 1-PCV-62-81, and 1-FCV-62-93. ________

[9] **PERFORM** the following to vent the PZR:

[9.1] **OPEN** one PZR PORV ________

[9.2] **WHEN** level increase observed in PRT, **THEN**

CLOSE PZR PORV. ________

[10] **PERFORM** venting steps of APPENDIX II Section 2.0. ________

[11] **WHEN** venting sequence performed per APPENDIX II **AND** vent paths are **ISOLATED**, **THEN**

CONTINUE to the next step ________

[12] **PERFORM** APPENDIX HH, to determine void volume. ________

[13] **IF** total makeup required in APPENDIX HH is less than or equal to 465 GAL, **THEN**

[13.1] **RECORD** further sweeps and vents are **NOT** required in Operations Narrative Log: ________

[13.2] **GO TO** Section 5.4.4[1], Restoration From Fill and Vent. ________

Date________ **INITIALS**

5.4.2 RCP Sweeps and Vents CIPTE (continued)

NOTES

1) Total void volume of 465 gallons is an acceptable void following venting of the RCS. 1723 gallons is the acceptable total volume of voids related to Vacuum fill. When fill and venting is done in Section 4.4.1, distribution of the remaining gas volume in S/G s is unknown. For the purpose of natural circulation, the gas volume must be less than 200 SCF/S/G. A range of 465 to 1723 gallons of void meets the overall acceptance criteria but does not ensure that two individual loop can support natural circulation in Mode 4.

2) For voids in the range of 465 to 1723 gallon, two opposing RCPs must be run concurrently before declaring RCS loops properly filled for Mode 4 operation. This can be accomplished by running #1 AND # 3 OR #4 and #2 RCP for heatup to Mode 4.

[14] **IF** total makeup required in APPENDIX HH is between 465 GAL and 1723 GAL, choose one of the following paths:

[14.1] **IF** Additional sweeps and vents are desired, **THEN**

GO TO Step 5.4.2[1] and start next RCP ________

[14.2] **IF** no further sweeps and vents are desired, **THEN**

RECORD sweeps and vents are NOT required in Operations Narrative Log **AND**

GO TO restoration section, Step 5.4.4[1] ________

[15] **IF** total makeup required in APPENDIX HH greater than 1723 GAL, **THEN**

PERFORM the following:

[15.1] **IF** sweeps and vents have **NOT** been completed for all four individual RCS loops, **THEN**
GO TO Step 5.4.2[1]

[15.2] **IF** sweeps and vents are complete for all four individual RCS loops, **THEN**

PERFORM 5.4.2[16] to run all four RCPs. ________

Date________ **INITIALS**

5.4.2 RCP Sweeps and Vents CIPTE (continued)

NOTE
All four RCP should be run together for a total of one minute. The one-minute time starts when fourth pump started indicates flow.

[16] **RUN** all four RCPs at the same time by performing the following:

[16.1] **ANNOUNCE** start of RCPs over PA system. ________

[16.2] **START** all RCPs one at a time at 5 min intervals per SOI-68.02. ________

PUMP	√
RCP No. 4	☐
RCP No. 3	☐
RCP No. 2	☐
RCP No. 1	☐

[16.3] **AFTER** 1 min with all RCPs running, **THEN**

STOP all RCPs. ________

[16.4] **PERFORM** the following after all four pumps have coasted down (three to five minutes):

NOMENCLATURE	LOCATION	POSITION	UNID	PERF INITIAL
RCP 1 SEAL RETURN	1-M-5	CLOSED	1-FCV-62-9	
RCP 2 SEAL RETURN	1-M-5	CLOSED	1-FCV-62-22	
RCP 3 SEAL RETURN	1-M-5	CLOSED	1-FCV-62-35	
RCP 4 SEAL RETURN	1-M-5	CLOSED	1-FCV-62-48	

[16.5] **LOWER** RCS pressure gradually to 40 to 60 psig with 1-PCV-62-81, and 1-FCV-62-93. ________

Date________ **INITIALS**

5.4.2 RCP Sweeps and Vents CIPTE (continued)

[16.6] **PERFORM** the following to vent the PZR:

[16.6.1] **OPEN** one PZR PORV ________

[16.6.2] **WHEN** level increase observed in PRT, **THEN**

CLOSE PZR PORV ________

[16.7] **PERFORM** venting steps of APPENDIX II, Section 2.0. ________

[16.8] **WHEN** venting sequence performed per APPENDIX II AND vent paths are **ISOLATED**, THEN

GO TO restoration section, Step 5.4.4[1] Restoration from Sweeps and Vents. ________

END OF CIPTE

End of Section

Appendix HH
(Page 1 of 4)

RCS Void Determination

Date________ **INITIALS**

1.0 VOID DETERMINATION

NOTES

1) This appendix will raise RCS pressure to 325 psig and measure the total volume of borated water needed and calculate the voids that remain in RCS. Some voids are expected, such as in the CRD housing on the vessel head.
2) This appendix may be performed multiple times, requiring additional copies
3) Multiple performances of APPENDIX HH can be compared to determine the effectiveness of sweeps and vents

[1] **RECORD** time to establish chronological order to correlate sequence of vents to performances of APPENDIX HH

___________ Time ___________

[2] **MONITOR** RCS pressure by using any of the following:

EQUIPMENT	INDICATION NUMBER
RCS Hot Leg Press Wide Range	1-PI-68-66A
	1-PT-68-68 (ICS P0498A)
MLMS Channel I or II	

[3] **ADJUST** 1-HIC-62-81A, and/or 1-HIC-62-93A as necessary to maintain RCS pressure stable at approximately 50 psig ________

[4] **ENSURE** RCS temperature is between 85°F and 105°F ________

[5] **ENSURE** VCT makeup system is aligned for AUTO operation IAW SOI-62.02 ________

CAUTION

Charging flow must be maintained within makeup capacity. CCP suction must remain aligned to VCT to allow accurate measurements of volume changed.

[6] **ENSURE** CVCS is aligned to the VCT ________

Appendix HH
(Page 2 of 4)

RCS Void Determination

Date________ **INITIALS**

1.0 VOID DETERMINATION (continued)

[7] **RECORD** the following initial values:

Computer Point OR VCT Level Indicator	L0112A/ 1-LI-62-139	%		
Boric Acid Batch Counter Totalizer	1-FQ-62-139	gallons		
[Primary Water Batch Counter	1-FQ-62-142	gallons		

[8] **BEGIN** raising RCS pressure slowly to 325 psig with 1-PCV-62-81, and 1-FCV-62-93 ________

[9] **WHEN** 100 psig RCS pressure is achieved, **THEN**

PERFORM the following:

NOMENCLATURE	LOCATION	POSITION	UNID	PERF INITIAL
RCP 1 SEAL RETURN	1-M-5	OPEN	1-FCV-62-9	
RCP 2 SEAL RETURN	1-M-5	OPEN	1-FCV-62-22	
RCP 3 SEAL RETURN	1-M-5	OPEN	1-FCV-62-35	
RCP 4 SEAL RETURN	1-M-5	OPEN	1-FCV-62-48	

[10] **WHEN** RCS pressure is 325 psig, **THEN**

ADJUST 1-HIC-62-93A AND 1-HIC-62-81A as necessary to maintain RCS pressure stable at approximately 325 psig. ________

[11] **RECORD** the following final values:

Computer Point OR VCT Level Indicator	L0112A/ 1-LI-62-139	%		
Boric Acid Batch Counter Totalizer	1-FQ-62-139	gallons		
[Primary Water Batch Counter	1-FQ-62-142	gallons		

Appendix HH
(Page 3 of 4)

RCS Void Determination

Date________ **INITIALS**

1.0 VOID DETERMINATION (continued)

[12] **DETERMINE** volume required to pressurize the RCS from 50 psig to 325 psig as follows

[12.1] **DETERMINE** makeup volume added based on change in Boric Acid Batch Counter 1-FQ-62-139 totalizer readings. ________

________	-	________	=	________
Final reading Step 1.0[11]		Initial reading Step 1.0[7]		gallons

[12.2] **DETERMINE** makeup volume added based on change in Primary Water Batch Counter 1-FQ-62-142 totalizer readings ________

________	-	________	=	________
Final reading Step 1.0[11]		Initial reading Step 1.0[7]		gallons

[12.3] **DETERMINE** change in VCT level ________

________ %	-	________ %	=	+/- ________
Initial reading Step 1.0[7]		Final reading 1.0[11]		% change +/-

[12.4] **CONVERT** VCT level change to gallons as follows: ________

________ +/-	X	19.27	=	+/- ________
% change		gallons/%		gallons

Appendix HH
(Page 4 of 4)

RCS Void Determination

Date________ **INITIALS**

1.0 VOID DETERMINATION (continued)

> **NOTE**
>
> A higher final VCT level will result in the change in VCT level being subtracted from total totalizer change

[13] **DETERMINE** total volume required to pressurize RCS. ________

________________	+	________________	+/-	________________	=	________________
change in Boric Acid totalizer (step 10.1)		change in PMW totalizer (Step 10.2)		change in VCT level (Step 10.3)		Total makeup required

End of Section

A.1-2
Complete ICRR plot and determine estimated critical rod position.

WATTS BAR NUCLEAR PLANT
JOB PERFORMANCE MEASURE
A.1-2
06-2011 NRC Exam

EVALUATION SHEET

Task: Complete ICRR plot and determine estimated critical rod position.

Alternate Path: n/a

Facility JPM #: New

Safety Function: n/a **Title:** Conduct of Operations

K/A 2.1.7 Ability to evaluate plant performance and make operational judgments based on operating characteristics, reactor behavior, and instrument interpretation.

Rating(s): 4.4/4.7 **CFR:** 41.5 / 43.5 / 45.12 / 45.13

Evaluation Method: Simulator ________ In-Plant ____________ **Classroom** X

References: GO-2,"Reactor Startup," Rev. 38.
1-SI-0-11, "Estimated Critical Position," Rev. 14.

Task Number: RO-085-GO-2-001 **Title:** Operate the control rods to bring the reactor critical.

Task Standard: The applicant :

1.) Evaluates data provided, plots appropriate points, and determines from the ICRR plot that criticality will be achieved at a position BELOW the minimum rod height (Bank C at 64 steps).

2.) Determines from GO-2, "Reactor Startup," that the control rods must be inserted fully, Mode 3 must be logged, and shutdown margin must be recalculated.

Validation Time: 20 minutes **Time Critical:** Yes _____ No X

==

Applicant: ______________________________ ________________ Time Start: ________
NAME Docket No. Time Finish: ________

Performance Rating: SAT ____ UNSAT ____ Performance Time ___

Examiner: ______________________________ ______________________________/________
NAME SIGNATURE DATE

==

COMMENTS

____

____

____

____

____

APPLICANT DATA SHEET

(RETURN TO EXAMINER UPON COMPLETION OF TASK)

INITIAL CONDITIONS:

1. Unit 1 is in Hot Standby recovering from a short forced outage at middle-of-core life (MOL).

2. The crew is performing a reactor startup in accordance with GO-2, "Reactor Startup."

3. From GO-2, "Reactor Startup," Section 5.3, "Reactor Startup," Step 11:

   A. Upper rod position limit 194.5 steps on bank D
   B. Lower rod position limit 37 steps on bank D
   C. Estimated Critical Position: 100 steps on bank D
   D. Mode 2, -1000 pcm rod position 15 steps on bank D

4. 1-SI-0-11, "Estimated Critical Position," Appendix A, "ICRR Monitoring," data has been collected from the Counter-Scaler for rod withdrawals up to Control Bank "C" at 18 steps.

	CBA 50	CBA 100	CBA/B 150/34	CBA/B 200/84	CBB/C 134/18
N31 Counts	1433	1556	1792	2330	5592
Count Period	30 sec	30 sec	30 sec	30 sec	30 sec

INITIATING CUE:

1. Using the data supplied, complete the ICRR plot and determine, from the plot, the rod position at which criticality is predicted.

2. Based on the predicted rod position at criticality, determine the action(s) required to be taken to comply with GO-2, "Reactor Startup," Section 5.3, "Reactor Startup."

DIRECTIONS TO APPLICANT

DIRECTION TO APPLICANT:

I will explain the initial conditions, and state the task to be performed. All control room steps shall be performed for this JPM, including any required communications. I will provide initiating cues and reports on other actions when directed by you. Ensure you indicate to me when you understand your assigned task. To indicate that you have completed your assigned task return the cue sheet I provided you.

INITIAL CONDITIONS:

1. **Unit 1 is in Hot Standby recovering from a short forced outage at middle-of-core life (MOL).**

2. **The crew is performing a reactor startup in accordance with GO-2, "Reactor Startup."**

3. **From GO-2, "Reactor Startup," Section 5.3, "Reactor Startup," Step 11:**

   A. Upper rod position limit 194.5 steps on bank D
   B. Lower rod position limit 37 steps on bank D
   C. Estimated Critical Position: 100 steps on bank D
   D. Mode 2, -1000 pcm rod position 15 steps on bank D

4. **1-SI-0-11, "Estimated Critical Position," Appendix A, "ICRR Monitoring," data has been collected from the Counter-Scaler for rod withdrawals up to Control Bank "C" at 18 steps.**

	CBA 50	CBA 100	CBA/B 150/34	CBA/B 200/84	CBB/C 134/18
N31 Counts	1433	1556	1792	2330	5592
Count Period	30 sec	30 sec	30 sec	30 sec	30 sec

INITIATING CUE:

1. **Using the data supplied, complete the ICRR plot and determine, from the plot, the rod position at which criticality is predicted.**

2. **Based on the predicted rod position at criticality, determine the action(s) required to be taken to comply with GO-2, "Reactor Startup," Section 5.3, "Reactor Startup."**

STEP/STANDARD	SAT/UNSAT

START TIME: _______

STEP 1: Enter the supplied data from the Cue Sheet on 1-SI-0-10 Appendix A, ICRR MONITORING USING SCALAR TIMER. STANDARD: Applicant enters the data provided for each rod position on Appendix A. (SEE ATTACHED KEY- Appendix A).) COMMENTS:	___ SAT ___ UNSAT
STEP 2: Calculate the ICRR from data for each rod withdrawal sequence. STANDARD: Applicant performs calculations and determines ICRR for each point. (SEE ATTACHED KEY - Appendix A). COMMENTS:	___ SAT ___ UNSAT
STEP 3: Determine the estimated critical position for each rod withdrawal sequence. STANDARD: For each calculated ICRR, the applicant places a point on the graph. Using a straight edge, the applicant connects the plotted points for the last two plots to the edge of the graph, comparing that position to the estimated critical position and the zero power rod insertion value. COMMENTS:	___ SAT ___ UNSAT

STEP/STANDARD	SAT/UNSAT
STEP 4: From the plotted points, determine the estimated critical position does not meet criteria of GO-2, "Reactor Startup." STANDARD: The applicant recognizes that count rate more than doubled during the rod pull from CBA/B 200/84 to CBB/C 134/18 (77.7 cps to 186.4 cps.) From the extrapolation of points, the applicant determines that the estimated critical position is BELOW the zero power rod insertion limit (64 steps on Control Bank C, from Core Operating Limits Report (COLR) Figure 1, Control Bank Insertion Limits Versus Thermal Power Four Loop Operation). **Step is critical to ensure that the reactor is not allowed to be critical below the minimum insertion limits, to ensure that shutdown margin is properly maintained.** COMMENTS:	**CRITICAL STEP** ___ SAT ___ UNSAT

STEP/STANDARD	SAT/UNSAT
STEP 5: Determine the required actions to be taken in response to the expected critical rod position. STANDARD: The applicant refers to GO-2, "Reactor Startup," Section 5.3, "Reactor Startup," Step 19, which refers back to step 5.3[11] tolerance band for criticality. The applicant determines that the following actions are required: 1. Rod withdrawal must be stopped. 2. ALL control rods must be fully inserted. 3. Mode 3 must be entered in the Narrative Log. 4. Shutdown Margin must be recalculated. **Step is critical to ensure that the reactor is placed in a stable, subcritical condition and that the errors in plant response/reactivity calculations are corrected prior to proceeding.** COMMENTS:	**CRITICAL STEP** ___ SAT ___ UNSAT

STOP TIME ________

WBN Unit 1	Estimated Critical Position	1-SI-0-11 Rev. 0014 Page 60 of 69

Appendix A
(Page 4 of 6)

ICRR Monitoring

Data Package: Page ____ of ____ **Date ________**

ICRR MONITORING USING SCALAR TIMER

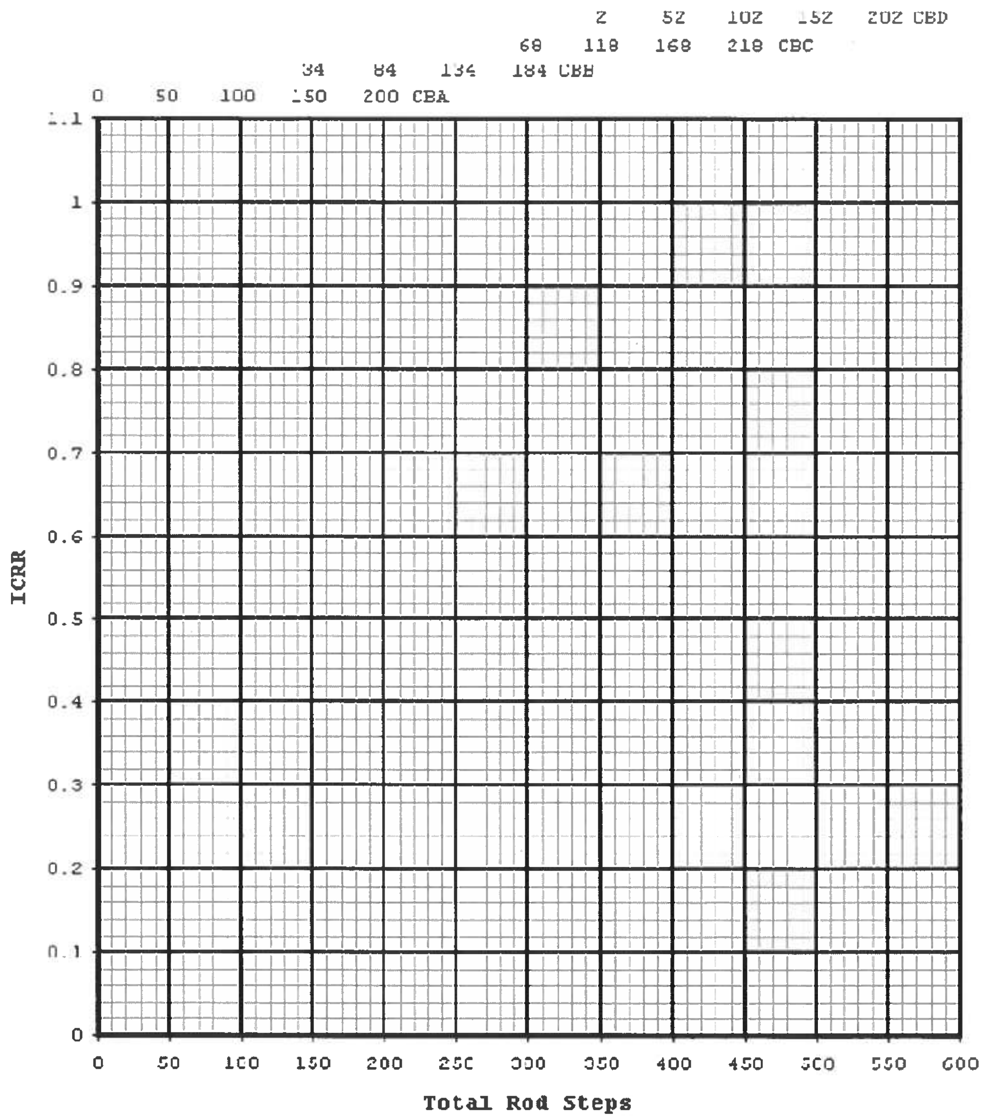
SOURCE RANGE CHANNEL: N-131 ☐, or N-132 ☐

Bank ID	Bank Position (Steps)	Counts	Count Period [ΔT] (sec)	Count Rate (C_i) [Counts/ΔT] (cps)	Base Count Rate (C_0) (cps)	ICRR [C_0/C_i]	Initial
Initial ΔT and C_0			30 sec.		46.6 cps		
CBA	50						
CBA	100						
CBA/B	150/34						
CBA/B	200/84						
CBB/C	134/18						
CBB/C	184/68						
CBC/D	118/2						
CBC/D	168/52						
CBC/D							
CBD							
CBD							
CBD							
CBD							
CBD							

Reviewed By: ______________________________

Figure 1
(Page 1 of 1)

ICCR VS Control Bank Position

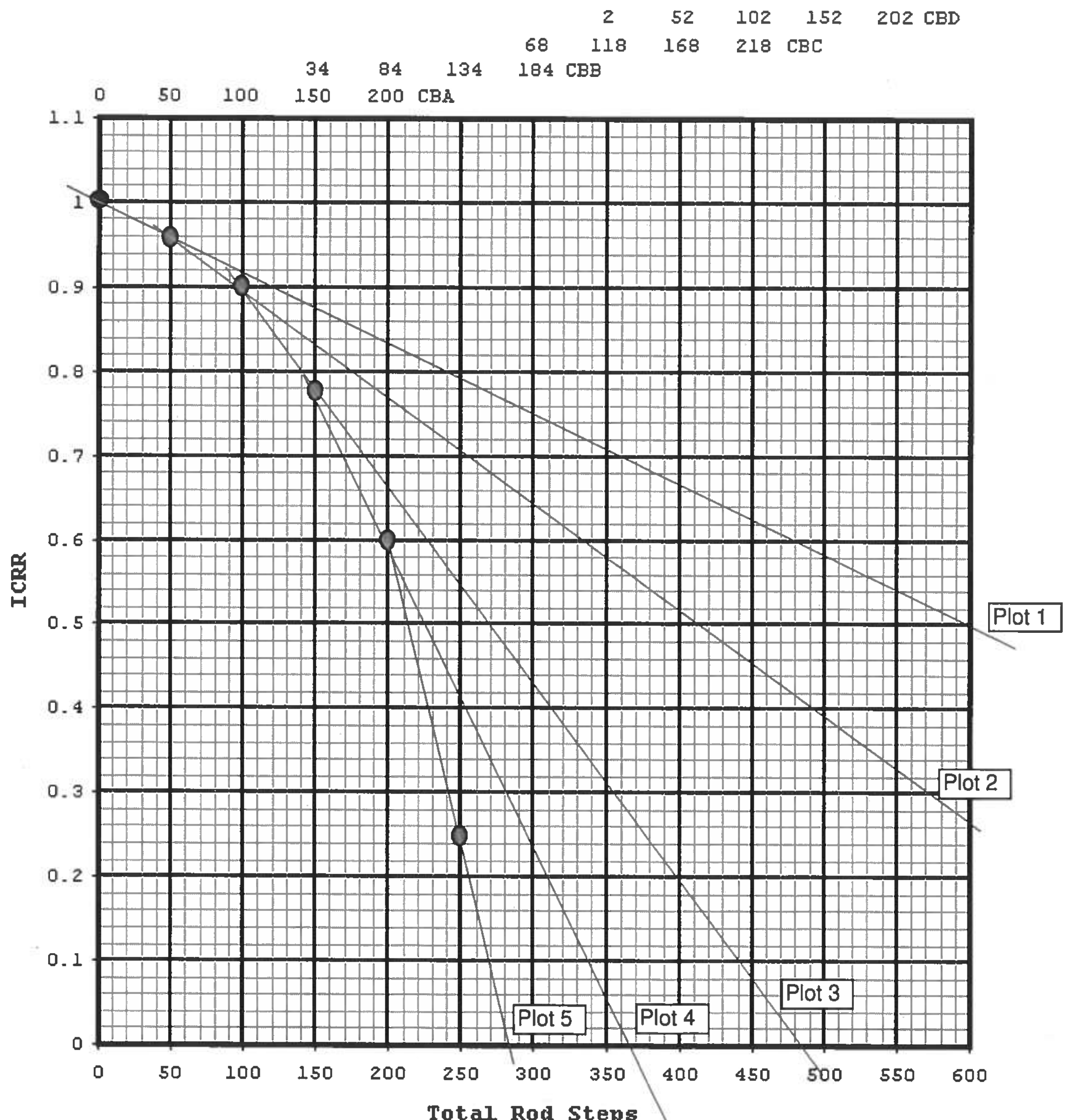


CONTROL BANK POSITION, Steps (Assuming Bank Overlap)

Performed By: ____________________ Reviewed By: ____________________

Figure 1
(Page 1 of 1)

ICCR VS Control Bank Position



CONTROL BANK POSITION, Steps (Assuming Bank Overlap)

Performed By: ______________________ Reviewed By: ______________________

Appendix A
(Page 4 of 6)

ICRR Monitoring

Data Package: Page ____ of ____ **Date ________**

ICRR MONITORING USING SCALAR TIMER

SOURCE RANGE CHANNEL: N-131 ☒, or N-132 ☐

Bank ID	Bank Position (Steps)	Counts	Count Period [ΔT] (sec)	Count Rate (C_i) [Counts/ΔT] (cps)	Base Count Rate (C_0) (cps)	ICRR [C_0/C_i]	Initial
Initial ΔT and C_0			30 sec.		46.6 cps		
CBA	50	1433	30 sec.	47.8 cps	46.6 cps	0.975	
CBA	100	1556	30 sec.	51.8cps	46.6 cps	0.9	
CBA/B	150/34	1792	30 sec.	59.7 cps	46.6 cps	0.78	
CBA/B	200/84	2330	30 sec.	77.7 cps	46.6 cps	0.6	
CBB/C	134/18	5592	30 sec.	186.4 cps	46.6 cps	0.25	
CBB/C	184/68						
CBC/D	118/2						
CBC/D	168/52						
CBC/D							
CBD							
CBD							
CBD							
CBD							
CBD							

Reviewed By: ____________________

TVA

Watts Bar Nuclear Plant

Unit 1

General Operating Instructions

GO-2

Reactor Startup

Revision 0038

Quality Related

Level of Use: Continuous Use

Effective Date: 02-16-2011

Responsible Organization: OPS, Operations

Prepared By: R. A. O'Rear

Approved By: Brian McIlnay

Revision Log

Revision or Change Number	Effective Date	Affected Page Numbers	Description of Revision/Change
32	03/19/09	2, 5, 6	Added reference and precaution for jumper installation and removal. (PER 140641)
33	06/04/09	2, 7, 10, 30, 31	Minor /Editorial change to removed the steps that required entry into Tech Spec 3.3.2. Reworded caution prior to resetting the TDMFWP's and added P/L to address Tech Spec change 08-07.
34	10/08/09	3, 18	Revised step 5.3[8.3] to direct continued performance at step 5.3[21]. Pet 201 no longer directs the actions equivalent to steps 5.3[21]-[22]
34 / UC-1	10/19/09	9	Made step 4.0[7] conditional, there is no requirement the TDAFWP be running.
35	10/20/09	9	Incorporate UC-1 to revision 34.
36	06/02/10	31	Incorporate UC-1 to revision 35
37	10/20/10	2, 6, 7, 10, 12-15, 17, 18, 20-22, 24-26, 28-30, 34, 35, 37	Minor editorial changes including corrective action for PER 231487-001 and ODM-23 required changes.
38	02/16/11	2, 6, 7,10, 12, 13, 16, 23, 27, 33, 34, 35, 38, 42	Clarified the sequence for resetting TDMFWPs and the notes associated with LCO 3.3.2 AFW start signals, in preparation for startup of initial MFW pump. [PER 288125, 231519] Added step to address the need for a local reset of CERPI Trouble Alarm and referenced IMI-85.001 [PCR 4810] Added note to Appendix A allowing out of sequence performance and formatted numbers to match. Minor changes including correcting format of Notes and Cautions.

Table of Contents

1.0 INTRODUCTION

1.1 Purpose

This Instruction provides actions to perform unit startup from Hot Standby (Mode 3) at normal operating temperature and pressure to between 1 and 4% Reactor Power (Mode 2).

1.2 Scope

This GO contains the following:

5.0 Instructions

5.1 General

5.2 Actions Performed Before Reactor Startup

5.3 Reactor Startup

2.0 REFERENCES

2.1 Performance References

A. 0-SI-0-3, Weekly Log

B. 1-SI-0-10, Shutdown Margin

C. 1-SI-0-11, Estimated Critical Position

D. 1-SI-0-2 Series, Shift And Daily Surveillance Log

E. 1-SI-0-903, Primary Pressure Boundary Isolation Valve Leak Test (Safety Injection Primary Check Valves)

F. 1-SI-47-76, Trip Actuating Device Operational Test (TADOT) Turbine Trip - Low Fluid Oil Pressure Channels I, II, III

G. 1-SI-47-77, Trip Actuating Device Operational Test (TADOT) Turbine Trip - Turbine Stop Valve Closure

H. 1-SI-68-34, Minimum Temperature for Criticality TAVG-TREF Deviation Alarm not Reset

I. 1-SI-85-1, Rod Drop Time Measurement by Simultaneously Dropping All Rod Banks

2.1 Performance References (continued)

J. 1-SI-85-10, Rod Drop Time Measurement Using CERPI Rod Drop Test Computer.

K. 1-SI-85-2, Reactivity Control Systems Moveable Control Assemblies (Mode 1 and 2)

L. 1-SI-85-3, Calibration (Cold/Hot) of Rod Position Indication Channels and Full Range Verification

M. 1-SI-92-8, Power Range Overpower Trip High Range Bistable Adjustment for Limiting Condition for Operation

N. 1-SI-99-4-A and (B), Trip Actuating Device Operational Test of Reactor Trip P-4 ESFAS Interlock Train A (B)

O. 1-TRI-85-1, Reactivity Control Systems Movable Control Assemblies (Modes 3,4, and 5)

P. CM-3.01, System Chemistry Specifications

Q. CM-5.08, Startup Primary Chemistry Control

R. Nuclear Operating Book (NOB)

S. OPDP-1, Conduct of Operations

T. PET-107, Mode 3 Physics Testing

U. PET-201, Initial Criticality and Low Power Physics Testing

V. SOI-2 & 3.01, Condensate And Feedwater System

W. SOI-62.02, Boron Concentration Control

2.1 Performance References (continued)

X. SOI-62.04, CVCS Purification System

Y. SOI-68.02, Reactor Coolant Pumps

Z. SOI-85.01, Control Rod Drive And Indicating System

AA. TI-127, Reactor/Turbine Trip Report, Event Critique, Root Cause Analysis

BB. TI-34.04, Loose Parts Monitoring Gain and Alarm Setpoints

CC. 0-PI-OPS-1.1, Jumper Control Process\

DD. IMI-99.040A, Maintain Source Range in Service Jumpers

EE. IMI-85.001, Computer Enhanced Rod Position Indication (CERPI) Diagnostics

2.2 Developmental References

A. WBN, Technical Specifications

B. GOI-7, Generic Equipment Operating Guidelines

3.0 PRECAUTIONS AND LIMITATIONS

3.1 Precautions

NOTES

1) If a precaution cannot be complied with, the SM shall initial, date, and write a brief explanation. Precautions that contain must, shall, or will, must be adhered to.

2) This instruction may be entered from a partial shutdown. N/A section(s) not applicable and annotate reason.

3) During power changes, maximize letdown flow when possible to minimize crud induced power shifts.

A. Anticipate criticality anytime reactivity changes are being made. [C.1]

B. In Hot Standby, maintain Shutdown Margin to account for positive reactivity addition from Xenon transients to ensure inadvertent criticality does not occur. The SR and IR instruments must be closely observed to detect an inadvertent criticality during Xenon transients.[C.1]

C. Pzr-RCS C_B difference should be less than or equal to 50 ppm and is maintained by use of Pzr heaters and spray.

3.1 Precautions (continued)

D. Contact Reactor Engineering for guidance on core operating recommendations during unusual power maneuvers such as startup at End of Life (EOL).

E. After refueling, NIS indications may be inaccurate until calibrated at higher power levels. NIS calibration procedures will adjust PRM trip setpoints lower than normal to ensure excore detectors protect against an overpower condition.

F. In Mode 2 (less than or equal to 5%), sudden temperature decreases, or C_B changes greater than 10 ppm, should be avoided. The operator should be alert to secondary steam flow to avoid cooling the RCS below the Minimum Temperature for Criticality of greater than or equal to 555°F, and/or causing a spurious Safety Injection.[C.2]

G. All jumper installation and removal shall be in accordance with 0-PI-OPS-1.1, Jumper Control Process.

H. In Mode 2, the trip function of all Turbine Driven Main Feedwater Pumps (TDMFWP) is required when one or more (TDMFWP) is supplying feedwater to the Steam Generators. During the process of placing the first TDMFW pump in service, the anticipatory AFW auto-start channel for the non-operating TDMFW pump is deenergized to prevent inadvertent AFW auto-start during rollup trip testing and overspeed trip testing. Once the operating TDMFW pump has established sufficient feed flow to maintain SG level, the anticipatory AFW auto-start channel for the non-operating TDMFW pump is placed in the "trip" condition, and the AFW pumps secured. Refer to Tech Spec 3.3.2 Table 3.3.2-1, Function 6.e. and B 3.3.2.6.e.

I. The Greek symbol (ρ) precedes steps associated with direct reactivity manipulations, for example: RCS dilution and boration, control rod manipulations.

3.2 Limitations

A. In Mode 2 with K_{eff} less than 1.0, or in Mode 3 or 4, Shutdown Margin shall be maintained greater than or equal to 1600 pcm (T.S. 3.1.1).

B. In Mode 3, at least two RCPs shall be operable with two loops in operation when the Rod Control System is capable of rod withdrawal, and at least one RCP shall be in operation when the Rod Control System is not capable of rod withdrawal (T.S. 3.4.5).

C. SOURCE RANGE HI FLUX AT SHUTDOWN alarm shall be in operation any time the Reactor is shutdown with fuel in the Reactor vessel.

D. Simultaneous reactivity addition by rod withdrawal and dilution is not allowed while in the Source range.

3.2 Limitations (continued)

E. If at any point during the approach to criticality, ONE of the two Source Ranges shows an unexplained rise in count rate by a factor of 5 or greater, or if BOTH Source ranges show an unexplained rise in count rate by a factor of 2 or greater, the approach to critical shall be SUSPENDED IMMEDIATELY and the control rods FULLY INSERTED (i. e., rod withdrawal and/or boron dilution shall be terminated). Further positive reactivity changes shall not be resumed UNTIL an evaluation is performed, Plant Manager approval obtained, and the SM authorizes resuming the approach to critical.[C.1]

F. A member of Operations Management Staff, not assigned to the operating crew, shall be present in the control room during the approach to criticality.

Date TODAY **Initials** TBD

4.0 PREREQUISITES

STARTUP No. 70

NOTES

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

2) Prerequisite Actions may be complied with in any order. If a prerequisite cannot be complied with, the SM shall initial, date, and write a brief explanation. Prerequisites that contain must, shall, or will, cannot be N/A'd.

3) Throughout this instruction, Concurrent Verification (CV) for breaker or fuse manipulations may be marked N/A if no manipulations are performed.

[1] **MAINTAIN** Pzr pressure in the normal operating band with Pzr heaters and spray. TBD

[2] **MAINTAIN** Pzr level at greater than or equal to 25%. TBD

NOTE

T_{AVG} will vary as a function of reactor power until the unit is greater than 15% turbine load (C5) and the T_{avg} program is maintained by AUTO or manual rod control. The T_{AVG}-T_{REF} deviation alarm should be expected as reactor power approaches 7% RTP.

[3] **MAINTAIN** Steam Dumps in the Pressure Mode set at 84% (1092 psig), or with SG PORVs set at 84%. TBD

[4] **IF** SG PORVs are in service, **THEN**

ENSURE adequate CST level. N/A

[5] **IF** A-A AFW Pump is NOT running, **THEN**

MANUALLY START the A-A AFW Pump in accordance with SOI-3.02, Section 8.1.1. TBD

[6] **IF** B-B AFW Pump is NOT running, **THEN**

MANUALLY START the B-B AFW Pump in accordance with SOI-3.02, Section 8.1.2. TBD

Date TODAY ________ Initials TBD ____

4.0 PREREQUISITES (continued)

[7] **IF** TD AFW Pump is desired to be running **AND** TD AFW Pump is **NOT** running, **THEN**

MANUALLY START the TD AFW Pump in accordance with SOI-3.02, Section 8.1.3. TBD ____

[8] **MAINTAIN** SG levels on program with AFW pumps. TBD ____

[9] **ENSURE** all RCPs are operating per SOI-68.02. TBD ____

[10] **ENSURE** Source Range jumpers have been removed per IMI-99.040A, Maintain Source Range in Service jumpers. (Ref GO-1). TBD ____

[11] **WHEN** Source Range jumpers are removed, **THEN**

REMOVE Caution Order from Reactor trip breakers, RTA and RTB . TBD ____

NOTE
CERPI Trouble Alarm can be diagnosed and reset using IMI-85.001

[12] **CONTACT** Work Control for assistance to reset CERPI Trouble Alarm. (N/A if alarm previously reset) TBD ____

[13] **CONDUCT** a pre-evolution briefing in accordance with OPDP-1, stressing the following:

- Management Expectations
- Limitations/Precautions
- Communications
- Chain of Command
- Conservative actions when repositioning control rods during approach to critical

TBD ____
SM

Date TODAY ________ Initials TBD ______

5.0 INSTRUCTIONS

5.1 General

NOTE

Section 5.0 steps must be performed sequentially, unless specifically stated otherwise. Prior SM approval is required to deviate from this sequence.

[1] **ENSURE** Section 4.0, Prerequisites, **COMPLETE.** TBD ______

5.2 Actions Performed Before Reactor Startup

[1] **INITIATE** Appendix A, Mode 3-To-Mode 2 Review and Approval, while continuing with this instruction. TBD ______

[2] **ENSURE** Daily Scheduling Supervisor has issued the Mode 3-to-Mode 2,1 surveillance reports to the applicable department sections to prepare for Mode 2 entry. TBD ______

[3] **ENSURE** Daily Scheduling Supervisor has issued the Reactor Trip Breaker reports to the applicable department sections before closing the Reactor trip breakers (N/A if previously performed). TBD ______

NOTE

The Pzr steam space sample should remain in service per CM-5.08 for removal of non-condensable gases.

[4] **COORDINATE** with Chemistry to establish primary and secondary startup chemistry controls per CM-5.08, and CM-3.01. TBD ______

Date TODAY **Initials**_____

5.2 Actions Performed Before Reactor Startup (continued)

CAUTION

Failure to have all three AFW pumps in operation with the FWPs tripped and trip buses energized will initiate an ESF Actuation.

NOTES

1) Step 5.2[5.1] may be initiated early to ensure the first Turbine Driven Main Feedwater (TDMFW) pump will be ready to start when Reactor power is 1 to 4%.

2) In Mode 2, trip function of all TDMFW pumps is required when one or more TDMFW pumps are supplying feedwater to the Steam Generators. Refer to Tech Spec 3.3.2 Table 3.3.2-1, Function 6.e .[C.5]

3) During the process of placing the first TDMFW pump in service, the anticipatory AFW auto-start channel for the non-operating TDMFW pump is deenergized to prevent inadvertent AFW auto-start during rollup trip testing and overspeed trip testing. Once the operating TDMFW pump has established sufficient feed flow to maintain SG level, the anticipatory AFW auto-start channel for the non-operating TDMFW pump is placed in the “trip” condition, and the AFW pumps secured. B 3.3.2.6.e

[5] **PERFORM** the following to prepare first TDMFW pump to support startup:

[5.1] **SELECT** which MFW pump will be started first: (N/A non-selected pump)

- 1A MFW pump. TBD
- 1B MFW pump. N/A

Date TODAY Initials_____

5.2 Actions Performed Before Reactor Startup (continued)

[5.2] **IF** 1A MFW pump will be started first, **THEN** **PERFORM** the following:

[5.2.1] **ENSURE** 1-BKR-46-36, 250V DC FDR FOR MFPT B TRIP BUS UNIT 1 in OFF. [250V Bat Bd 1, Panel 3] TBD

SOG

CV

[5.2.2] **ENSURE** 1-BKR-46-9, 250V DC FDR FOR MFPT A TRIP BUS UNIT 1 in ON. [250V Bat Bd 1, Panel 3] TBD

SOG

CV

[5.2.3] **PERFORM** the applicable steps of SOI-2&3.01 to RESET and WARM 1A MFW pump. TBD

[5.3] **IF** 1B MFW pump will be started first, **THEN** **PERFORM** the following:

[5.3.1] **ENSURE** 1-BKR-46-9, 250V DC FDR FOR MFPT A TRIP BUS UNIT 1 in OFF. [250V Bat Bd 1, Panel 3] N/A

CV

[5.3.2] **ENSURE** 1-BKR-46-36, 250V DC FDR FOR MFPT B TRIP BUS UNIT 1 in ON. [250V Bat Bd 1, Panel 3]

CV

[5.3.3] **PERFORM** the applicable steps of SOI-2&3.01 to RESET and WARM 1B MFW pump.

Date TODAY Initials TBD

5.2 Actions Performed Before Reactor Startup (continued)

[6] **IF** an SI signal has occurred, **THEN**

CYCLE the Reactor Trip Breakers. N/A

[7] **SELECT** HIGHEST reading Source Range and Intermediate Range channels to record on 1-NR-92-145. TBD

[8] **ENSURE** the following:

[8.1] Audio Count Rate channel IN OPERATION. TBD

[8.2] Audio Count Rate selected to the highest Source Range. TBD

Date TODAY Initials TBD

5.2 Actions Performed Before Reactor Startup (continued)

NOTE
The Loose Parts Monitoring System (LPMS) alarm is required to be in service prior to Mode 2 entry (TR 3.3.6.)

[9] **PERFORM** Step 5.2[9.1] OR 5.2[9.2] below (**N/A** option **NOT** used):

[9.1] **IF** the plant has been maintained in Hot Standby Conditions, **THEN**

PERFORM the following to enable LPMS alarm [0-R-139 panel, Aux Instr. Rm]

A. **PRESS** SYSTEM RESET switch [1433-P module] N/A ______

B. **PLACE** ANNUNCIATOR INHIBIT switch [1439 module] in DOWN position. ______

C. **PLACE** TAPE RECORDER INHIBIT AUTO START switch [1436WB module] in DOWN position. ______

[9.2] **IF** plant has NOT been maintained in Hot Standby Conditions, **THEN**

ENSURE Instrument Maintenance (IM) completes performance of TI-34.04 to place LPMS in service. ______

[10] **IF** Shutdown Rods are INSERTED, **THEN**

[10.1] **CHECK** Reactor Trip Breaker Closure Surveillance report (generated by scheduling) is COMPLETE. TBD ______

[10.2] **ENSURE** Shutdown Bank withdrawal criteria MET per 1-SI-0-10. TBD ______

[10.3] **ENSURE** all Reactor Trip first-out alarms RESET. TBD ______

[10.4] **PLACE** Control Rod Drive System in service per SOI-85.01. TBD ______

[10.5] **CLOSE** Reactor Trip Breakers per SOI-85.01. TBD ______

Date TODAY Initials TBD

5.2 **Actions Performed Before Reactor Startup (continued)**

[10.6] **PERFORM** the following concurrently:

A. 1-TRI-85-1 (N/A if performed within the previous 31 days), TBD

B. 1-SI-85-2 (N/A if in frequency). TBD

[10.7] **PERFORM** the ROD BANK UPDATE on the ICS Computer (ROD BANK UPDATE is on NSSS Screen). TBD

[10.8] **ENSURE** Instrument Maintenance (IM) has completed 1-SI-99-4-A and -B, to check P-4 Interlock.[C.3] TBD

NOTE

Procedure PET-107, Mode 3 Physics Testing, satisfies low power physics testing if completed satisfactorily. If not, further testing will be required per PET-201, Initial Criticality, and Low Power Physics Testing, which includes steps to withdraw Shutdown Banks. IF PET-107 and PET-201 are not required, N/A Step 5.2[10.9]

[10.9] **COORDINATE** with Reactor Engineering to ensure PET-107, Mode 3 Physics Testing and PET-201, Initial Criticality and Low Power Physics Testing completed as necessary for startup. TBD

Date TODAY Initials TBD

5.2 Actions Performed Before Reactor Startup (continued)

•

CAUTION

Control Room activities not related to reactor startup should be minimized during the approach to criticality. SM should not permit shift turnover or other distractions to cause insufficient attention to the approach to criticality.

NOTES

1) NIS Instruments must be monitored in anticipation of unplanned reactivity changes.[C.1]

2) During rod withdrawal, Rod Position Indicators (RPIs) should be compared with the Step Counters to determine if rod misalignment or other rod related problems exist.[C.4]

3) COLR defines fully withdrawn as a band for the Shutdown and Control banks. Computer constant K0015 provides current value, and should be consistent with NOB Sheet A-7, Monthly Full Out Rod Position.

[10.10] (ρ) **WITHDRAW** Shutdown Rods to fully withdrawn per SOI-85.01. TBD

[11] **IF** refueling was performed **OR** Reactor Vessel Head removed, **THEN**

[11.1] **ENSURE** Rod Drop Timing per either 1-SI-85-10 OR 1-SI-85-1 has been performed. N/A

[11.2] **ENSURE** IM has performed RPI Calibration per 1-SI-85-3.

Date TODAY Initials TBD

5.2 Actions Performed Before Reactor Startup (continued)

[12] **ENSURE** the following systems are operable prior to going to Mode 2.

- Containment H_2 Recombiners per SOI-83.01, Checklist 1. TBD
- Permanent H_2 Mitigation System per SOI-268.01, Checklist 1, 2, & 3. TBD

[13] **INITIATE** Appendix A, Mode 3-To-Mode 2 Review And Approval, to ensure ALL restraints to Mode 2 entry are resolved, and approvals for mode change granted. TBD SM

[14] **ENSURE** IM has completed the following Trip Actuating Device Operational Tests (TADOTs) (N/A if performed within 31 days before reactor startup):

- 1-SI-47-76 TBD
- 1-SI-47-77 TBD

End of Section

Date TODAY   Initials TBD

5.3 Reactor Startup

NOTE

Anytime reactivity changes are made, criticality must be anticipated. Closely monitor NIS instruments.

[1] **ENSURE** Section 5.2, Actions Performed Before Reactor Startup, have been COMPLETED. TBD

[2] **BLOCK** SOURCE RANGE HI FLUX AT SHUTDOWN alarm by placing both HI FLUX AT SHUTDOWN switches at SR NIS panels [M-13] to BLOCK. TBD

[3] **CHECK** Alarm 81 C, SOURCE RANGE HI FLUX AT SHUTDOWN ALM BLOCKED, is LIT. TBD

[4] **CHECK** greater than or equal to 0.5 cps on highest SR NIS. TBD

NOTE

The following count rates may be used as a reference during the approach to criticality.

[5] **RECORD** SR NIS count rates from 5.3[5.1] or 5.3[5.2] (N/A NIs not used): TBD

[5.1] 1-M-4 (preferred)

1-NI-92-131A 46.6 cps

1-NI-92-132A 45 cps

[5.2] SR NIS Drawer [1-M-13]

1-NI-92-131D N/A cps

cps1-NI-92-132E N/A cps

Date TODAY Initials TBD

5.3 Reactor Startup (continued)

CAUTION

After refueling, NIS indications may be inaccurate until calibrated at higher power. NIS calibrations will adjust PRM setpoints lower than normal to ensure excore detectors protect against an overpower condition. Redundant indications of Reactor Power should be used until confidence is established in the PR indicators (ΔT, Turbine Power, NIS).

NOTE

ICRR plot being performed should be referred to until criticality is achieved.

[6] **IF** initial startup following refueling, **OR** activities occurred which could cause non-conservative NIS response, **THEN**

ENSURE Power Range high-flux trip setpoints are reduced to less than or equal to 85% RTP.

TBD	TODAY	
IM	Date	Time

CAUTION

Avoid operations that could produce sudden temperature changes or unplanned C_B changes during approach to critical or at low power.

[7] **MONITOR** Source and Intermediate range NIs during approach to critical to identify potential reactivity anomalies. TBD

[8] **IF** initial startup is following refueling, **THEN**

PERFORM the following:

[8.1] **ENSURE** Shift and Daily Surveillance Log Mode 2, 1-SI-0-2A-02 (1900-0700) or 1-SI-0-2B-02 (0700-1900) is **COMPLETE** for Mode 2 entry.

TBD	TODAY	
Initials	Date	Time

[8.2] **NOTIFY** on-site personnel of Reactor startup over P/A. TBD

Date TODAY ______ Initials TBD _____

5.3 Reactor Startup (continued)

NOTES

SR 3.1.7.1 (ECP above insertion limit), is triggered in PET-201.

[8.3] **IF** dilution to critical is required, **THEN**

ENSURE Appendix A, Mode 3-To-Mode 2 Review And Approval, COMPLETE, **AND**, N/A _____

LOG Mode 2 entry in Narrative Log as directed by PET-201, Initial Criticality and Low Power Physics Testing. _____

GO TO step 5.3[21]. _____

NOTE

If performing PET-201, steps 5.3[9] through 5.3[22] are N/A.

[9] **CALCULATE** Estimated Critical Position (ECP) per 1-SI-0-11.

TBD	TODAY	
Initials	Date	Time

[10] **IF** actual C_B is **NOT** within 5 ppm of Estimated Critical C_B, **THEN**

RECALCULATE ECP

OR TBD _____

PERFORM the following:

[10.1] **(ρ) DILUTE/BORATE** per SOI-62.02, to the Estimated Critical C_B. N/A _____

[10.2] **EQUALIZE** RCS-Pzr C_B (within 50 ppm) using Pzr heaters and spray. _____

[10.3] **WHEN** sufficient mixing has occurred (≥30 minutes), **THEN**

REQUEST Chemistry to obtain a new C_B sample. _____

Date TODAY Initials TBD

5.3 **Reactor Startup (continued)**

[10.4] **ENSURE** actual C_B is within 5 ppm of estimated C_B. TBD

[11] **RECORD** the 750 pcm Upper and Lower rod position limits, Estimated Critical Position, and the Mode 2 rod position, determined by 1-SI-0-11:

> **NOTE**
>
> If ARO on Control Bank D (CBD) is less than 750 pcm, the upper limit rod position is the Control Bank D ARO number.

A. Upper rod position limit 194.5 steps on bank D

B. Lower rod position limit 37 steps on bank D

C. Estimated Critical Position: 100 steps on bank CBD

D. Mode 2, -1000 pcm rod position 15 steps on bank D

TBD

[12] **CHECK** Shutdown Banks fully withdrawn, **AND** TBD

CHECK the ROD BANK UPDATE was updated on the ICS Computer (ROD BANK UPDATE is on NSSS Screen). TBD

[13] **ENSURE** the following are COMPLETE as required:

- TI-34.04, Loose Parts Monitoring System Gain and Alarm Setpoints (Ref. Step 5.2[9]) TBD
- 1-SI-47-76, Trip Actuating Device Operational Test (TADOT) Turbine Trip - Low Fluid Oil Pressure Channels I, II, III (N/A if performed within 31 days before reactor startup) (Ref. Step 5.2[14]) TBD
- 1-SI-47-77, Trip Actuating Device Operational Test (TADOT) Turbine Trip - Turbine Stop Valve Closure (N/A if performed within 31 days before reactor startup) (Ref. Step 5.2[14]) TBD

Date TODAY   Initials TBD

5.3 Reactor Startup (continued)

[14] **ENSURE** a member of Operations Management Staff who is **NOT** a member of the operating crew, is present in the control room during the approach to criticality. TBD
SRO

[15] **ANNOUNCE** Reactor startup over P/A (N/A if previously performed). TBD

CAUTIONS

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

2) If the approach to criticality is suspended or delayed, the core shall be maintained sufficiently subcritical to avoid inadvertent criticality.

[16] **INITIATE** Reactor Startup by performing the following:

[16.1] **INITIATE** Inverse Count Rate Ratio monitoring (ICRR). TBD

[16.2] **RECORD** both SR NIS readings for ICRR base counts:

1-NI-92-131A 46.6 cps

1-NI-92-132A 45 cps TBD

NOTE

NIS Instruments shall be monitored in anticipation of unplanned reactivity rate of change [C.1]

[16.3] (ρ) **START** Control Bank withdrawal per SOI-85.01. TBD

[16.4] **ENSURE** RPIs and step counters are within ± 12 steps prior to rods reaching Mode 2 rod position specified in Step 5.3[11]D. TBD

Date TODAY   Initials TBD

5.3 Reactor Startup (continued)

[16.5] **IF** rods reach MODE 2 rod position specified in Step 5.3[11]D, **THEN**

ENSURE Appendix A, Mode 3-To-Mode 2 Review And Approval, COMPLETE, **AND**

LOG Mode 2 entry in Narrative Log. _________

_________ Initials _________ Date _________ Time

NOTE

Step 5.3[16.6] and 5.3[17] may be signed off at the completion of the last full 50 steps before critical.

[16.6] **STOP** at 50 steps, **AND**

PERFORM ICRR. _________

[17] **IF** ICRR predicts criticality will not occur in next 50 steps, **THEN**

(ρ) WITHDRAW RODS an additional 50 steps, **AND**

RETURN to step 5.3[16.4]. _________

[18] **IF** ICRR plot predicts criticality in the next 50 steps **AND**

within the tolerance in step 5.3[11]**, THEN**

[18.1] **CHECK** Estimated Critical Position above Insertion Limit, per 1-SI-0-11, within 4 hours of achieving criticality (SR 3.1.7.1). _________

[18.2] **ENSURE** T_{AVG} greater than or equal to 555°F. _________

[18.3] **(ρ) WITHDRAW** RODS to achieve criticality, establish a positive startup rate, **THEN**

GO TO step 5.3[21]. _________

Date________ Initials_____

5.3 Reactor Startup (continued)

Start of Critical Step(s)

[19] **IF** criticality cannot be achieved within step 5.3[11] tolerance, **THEN**

PERFORM the following:

[19.1] **STOP** rod withdrawal. ________

[19.2] (ρ) **INSERT** ALL Control Banks fully. ________

[19.3] **LOG** Mode 3 entry in Narrative Log.

________ ________ ________
Initials Date Time

[19.4] **RECALCULATE** Shutdown Margin per 1-SI-0-10.

________ ________ ________
Initials Date Time

End of Critical Step(s)

[20] **IF** all control rods were inserted per 5.3[19], **THEN**

[20.1] **ENSURE** Reactor Engineering evaluates **AND** Initiates a Service Request (SR). ________

[20.2] **RECALCULATE** ECP per 1-SI-0-11.

________ ________ ________
Initials Date Time

[20.3] **OBTAIN** permission to proceed from Plant Manager. ________

[20.4] (ρ) **DILUTE/BORATE** per SOI-62.02 to Estimated Critical C_B. ________

[20.5] **EQUALIZE** RCS-Pzr C_B (within 50 ppm) using Pzr heaters and spray. ________

Date________ Initials_____

5.3 Reactor Startup (continued)

[20.6] **WHEN** sufficient mixing has occurred (≥30 minutes), **THEN**

REQUEST Chemistry to obtain a new C_B sample. ________

[20.7] **ENSURE** actual C_B is within 5 ppm of ECP boron for Reactor Startup. ________

NOTE
If ARO on Control Bank D (CBD) is less than 750 pcm, the upper limit rod position is the Control Bank D ARO number.

[20.8] **RECORD** the 750 pcm Upper and Lower rod position limits, Estimated Critical Position, and Mode 2 rod position, determined by 1-SI-0-11:

A. Upper rod position limit

______ steps on bank ________

B. Lower rod position limit ________ steps

on bank ________.

C. Estimated Critical Position ________ steps

on bank CBD.

D. Mode 2, -1000 pcm rod position ________ steps

on bank ________ ________

[20.9] **ENSURE** 1-SI-0-2, COMPLETE for Mode 2 entry.

____________	____________	____________
Initials	Date	Time

[20.10] **INITIATE** Inverse Count Rate Ratio monitoring (ICRR). ________

[20.11] **RECORD** both SR NIS readings for ICRR base counts:

1-NI-92-131A ________cps,

1-NI-92-132A ________cps ________

Date________ Initials_____

5.3 Reactor Startup (continued)

NOTE

NIS Instruments shall be monitored in anticipation of unplanned reactivity rate of change.[C.1]

[20.12] (ρ) **START** Control Bank withdrawal per SOI-85.01. ________

[20.13] **ENSURE** RPIs and step counters are within ± 12 steps prior to rods reaching Mode 2 rod position specified in Step 5.3[20.8]D ________

[20.14] **IF** control rods reach Mode 2 rod position specified in Step 5.3[20.8]D **THEN**

ENSURE Appendix A, Mode 3-To-Mode 2 Review And Approval, COMPLETE, **AND** ________

LOG Mode 2 entry in Narrative Log.

____________	____________	____________
Initials	Date	Time

NOTE

Step 5.3[20.15][and 5.3[20.16] may be signed off after last 50 steps before criticality.

[20.15] **STOP** at 50 steps, **AND**

PERFORM ICRR. ________

[20.16] **IF** ICRR predicts criticality will **NOT** be achieved in next 50 steps, **THEN**

(ρ) **WITHDRAW** RODS an additional 50 steps, **AND**

RETURN to step 5.3[20.13] ________

Date________ Initials_____

5.3 Reactor Startup (continued)

[20.17] **IF** ICRR plot predicts criticality in next 50 steps **AND** within the tolerance in step 5.3[20.8], **THEN**

[20.17.1] **CHECK** Estimated Critical Position above Insertion Limit, per 1-SI-0-11, within 4 hours of achieving criticality (SR 3.1.7.1). _________

[20.17.2] **ENSURE** T_{AVG} greater than or equal to 555°F. _________

[20.17.3] **(ρ) WITHDRAW** rods to achieve Reactor criticality, establish a positive startup rate, **THEN**

GO TO step 5.3[21]. _________

Start of Critical Step(s)

IF criticality cannot be achieved within step 5.3[20.8] tolerance, **THEN**

[20.17.4] **STOP** rod withdrawal. _________

[20.17.5] **(ρ) INSERT** ALL Control Banks fully. _________

[20.17.6] **LOG** Mode 3 entry in Narrative Log.

_________	_________	_________
Initials	Date	Time

[20.17.7] **ENSURE** Reactor Engineering evaluates **AND** Initiates a SR. _________

[20.17.8] **INITIATE** new GO-2, if startup to continue.

_________	_________	_________
SRO	Date	Time

End of Critical Step(s)

Date________ Initials_____

5.3 Reactor Startup (continued)

CAUTION

The Reactor will trip at 10^5 cps on one Source Range, if the trip is not blocked.

Start of Critical Step(s)

[21] **WHEN** 1/2 IR monitors reach 1.66 X 10^{-4}%, **THEN**

[21.1] **CHECK** Permissive 65 D, P-6 INTERMED RANGE PERMISSIVE, is LIT. ________

[21.2] **(p) ADJUST** Control Rods to maintain 0 SUR at less than 10^5 cps on SR monitors. ________

[21.3] **RECORD** both SR NIS readings:

1-NI-92-131A______ cps,

1-NI-92-132A______ cps ________

[21.4] **RECORD** both IR NIS readings:

1-NI-92-135A ________%,

1-NI-92-136A ________% ________

End of Critical Step(s)

Date________ Initials_____

5.3 Reactor Startup (continued)

NOTES

1) Blocking SRM Reactor Trip disables detectors outputs and removes audio count rate signal.

2) Steps 5.3[21.5] through 5.3[21.7] should, at SM discretion, be performed at the time of criticality. However, SR Trip must be BLOCKED conservatively before the SR Trip setpoint of 10^5 cps.

Start of Critical Step(s)

[21.5] **BLOCK** SR Trip by placing handswitches 1-N33A, SR TRIP TR A RESET-BLOCK P-6, and 1-N33B, SR TRIP TR B RESET-BLOCK P-6, to BLOCK. ________

End of Critical Step(s)

[21.6] **CHECK** the following:

[21.6.1] Permissive 64 C, SOURCE RANGE TRIP BLOCKED, LIT. ________

[21.6.2] Alarm 81 C, SOURCE RANGE HI FLUX AT SHUTDOWN ALM BLOCKED, **NOT** LIT. ________

[21.7] **SELECT** 1-NR-92-145 to record the highest indicating IR channel and one PR channel. ________

[22] **ANNOUNCE** Reactor Criticality on the P/A. ________

Date________ Initials_____

5.3 Reactor Startup (continued)

Start of Critical Step(s)

[23] **IF** initial startup following refueling **AND** criticality can **NOT** be achieved per PET-201, **THEN**

[23.1] **(ρ) INSERT** ALL Control Banks fully. ________

[23.2] **LOG** Mode 3 entry in Narrative Log.

________	________	________
Initials	Date	Time

[23.3] **EVALUATE** the discrepancy and

INITIATE new GO-2, if startup to continue.

________	________	________
SM	Date	Time

End of Critical Step(s)

[24] **IF** T_{AVG} is less than 561°F **AND** Alarm 94 A,

TAVG-TREF DEVIATION, is LIT, **THEN**

INITIATE 1-SI-68-34 (SR 3.4.2.1). ________

[25] **(ρ) ADJUST** Control Rods and/or boron concentration to RAISE Reactor power, at a rate of less than 1 dpm, to 1 X 10^{-2} %. ________

[26] **STABILIZE** Reactor power at 1 X 10^{-2} %. ________

Date________ **Initials**_____

5.3 Reactor Startup (continued)

[27] **RECORD** CRITICAL DATA:

Power Level: ____________ % ____________ %
1 NI 92 135A 1 NI 92 136A

Rod Position: ________ ________ ____________ RCS C_B ________ PPM
Bank Steps

Loop T_{AVG} ____________ °F ____________ °F ____________ °F ____________ °F
1 TI 68 2E 1 TI 68 25E 1 TI 68 44E 1 TI 68 67E

________ ________ ________
Initials Date Time

[28] **IF** Actual Critical Rod Position is between 500 and 750 pcm from ECP, **THEN**

ENSURE Reactor Engineering evaluates **AND** initiates a SR. ________

[29] **IF** Mode 2 physics testing required, **THEN**

ENSURE that the Mode 2 and Mode 3 Surveillances are in effect during the duration of rod worth measurements (approx 8 hours) per PET-201, **AND**

ENSURE Reactor Engineering has performed the applicable low-power physics tests per PET-201. ________

NOTE

If AFW is in service, Reactor power must be maintained within the capability of AFW to maintain SG levels.

[30] **EVALUATE** closing AFW Pumps Recirc Valves (refer to SOI-3.02, Section 8.9). ________

Date________ Initials_____

5.3 Reactor Startup (continued)

NOTE

T_{AVG} will vary as a function of reactor power until the unit is greater than 15% turbine load (C5) and the T_{avg} program is maintained by AUTO or manual rod control. The TAVG-TREF deviation alarm is expected as reactor power approaches 7% RTP.

[31] **(p) ADJUST** Control Rods or RCS C_B to RAISE Reactor power, at a rate of less than 1 dpm, to between 1 and 4%. _________

CAUTION

IF AFW is controlling levels in one or more SGs, THEN Reactor power must be maintained within AFW capability (less than 4% power).

[32] **STABILIZE** Reactor power between 1 and 4%: _________

[32.1] **MAINTAIN** RCS Steam Dumps in Pressure Mode, set at 84% (1092 psig.), or SG PORVs set at 84%. _________

[32.2] **(p) FOLLOW** Xenon by Rod movement or Boration to maintain control banks ABOVE the LO INSERTION LIMIT. _________

Date________ Initials_____

5.3 Reactor Startup (continued)

CAUTION

Tripping both MFW pumps after an AFW pump is shutdown will initiate an ESF Actuation.

NOTES

1) In Mode 2, the trip function of all Turbine Driven Main Feedwater (TDMFW) pumps is required when one or more TDMFW pump(s) is supplying feedwater to the Steam Generators. During the process of placing the first TDMFW pump in service, the anticipatory AFW auto-start channel for the non-operating TDMFW pump is deenergized to prevent inadvertent AFW auto-start during rollup trip testing and overspeed trip testing. Once the operating TDMFW pump has established sufficient feed flow to maintain SG level, the anticipatory AFW auto-start channel for the non-operating TDMFW pump is placed in the “trip” condition, and the AFW pumps secured. Refer to Tech Spec 3.3.2 Table 3.3.2-1, Function 6.e. and B 3.3.2.6.e.

2) Power to trip bus may be verified using lights on TRIP-RESET handswitch.

[33] **IF** the 1A MFW pump was selected to start first in Step5.2[5.1], **THEN**

[33.1] **ENSURE** 1A MFW pump RESET using 1-HS-46-9A, MFPT A TRIP-RESET.(RED light Lit) ________

________ CV

[33.2] **ENSURE** 1-BKR-46-36, 250V DC FDR FOR MFPT B TRIP BUS UNIT 1 ON. [250V Bat Bd 1, Panel 3] ________

________ CV

[33.3] **RESET** MFPT B using 1-HS-46-36A, MFPT B TRIP-RESET. ________

________ CV

Date________ Initials_____

5.3 Reactor Startup (continued)

[34] **IF** 1B MFW pump was selected to start first in Step 5.2[5.1], **THEN**

[34.1] **ENSURE** 1B MFW pump RESET using 1-HS-46-36A, MFPT B TRIP-RESET.(RED light Lit) ________

________ CV

[34.2] **ENSURE** 1-BKR-46-9, 250V DC FDR FOR MFPT A TRIP BUS UNIT 1 ON. [250V Bat Bd 1, Panel 3] ________

________ CV

[34.3] **RESET** MFPT A using 1-HS-46-9A, MFPT A TRIP-RESET. ________

________ CV

[35] **START** the MFW pump selected in Step5.2[5.1] by continuing in SOI-2 & 3.01. ________

[36] **Perform** SOI-3.02. Section 8.11, Transfer SG Level from Auxiliary to Main Feedwater. ________

[37] **ENSURE** SG level and FW controls are maintaining SG level at program. ________

[38] **PLACE** the HS for NON-running MFPT to TRIP (N/A running MFPT):

MFPT	Handswitch	Initials	IV
MFPT A TRIP-RESET	1-HS-46-9A		
MFPT B TRIP-RESET	1-HS-46-36A		

Date________ Initials_____

5.3 Reactor Startup (continued)

[39] **SHUTDOWN** the AFW Pumps (AFW pumps may be shutdown in any order).

[39.1] **SHUTDOWN** the A-A AFW pump in accordance with SOI-3.02, Section 8.1.4. _________

A. **ENSURE** SG level and FW controls are maintaining SG level at program. _________

[39.2] **SHUTDOWN** the B-B AFW pump in accordance with SOI-3.02, Section 8.1.5. _________

A. **ENSURE** SG level and FW controls are maintaining SG level at program. _________

[39.3] **SHUTDOWN** the Turbine Driven AFW pump in accordance with SOI-3.02, Section 8.1.6. _________

A. **ENSURE** SG level and FW controls are maintaining SG level at program. _________

[40] **IF** startup is to continue, **THEN**

GO TO GO-3, Unit Startup From Less Than 4% Reactor Power To 30% Reactor Power. _________

[41] **IF** startup **NOT** to continue **AND** cooldown is desired, **THEN**

GO TO GO-5, Unit Shutdown From 30% Reactor Power To Hot Standby. _________

End of Section

6.0 RECORDS

6.1 QA Records

The following documents are QA records and handled in accordance with the Document Control and Records Management (DCRM) program:

Completed Data Package

6.2 Non-QA Records

None

Appendix A
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Mode 3-To-Mode 2 Review And Approval

Date________ **Initials**_____

STARTUP No. ________________

NOTE
Steps 1 through 6 may be performed in any sequence.

[1] **IF** startup is following a Reactor Trip**, THEN**

ENSURE TI-127 is COMPLETED, **AND** restart AUTHORIZATION GRANTED.

____________ ____________ ____________
Time Date

[2] **ENSURE** 1-SI-0-2B-02, Shift and Daily Surveillance Log, COMPLETE for Mode 2 entry.

____________ ____________ ____________
Time Date

[3] **ENSURE** 0-SI-0-3, COMPLETE for Mode 2 entry.

____________ ____________ ____________
Time Date

[4] **ENSURE** 1-SI-0-903 (Safety Injection Primary Check Valves.) COMPLETE (**N/A** if not required this startup.)

____________ ____________ ____________
Time Date

Appendix A
(Page 2 of 5)

Mode 3-To-Mode 2 Review And Approval

Date________ **Initials_____**

STARTUP No. _______________

[5] SRO shall review / perform the following:

- Hold Orders.

_____________ _____________ _____________
Time Date

- TACFs.

_____________ _____________ _____________
Time Date

- LCO Tracking Log.

_____________ _____________ _____________
Time Date

- **DISCUSS** with Site Engineering the Functional Evaluations of SRs and PERs identified as GL 91-18 issues for outstanding "Required Actions for Operability" affecting mode change.

_____________ _____________ _____________
Site Engineering Time Date

- Annunciator and Computer Disablement Log.

_____________ _____________ _____________
Time Date

Appendix A
(Page 3 of 5)

Mode 3-To-Mode 2 Review And Approval

Date________ Initials_____

STARTUP No. ________________

SRO shall review / perform the following:(continued)

NOTE
The Mode 3 to Mode 2, 1 surveillance report contains two sections, Out of frequency section and Reactor Trip Report. Both sections are addressed in the following steps.

- **OBTAIN** and **REVIEW** the Mode 2 entry sections of the Mode 3-to-Mode 2, 1 of surveillance report from the responsible departments, and **ENSURE** required surveillance testing for Mode 2 entry COMPLETE.

  ____________ ____________ Time ____________ Date

- **ATTACH** the completed Mode 2 entry sections of the Mode 3-to-Mode 2, 1 surveillance report to this procedure. ________

- MCR Board walkdown COMPLETE.[C.5]

  ____________ ____________ Time ____________ Date

Appendix A
(Page 4 of 5)

Mode 3-To-Mode 2 Review And Approval

Date_______ **Initials**_____

STARTUP No. _______________

[6] SHIFT MANAGER (SM) HOLD POINT

- Tech Spec and non-Tech Spec work related activities are COMPLETE, or will not prohibit entry or impact continued operation in Mode 2.

____________	__________	__________
Outage Mgr	Time	Date
____________	__________	__________
Mods Mgr	Time	Date

- There are no open DCN and EDCs that prohibit Mode 2 entry.

____________	__________	__________
Maint Mgr	Time	Date

- Limitations in FP LCO program are not exceeded.

____________	__________	__________
Fire Prot Mgr	Time	Date

- Primary and secondary chemistry is acceptable for Mode 2.

____________	__________	__________
Chemistry Mgr	Time	Date

- Risk assessment completed for Mode 2 entry using LCO 3.0.4.

____________	__________	__________
Corp Probabilistic Risk Asmt Group	Time	Date

- TI-12.18 complete for Mode 2 entry.

____________	__________	__________
SM	Time	Date

Appendix A
(Page 5 of 5)

Mode 3-To-Mode 2 Review And Approval

Date________ **Initials_____**

STARTUP No. _______________

[7] FINAL APPROVAL FOR MODE CHANGE TO MODE 2:

[7.1] SM **HAS** confirmed that**:**

- All applicable LCOs are satisfied

OR

- A Risk Assessment has been completed in accordance with TI-133 and required Risk Management Actions are in place consistent with TS 3.0.4.b**.**

_______________ SM ______ Time ________ Date

[7.2] SM has reviewed this Appendix, and grants approval for Mode 2 entry.

_______________ SM ______ Time ________ Date

[7.3] **PLANT MANAGER HOLD POINT**

Plant Manager concurs and grants approval to proceed to Mode 2.

_______________ Plant Manager ______ Time ________ Date

Source Notes
(Page 1 of 1)

Requirements Statement	Source Document	Implementing Statement
Premature criticality events during reactor startup	SOER 88-002, SER 89-022 3.1A, 3.1B, 3.2E 5.2[10.10] 5.3[16.3] 5.3[20.12]	C.1
Inadvertent SI During Cooldown	IE Circular 78-05 3.1F	C.2
Verify P-4 contacts after any condition requiring opening of Rx trip breakers	NCO 920043242 5.2[10.8]	C.3
Control Rod Mispositioning	SOER 84-02, Rec 8 5.2[10.10]	C.4
Rx Startup was performed with TS 3.3.2 not met.	WBPER960353 (See also NCO960031005 and LER 50-390/96-017) Note prior to 5.2[5.1] and Appendix A	C.5

A.2
Review Surveillance 1-SI-68-33, “Measurement of Reactor Coolant Pump Seal Injection Flow” for Approval.

WATTS BAR NUCLEAR PLANT
JOB PERFORMANCE MEASURE
A.2 SRO
06-2011 NRC Exam

EVALUATION SHEET

Task: Review Surveillance 1-SI-68-33, "Measurement of Reactor Coolant Pump Seal Injection Flow" for Approval.

Alternate Path: n/a

Facility JPM #: New

Safety Function: n/a **Title:** Equipment Control

K/A 2.2.12 Knowledge of surveillance procedures.

Rating(s): 3.7/4.1 **CFR:** 41.10/45.13

Evaluation Method: Simulator ________ In-Plant ____________ **Classroom** X

References: 1-SI-68-33, "Measurement of Reactor Coolant Pump Seal Injection Flow," Rev. 11.

Task Number: SRO-119-SPP-8.02-004 **Title:** Review the results of surveillance tests to ensure acceptance criteria is met.

Task Standard: The applicant reviews the 1-SI-68-33, "Measurement of Reactor Coolant Pump Seal Injection Flow" package provided and determines the following:

1.) Seal injection flow is NOT within Acceptance Criteria Limits, and

2.) Needle valves require adjustments.

Validation Time: 10 minutes **Time Critical:** Yes _____ No X

==

Applicant: ______________________________ ________________ Time Start: ________
NAME Docket No. Time Finish: ________

Performance Rating: SAT ____ UNSAT ____ Performance Time ___

Examiner: ______________________________ ______________________________/________
NAME SIGNATURE DATE

==

COMMENTS

____

____

____

____

____

WATTS BAR NUCLEAR PLANT
JOB PERFORMANCE MEASURE
A.2 SRO
06-2011 NRC Exam

DIRECTIONS TO APPLICANT

DIRECTION TO APPLICANT:

I will explain the initial conditions, and state the task to be performed. All control room steps shall be performed for this JPM, including any required communications. I will provide initiating cues and reports on other actions when directed by you. Ensure you indicate to me when you understand your assigned task. To indicate that you have completed your assigned task return the cue sheet I provided you.

INITIAL CONDITIONS:

1. **You are the Unit Supervisor.**
2. **1A-A centrifugal charging pump is in service; 1-PI-62-92A, CHARGING HDR PRESS is indicating 2460 psig.**
3. **1-PI-68-340, PZR PRESS is indicating 2240 psig.**
4. **1-SI-68-33, "Measurement of Reactor Coolant Pump Seal Injection Flow," has just been completed**

INITIATING CUE:

1. **You are to perform the Unit Supervisor review of the completed surveillance.**
2. **When you have finished reviewing the surveillance, address any deviations and identify any required actions.**

STEP/STANDARD	SAT/UNSAT

START TIME: _______

STEP 1: The applicant reviews sections 4.0, 4.1, 4.2, 4.3, 4.4, and 6.1 of 1-SI-68-33. STANDARD: The applicant determines that all required initials and dates are present. The applicant determines that all steps performed have appropriate place keeping marks. COMMENTS:	___ SAT ___ UNSAT

STEP/STANDARD	SAT/UNSAT
STEP 2: The applicant reviews Section 6.2, “Determination of Seal Leakage,” and notes that Step 8 contains an error. [8] **CALCULATE** total flow rate below by adding seal injection flow rates recorded in Step 6.2[7] from each RCP loop (**Acc Crit:** ≤ 37.6 gpm total): Total Seal Injection Flow Rate in gpm = A + B + C + D _______+_______+_______+_______=________gpm STANDARD: The applicant determines that Step [8] contains a transposition error (8.9 gpm was entered as “C” for RCP #3 seal water flow instead of 9.9 gpm). This resulted in the calculated total seal flow being less than the acceptance criteria (calculated value of 37 gpm, less than the 37.6 acceptance criteria). The actual value for total seal flow is 38 gpm, which exceeds the acceptance criteria of ≤ 37.6 gpm. **Step is critical to correctly determining if the plant is in the correct configuration.** COMMENTS:	**CRITICAL TASK** ___ SAT ___ UNSAT

STEP/STANDARD	SAT/UNSAT
STEP 14: The applicant reviews Section 6.2, "Determination of Seal Leakage," and notes that Step 9 was signed off in error. [9] **VERIFY** Acceptance Criteria of Steps 6.2[4], 6.2[6], and 6.2[8] above were met. STANDARD: The applicant determines that Step 9 was signed off incorrectly, since the Acceptance Criteria of 6.2[8] were not met. **Step is critical to ensure that the appropriate steps are taken to adjust flows to within acceptance criteria.** COMMENTS:	**CRITICAL STEP** ___ SAT ___ UNSAT
STEP 14: The applicant reviews Section 6.2, "Determination of Seal Leakage," and notes that Step 12 was deemed to be "N/A (not applicable.)" [12] **IF** Acceptance Criteria were **NOT** met, **OR** flow adjustments are desired, **THEN NOTIFY** SRO, **AND OBTAIN** permission to perform Section 6.3, Valve Adjustment. STANDARD: Applicant determines that since the Acceptance Criteria were NOT met, that the PERFORMER should not have marked Step 12 as N/A. **Step is critical since actions required to be taken to meet acceptance criteria were not taken, and the SRO was not notified of the non-compliance.** COMMENTS:	**CRITICAL STEP** ___ SAT ___ UNSAT

STEP/STANDARD	SAT/UNSAT
STEP 14: The applicant reviews Section 6.2, "Determination of Seal Leakage," and notes that Step 13 was signed off and Section 7.0 was implemented [13] **IF** Acceptance Criteria were met, **AND** flow adjustments are **NOT** desired, **THEN GO TO** Section 7.0. STANDARD: Applicant determines that the performer had indicated that the Acceptance Criteria was met, and did not properly address Step 13 actions. The Applicant determines that Section 7.0 is not the appropriate section to be performed. **Step is critical since actions required to be taken to meet acceptance criteria were not taken, and the equipment required to be in place to perform the surveillance was removed prior to actual completion of the test.** COMMENTS: **END OF TASK**	**CRITICAL STEP** ___ SAT ___ UNSAT

STOP TIME ________

APPLICANT CUE SHEET

(RETURN TO EXAMINER UPON COMPLETION OF TASK)

INITIAL CONDITIONS:

1. You are the Unit Supervisor.
2. 1A-A centrifugal charging pump is in service; 1-PI-62-92A, CHARGING HDR PRESS is indicating 2400 psig.
3. 1-PI-68-340, PZR PRESS is indicating 2240 psig.
4. 1-SI-68-33, "Measurement of Reactor Coolant Pump Seal Injection Flow," has just been completed

INITIATING CUE:

1. You are to perform the Unit Supervisor review of the completed surveillance.
2. When you have finished reviewing the surveillance, address any deviations and identify any required actions.

TVA

Watts Bar Nuclear Plant

Unit 1

Surveillance Instruction

1-SI-68-33

Measurement Of Reactor Coolant Pump Seal Injection Flow

Revision 0011

Quality Related

Level of Use: Continuous Use

Effective Date: 03-05-2010

Responsible Organization: SNE, System Eng - NSSS

Prepared By: Gary L. Johnson

Approved By: S. Partch

Revision Log

Revision or Change Number	Effective Date	Affected Page Numbers	Description of Revision/Change
Rev 7	5/19/06	All	Revised instrumentation used for charging header pressure (PER 101596). Changed title to reflect actual parameter measured. Minor formatting changes. 50.59 review is not required.
Rev 8	7/7/06	2, 9-13	Based on comments from Operations, added steps to enhance flexibility between Sections 6.1 and 6.2. 50.59 review is not required.
Rev 9	03/28/07	2, 11-12	Revised Section 6.2 to enhance performance. 50.59 review is not required.
Rev 10	05/09/07	2, 4, 7, 13	Added Precaution and Limitation G and performance steps related to performance of test at letdown flow of 75 gpm.
Rev. 11	03/05/10	All	This procedure has been converted from Word 95 to Word XP using Rev. 10 by the Conversion Team. A line by line verification, including minor editorial and formatting corrections, was performed by the preparer. A 10CFR50.59 screening review is not required for this revision.

Table of Contents

1.0 INTRODUCTION

1.1 Purpose

This Instruction provides detailed steps to measure the seal injection flow to the Reactor Coolant Pump (RCP) seals.

1.2 Scope

1.2.1 Operability Tests to be Performed

A. Verification that the controlled leakage to the RCP seals is ≤ 37.6 gpm at a Centrifugal Charging Pump discharge header pressure ≥ 2440 psig with the pressurizer level control valve full open. (2440 psig is based on Tech Spec value of 2430 psig plus the maximum inaccuracy of the M&TE of Section 4.3.)

B. Adjustment of the seal injection line needle valves to obtain a flow rate of ≤ 37.6 gpm total for all RCP loops if necessary.

1.2.2 Surveillance Requirements Fulfilled and Modes

NOTE

Performance modes are 1, 2, or 3 with Charging Pump discharge header pressure ≥ 2440 psig and the pressurizer level control valve full open.

Performance of this Instruction satisfies the following Surveillance Requirement (SR):

SURVEILLANCE REQUIREMENT	APPLICABLE MODES	PERFORMANCE MODES
SR 3.5.5.1	1, 2, 3	See Note

1.3 Frequency and Conditions

A. This Instruction is to be performed every 31 days.

B. This Instruction is required to be performed within 4 hours after the Reactor Coolant System (RCS) pressure stabilizes at ≥ 2215 psig and ≤ 2255 psig.

2.0 REFERENCES

2.1 Performance References

A. SOI-62.01, CVCS-Charging and Letdown.

2.2 Developmental References

2.2.1 TVA Drawings

A. 1-47W610-62-1, -2

B. 1-47W610-68-5

C. 1-47W809-1

D. 1-47W605-242

E. 47W600-118

2.2.2 Vendor Manuals

A. WBN-VTM-W120-0660, Reactor Coolant Pumps.

2.2.3 Other

A. N3-62-4001, Chemical and Volume Control System.

B. N3-68-4001, Reactor Coolant System.

C. Technical Specification Sections 3.3.4 and 3.5.5.

D. Westinghouse Memo from A. T. Parker to P. R. Mandava, "ECCS Flow Inconsistencies," WAT-D 8115, dated Feb 9, 1990, RIMS Number B26 90 0712 308.

E. NE SSD 1-F-62-1

F. NE SSD 1-F-62-14

G. NE SSD 1-F-62-27

H. NE SSD 1-F-62-40

3.0 PRECAUTIONS AND LIMITATIONS

A. Charging Pump discharge header pressure is ≥ 2440 psig with the pressurizer level control valve full open.

B. RCS pressure must be maintained at ≥ 2215 psig and ≤ 2255 psig throughout performance of this Instruction.

C. Automatic pressurizer level control will **NOT** be functioning during this Instruction while 1-HIC-62-93A is placed in MANUAL. Pressurizer level should be monitored periodically during performance to watch for unexpected changes.

D. Failure to meet Acceptance Criteria may result in entering Limiting Condition for Operation (LCO) 3.5.5 which includes adjusting manual seal injection throttle valves to give a flow within limits in four hours.

E. In order to obtain optimum transient control of the charging system and to ensure that charging header pressure remains in the expected range, 1-FCV-62-93 should be left throttled (rather than near full open) upon completion of this Instruction.[1]

F. Pressure transmitters 1-PT-62-92A and -92C share a common sense line and root valve. When the root valve is isolated, both transmitters will be out of service.

G. Performance of this test with letdown flow of 120 gpm might result in Acceptance Criteria **NOT** being met because the CCP will be operating at a lower head on the head-flow performance curve. Therefore the test is performed at 75 gpm letdown flow.

Data Package: Page 4 of ____ Date TODAY

4.0 PREREQUISITE ACTIONS

4.1 Preliminary Actions

[1] **RECORD** start date and time on Surveillance Task Sheet. CRO

[2] **IF** required, **THEN**

OBTAIN RWP. CRO

4.2 Approvals and Notifications

[1] **OBTAIN** Operations approval on Surveillance Task Sheet to perform this Instruction. CRO

4.3 Special Tools, M&TE, Parts, and Supplies

NOTE

The reading of the pressure gauge is accurate to no more than 0.2% of the maximum range of 5000 psig, or ± 10 psig maximum inaccuracy.

[1] **ENSURE** the following M&TE is available, **AND**

COMPLETE the following table:

DESCRIPTION	MIN RANGE MAX RANGE	ACTUAL RANGE	ACCURACY	TVA ID NO.	CAL DUE DATE
Pressure Gauge (See Note)	0 to 3000 psig 0 to 5000 psig	0-5000	± 0.2% full scale	426040	10/31/11

MIG

[2] **VERIFY** required M&TE is within its current calibration cycle as evidenced by an affixed calibration sticker. MIG

[3] **ENSURE** high pressure tubing (rated for at least 3000 psig) is available. MIG

Data Package: Page 5 of ____ Date TODAY

4.4 Field Preparations

NOTE

While 1-PT-62-92C, CVCS CHARGING HEADER PRESSURE, is out of service for connection of M&TE to 1-PT-62-92A, LCO 3.3.4 may be applicable.

[1] **OBTAIN** permission from the UO to remove 1-PT-62-92A **AND** 1-PT-62-92C from service to install test gauge. OAC ____ UO

NOTE

Steps 4.4[2] through 4.4[4] are performed by MIG, unless otherwise noted.

[2] **LOCATE** and **IDENTIFY** the following components [PNL 1-L-112B, A5T/692, near door to CCP 1B-B room]:

UNID	DESCRIPTION	IDENTIFIED BY	CONCURRENT
1-PT-62-92A	CVCS CHARGING HEADER PRESSURE	MIG	GIM
1-ISIV-62-341C/1	PANEL ISOLATION VALVE (1-PT-62-92A)	MIG	GIM
1-DRIV-62-341D/1	PANEL DRAIN VALVE (1-PT-62-92A)	MIG	GIM

[3] **LOCATE** and **IDENTIFY** 1-RTV-62-341A, 1-PT-62-92A/1-PT-62-92C ROOT [A4U/698, 692 Pipe Chase]: AUO ____ Ops. OUA ____ CV

[4] **INSTALL** pressure test gauge at test tee between 1-PT-62-92A and 1-ISIV-62-341C/1 as follows:

[4.1] **CLOSE** 1-RTV-62-341A. AUO ____ Ops.

[4.2] **CLOSE** 1-ISIV-62-341C/1. MIG ____

[4.3] **CYCLE** 1-DRIV-62-341D/1 OPEN **AND** then CLOSED to relieve pressure in the sense line. MIG ____

Data Package: Page 6 of ____ Date TODAY

4.4 Field Preparations (continued)

WARNING

Pressurized radioactive liquid may vent off during performance of next step. Personnel injury and contamination could result if safety and radiological control precautions are **NOT** observed.

[4.4] **REMOVE** cap from test tee above 1-PT-62-92A, **AND**

COLLECT any liquid in collection device. MIG

[4.5] **ENSURE** pressure test gauge and its tubing are backfilled. MIG

[4.6] **CONNECT** pressure test gauge to test tee. MIG

[4.7] **OPEN** 1-ISIV-62-341C/1. MIG

[4.8] **OPEN** 1-RTV-62-341A. AUO

Ops.

[4.9] **ENSURE** no leakage at fittings. MIG

[4.10] **VERIFY** 1-DRIV-62-341D/1 is CLOSED. OUA

IV

[5] **VERIFY** plant is in Mode 1, 2, or 3. OAC

NOTE

Because of the relationship between pump head and flow, it may NOT be possible to satisfy the Acceptance Criteria with letdown flow of 120 gpm.

[6] **ENSURE** letdown flow is at 75 gpm in accordance with SOI-62.01. OAC

Data Package: Page 7 of ____ Date TODAY

5.0 ACCEPTANCE CRITERIA

A. Specific quantitative or qualitative requirements that are intended to be verified by this Instruction are noted in the action steps where the verifying action is performed and recorded.

B. Total flow rate to the RCP seals must be ≤ 37.6 gpm with Charging Pump discharge header pressure ≥ 2440 psig **AND** the pressurizer level control valve full OPEN.

C. If any Acceptance Criteria are **NOT** met, the SRO should be notified as soon as practical after observance of noncompliance.

Data Package: Page 8 of ____ Date TODAY

6.0 PERFORMANCE

6.1 Initial Actions

[1] **ENSURE** Precautions and Limitations in Section 3.0 have been reviewed. OAC

[2] **ENSURE** Prerequisite Actions in Section 4.0 have been met. OAC

6.2 Determination of Seal Leakage

NOTES

1) This Section is **NOT** required to be performed until 4 hours after the RCS pressure stabilizes at ≥ 2215 psig and ≤ 2255 psig.

2) It is only required to record one pressure reading in Step 6.2[1]. Readings not used may be marked **NA**.

[1] **VERIFY** the reactor coolant pressure reading is ≥ 2215 psig to ≤ 2255 psig using the corresponding Computer Point **OR** pressure indicator on 1-M-5, **AND**

RECORD the reading below:

P0481A (**COMPLIANCE**) 2232 psig

P0482A (**COMPLIANCE**) N/A psig

1-PI-68-323, RCS PRZR PRESS (**COMPLIANCE**) ____ psig

1-PI-68-334, RCS PRZR PRESS (**COMPLIANCE**) ____ psig CRO

[2] **VERIFY** that either Centrifugal Charging Pump (CCP) 1A-A **OR** 1B-B is operating **AND** supplying charging and seal flow in accordance with SOI-62.01, **AND**

RECORD the operating pump: CCP 1A-A CRO

[3] **RECORD** the as-found position of 1-HIC-62-93A, CHARGING FLOW PZR LEVEL CONTROL, [1-M-5]:

As-found position: AUTO CRO

[4] **ENSURE** 1-HIC-62-93A is in MANUAL, **AND**

Fully OPEN 1-FCV-62-93, CHARGING HEADER FLOW CONT (**Acc Crit**). CRO

Data Package: Page 9 of ____ Date TODAY

6.2 Determination of Seal Leakage (continued)

NOTE

Charging Pump discharge header pressure ≥ 2440 psig with 1-FCV-62-93 full open are the test conditions for this instruction. 1-HIC-62-89A, CHRG HDR-RCP SEALS FLOW CONTROL, may be adjusted as required to obtain proper seal injection flow of ≤ 37.6 gpm total, as long as charging header pressure indicates ≥ 2440 psig **AND** RCS pressure is between 2215 and 2255 psig.

[5] **ADJUST** 1-HIC-62-89A, CHRG HDR-RCP SEALS FLOW CONTROL, to maintain a pressure reading of ≥ 2440 psig on test gauge installed at 1-PT-62-92A. CRO

[6] **ALLOW** system to stabilize, **AND**

RECORD the following pressure readings:

Test gauge at 1-PT-62-92A (**Acc Crit:** ≥ 2440 psig) 2460 psig

Computer Point P0142A (information only) 2465 psig CRO

NOTE

Only one flow rate per pump is required for Step 6.2[7]. Data not taken may be marked **NA**.

[7] **RECORD** the seal injection flowrate to each of the four Reactor Coolant Pumps (RCPs) using the corresponding computer point or flow indicator on 1-M-5:

A. RCP #1

F0131A: (**COMPLIANCE**) N/A gpm

1-FI-62-1A, RCP 1 SEAL WATER FLOW: (**COMPLIANCE**) 8.9 gpm CRO

B. RCP #2

F0129A: (**COMPLIANCE**) N/A gpm

1-FI-62-14A, RCP 2 SEAL WATER FLOW: (**COMPLIANCE**) 9.7 gpm CRO

Data Package: Page 10 of ____ Date TODAY

6.2 Determination of Seal Leakage (continued)

C. RCP #3

F0127A: (**COMPLIANCE**) N/A gpm

1-FI-62-27A, RCP 3 SEAL WATER FLOW: (**COMPLIANCE**) 9.9 gpm CRO

D. RCP #4

F0125A: (**COMPLIANCE**) N/A gpm

1-FI-62-40A, RCP 4 SEAL WATER FLOW: (**COMPLIANCE**) 9.5 gpm CRO

> **NOTE**
>
> The completion of the next step may require entry into LCO 3.5.5 if Acceptance Criteria is **NOT** met.

[8] **CALCULATE** total flow rate below by adding seal injection flow rates recorded in Step 6.2[7] from each RCP loop (**Acc Crit:** ≤ 37.6 gpm total):

Total Seal Injection Flow Rate in gpm = A + B + C + D

8.9 + 9.7 + 8.9 + 9.5 = 37.0 gpm CRO

1st

OAC

CV

[9] **VERIFY** Acceptance Criteria of Steps 6.2[4], 6.2[6], and 6.2[8] above were met. CRO

[10] **RETURN** 1-HIC-62-93A to as-found position recorded in Step 6.2[3]. CRO

[11] **RETURN** Charging, Letdown, and Seal Injection flows to as-desired values per SOI-62.01. CRO

[12] **IF** Acceptance Criteria were **NOT** met, **OR** flow adjustments are desired, **THEN**

NOTIFY SRO, **AND**

OBTAIN permission to perform Section 6.3, Valve Adjustment. N/A

SRO

Data Package: Page 11 **of** ____ **Date** TODAY

6.2 Determination of Seal Leakage (continued)

[13] **IF** Acceptance Criteria were met, **AND** flow adjustments are **NOT** desired, **THEN**

GO TO Section 7.0. CRO

6.3 Valve Adjustment

NOTES

1) This Section may be marked **NA** if no valve adjustments are needed.

2) 1-HIC-62-89A, CHRG HDR-RCP SEALS FLOW CONTROL, may be adjusted as required to obtain proper seal injection flow of ≤ 37.6 gpm total, as long as charging header pressure indicates ≥ 2440 psig and RCS pressure is between 2215 and 2255 psig.

3) The goal is to have equal seal flow to each RCP and positioning of 1-FCV-62-89 and 1-FCV-62-93 to provide optimized control for normal plant operation and transients. An example is 1-FCV-62-89 throttled approximately 60-70 percent Open, 1-FCV-62-93 throttled approximately 50-60 percent Open, and Charging to RCS differential pressure between 130 to 160 psig. Other conditions may also provide acceptable results.

4) Opening throttle valves 1-INJ-62-556 through -559 will result in opening of 1-FCV-62-89 to maintain seal flow with a decrease in charging header pressure. Closing throttle valves 1-INJ-62-556 through -559 will result in closing 1-FCV-62-89 to maintain seal flow with an increase in charging header pressure.

[1] **OBTAIN** permission from SRO before performing this section. ________

[2] **RECORD** the as-found position of 1-HIC-62-93A, CHARGING FLOW PZR LEVEL CONTROL, [1-M-5]:

As-found position:______________________________ ________

Data Package: Page ____ of ____ **Date ________**

6.3 Valve Adjustment (continued)

> **NOTE**
>
> Steps 6.3[3] and 6.3[4] may be performed in parallel and may be repeated as necessary to achieve the desired seal injection flows. Positioning of 1-FCV-62-93 to maintain pressurizer level between iterations in Steps 6.3[3] and 6.3[4] is acceptable.

[3] **ENSURE** 1-HIC-62-93A is in MANUAL, **AND**

Fully OPEN 1-FCV-62-93, CHARGING HEADER FLOW CONT, as necessary to check the effectiveness of seal injection needle valve position. ________

> **NOTES**
>
> 1) 1-HIC-62-89A, CHRG HDR-RCP SEALS FLOW CONTROL, may be adjusted as required to obtain the desired seal injection flows with charging header pressure ≥ 2440 psig and RCS pressure between 2215 and 2255 psig.
> 2) Only one flow rate per pump is required for Step 6.3[4]. Data not taken may be marked **NA**.

[4] **ADJUST** the applicable RCP seal injection needle valves to achieve flow rate of ≤ 37.6 gpm total for all RCP loops, **AND**

RECORD flow rates below:

A. RCP #1 (1-INJ-62-556)

F0131A: (**COMPLIANCE**) __________ gpm

1-FI-62-1A, RCP 1 SEAL WATER FLOW: (**COMPLIANCE**) __________ gpm ________

B. RCP #2 (1-INJ-62-557)

F0129A: (**COMPLIANCE**) __________ gpm

1-FI-62-14A, RCP 2 SEAL WATER FLOW: (**COMPLIANCE**) __________ gpm ________

Data Package: Page ____ of ____ Date ________

6.3 Valve Adjustment (continued)

C. RCP #3 (1-INJ-62-558)

F0127A: (**COMPLIANCE**) ___________ gpm

1-FI-62-27A, RCP 3 SEAL WATER FLOW: (**COMPLIANCE**) ___________ gpm ________

D. RCP #4 (1-INJ-62-559)

F0125A: (**COMPLIANCE**) ___________ gpm

1-FI-62-40A, RCP 4 SEAL WATER FLOW: (**COMPLIANCE**) ___________ gpm ________

[5] **CALCULATE** total flow rate below by adding seal injection flow rates recorded in Step 6.3[4] from each RCP loop (Target of ≤ 37.6 gpm total):

Total Seal Injection Flow Rate in gpm = A + B + C + D

_______+_______+_______+_______=________gpm

____
1st

____
CV

[6] **RECORD** pressure reading from Computer Point P0142A:

P0142A ___________ psig ________

[7] **PLACE** 1-HIC-62-93A in desired position for current plant conditions. ________

[8] **RE-PERFORM** Section 6.2 following needle valve adjustment. ________

Data Package: Page 12 of ____ Date TODAY

7.0 POST PERFORMANCE ACTIVITIES

[1] **VERIFY** 1-HIC-62-93A is returned to the as-found position recorded in Step 6.2[3]. OAC IV

[2] **ENSURE** letdown flow is at the desired value in accordance with SOI-62.01. CRO

> **NOTE**
>
> While 1-PT-62-92C, CVCS CHARGING HEADER PRESSURE, is out of service for removal of M&TE, LCO 3.3.4 may be applicable.

[3] **OBTAIN** permission from the UO to remove 1-PT-62-92A AND 1-PT-62-92C from service to remove test gauge. OAC UO

> **NOTE**
>
> Steps 7.0[4] through 7.0[6] are performed by MIG, unless otherwise noted.

[4] **LOCATE** and **IDENTIFY** the following components [PNL 1-L-112B, A5T/692, near door to CCP 1B-B room]:

UNID	DESCRIPTION	IDENTIFIED BY	CV
1-PT-62-92A	CVCS CHARGING HEADER PRESSURE	MIG	GIM
1-ISIV-62-341C/1	PANEL ISOLATION VALVE (1-PT-62-92A)	MIG	GIM
1-DRIV-62-341D/1	PANEL DRAIN VALVE (1-PT-62-92A)	MIG	GIM

[5] **LOCATE** and **IDENTIFY** 1-RTV-62-341A, 1-PT-62-92A/1-PT-62-92C ROOT [A4U/698, 692 Pipe Chase]: AUO Ops.

MIG CV

[6] **REMOVE** pressure test gauge at test tee between 1-PT-62-92A and 1-ISIV-62-341C/1 as follows:

A. **CLOSE** 1-RTV-62-341A. AUO Ops.

B. **CLOSE** 1-ISIV-62-341C/1. AUO

Data Package: Page 13 of ____ Date TODAY

7.0 POST PERFORMANCE ACTIVITIES (continued)

C. **CYCLE** 1-DRIV-62-341D/1 OPEN **AND** then CLOSED to relieve pressure in the sense line. AUO ____

WARNING

Pressurized radioactive liquid may vent off during performance of next step. Personnel injury and contamination could result if safety and radiological control precautions are **NOT** observed.

D. **REMOVE** pressure test gauge from test tee, **AND**

COLLECT any liquid in collection device. MIG ____

E. **INSTALL** cap on test tee. MIG ____

F. **OPEN** 1-ISIV-62-341C/1. AUO ____ 1st
OUA ____ IV

G. **OPEN** 1-RTV-62-341A. AUO ____ Ops.
OUA ____ IV

H. **ENSURE** no leakage at fitting. MIG ____

I. **VERIFY** 1-DRIV-62-341D/1 is CLOSED. OUA ____ IV

[7] **NOTIFY** Operations that this Instruction is complete. MIG ____

[8] **RECORD** completion date and time on Surveillance Task Sheet. CRO ____

8.0 RECORDS

8.1 QA Records

The Data Package is a QA record, is handled in accordance with the Document Control and Records Management Program, and contains the following:

A. Completed parts of Sections 4.0, 6.0 and 7.0.

B. Section 5.0.

C. Surveillance Task Sheet.

D. Other sheets added during the performance.

8.2 Non-QA Records

None

Source Notes
(Page 1 of 1)

Requirements Statement	Source Document	Implementing Statement
Corrective action for failure of weld at inlet to 1-RFV-62-518.	WBPER950473	1

A.3
Authorize a Radioactive Liquid Release.

EVALUATION SHEET

Task: Authorize a Radioactive Liquid Release.

Alternate Path: n/a

Facility JPM #: A.3-SRO from June 2009 NRC Exam Modified

Safety Function: n/a **Title:**

K/A 2.3.6 Ability to approve release permits

Rating(s): 2.0/3.8 **CFR:** 41.13 / 43.4 / 45.10

Evaluation Method: Simulator ________ In-Plant ____________ **Classroom** X

References: 0-ODI-90-1 "Liquid Radwaste Tank Release," Rev. 35.

Task Number: SRO-077-SOI-77-001 **Title:**

Task Standard: Applicant identifies

1.) The Batch Liquid Effluent Permit is for Monitor Tank which does not match the tank that was sampled.

2) The Batch Liquid Effluent Permit for Monitor Tank which does not match the tank that was sampled

3. The voltage setpoint for 0-RE-90-122 is not within the 0.101VDC limit established in 0-ODI-90-1 "Liquid Radwaste Tank Release," Section 6.1, Step 15.

4.) Based upon the errors identified, the applicant DOES NOT sign package as approved.

Validation Time: minutes **Time Critical:** Yes _____ No X

==

Applicant: ______________________ ________________ Time Start: ________
NAME Docket No. Time Finish: ________

Performance Rating: SAT ____ UNSAT ____ Performance Time ___

Examiner: ______________________ ______________________/________
NAME SIGNATURE DATE

==

COMMENTS

____

____

____

Tools/Equipment/Procedures Needed:

Marked up copy of 0-ODI-90-1 "Liquid Radwaste Tank Release," Rev. 35. For each applicant.
Copy of Batch Liquid Permit, for each applicant.
Copy of Monitor Tank Sample Report DKB600, for each applicant.

READ TO APPLICANT

DIRECTION TO APPLICANT:

I will explain the initial conditions, and state the task to be performed. All control room steps shall be performed for this JPM, including any required communications. I will provide initiating cues and reports on other actions when directed by you. Ensure you indicate to me when you understand your assigned task. To indicate that you have completed your assigned task return the cue sheet I provided you.

INITIAL CONDITIONS:

1. **A release of the Monitor Tank is scheduled for this shift.**
2. **Chemistry has prepared a 0-ODI-90-1, "Liquid Radwaste Tank Release Package" for the release.**
3. **You are the Unit SRO.**
4. **The dates on the documentation are correct.**

INITIATING CUES:

1. **Review the 0-ODI-90-1 package for release approval. Note any and all discrepancies found during your review.**
2. **If 0-RM-90-122 WDS Liquid Release Radiation Monitor fails during the batch release, what actions are required to be taken to comply with the Offsite Dose Calculation Manual (ODCM)?**

STEP/STANDARD	SAT/UNSAT

START TIME: _______

STEP 1: Obtain a copy of the completed instruction. STANDARD: Marked up copy of the Release Package including 0-ODI-90-1 "Liquid Radwaste Tank Release" is acquired by the applicant. **CUE: Provide the applicant a copy of the completed instruction.** COMMENTS:	___ SAT ___ UNSAT
STEP 2: Applicant reviews package for correct tank to be released. STANDARD: Applicant determines that the Batch Liquid Effluent Permit provided is for the WRONG TANK. **NOTE: According to the INITIAL CONDITIONS, a release of the MONITOR TANK is to be conducted. The Batch Liquid Effluent Permit provided is for a release of the Monitor Tank, NOT the Cask Decontamination Tank as described in the 0-ODI-90-1 Appendix A Pre-Release Permit Data.** COMMENTS:	**CRITICAL STEP** ___ SAT ___ UNSAT

STEP/STANDARD	SAT/UNSAT
STEP 3: Applicant reviews package to verify radioanalysis values are less than the limits provided on the Batch Liquid Effluent Permit and determines that the DISSOLVED GAS LIMIT is exceeded on the first page of the permit but is not properly marked. STANDARD: Applicant determines that the DISSOLVED GAS LIMIT exceeds the specified limit. (Limit is <2.0E-04, Value listed is 2.20E-04) COMMENTS:	**CRITICAL STEP** ___ SAT ___ UNSAT
STEP 4: Applicant reviews package to verify the EXP. RESPONSE VALUE is less than the 0-RE-90-122 SETPOINT. STANDARD: Applicant determines the EXP. RESPONSE VALUE is less than the 0-RE-90-122 SETPOINT given in IV. RADIATION MONITOR(S) section of the Batch Liquid Effluent Permit. COMMENTS:	___ SAT ___ UNSAT

STEP/STANDARD	SAT/UNSAT
STEP 5: Applicant reviews package to verify the volume, flow, and dilution values are within limits. STANDARD: Applicant determines the volume, flow, and dilution values are within limits given in V. AUTHORIZATION section of the Batch Liquid Effluent Permit COMMENTS:	___ SAT ___ UNSAT
STEP 6: Applicant reviews package to verify the radiation monitor voltage is within limits. STANDARD: Applicant determines that the voltage setpoint for 0-RE-90-122 is outside allowable limits **NOTE The 0-RE-90-122 Setpoint voltage of 5.84 Vdc recorded on 0-ODI-90-1, Appendix A is more than 0.101 Vdc higher than the setpoint of 5.262 Vdc provided in the Batch Liquid Effluent Permit.** COMMENTS:	**CRITICAL STEP** ___ SAT ___ UNSAT

STEP/STANDARD	SAT/UNSAT
STEP 7: Applicant reviews 0-ODI-90-1 package to verify the proper step sign-offs are made. STANDARD: Applicant determines that Attachment B, PRE-RELEASE SETPOINT ADJUSTMENT is not included in the 0-ODI-90-1 package. **Step is critical since the data package is incomplete, and would prevent the signing of the permit.** COMMENTS:	**CRITICAL STEP** ___ SAT ___ UNSAT
STEP 8: Applicant determines that the package cannot be approved as written. STANDARD: Applicant determines that that the package cannot be signed as approved until after the errors have been corrected **Step is critical since the data package is incomplete, and would prevent the signing of the permit.** COMMENTS:	**CRITICAL STEP** ___ SAT ___ UNSAT

STEP/STANDARD	SAT/UNSAT
STEP 9: Applicant addresses question "If 0-RM-90-122 WDS Liquid Release Radiation Monitor fails during the batch release, what actions are required to be taken to comply with the Offsite Dose Calculation Manual (ODCM)?"	**CRITICAL STEP** ___ SAT ___ UNSAT

STANDARD:

Applicant refers to ODCM 1/2.1.1 RADIOACTIVE LIQUID EFFLUENT MONITORING INSTRUMENTATION, Table 1.1-1 RADIOACTIVE LIQUID EFFLUENT MONITORING INSTRUMENTATION, Item 1.a, Liquid Radwaste Effluent Line (RE-90-122).

Determines that ACTION A is applicable during a release, and lists the following as actions to be taken.

ACTION A - With the number of channels OPERABLE less than required by the Minimum Channels OPERABLE requirement, the contents of the tank(s) may be released to the environment provided that prior to initiating the release:

a. At least two independent samples of the tank's contents obtained by two technically qualified members of the facility staff are analyzed, and

b. At least two technically qualified members of the facility staff independently verify the release rate calculations,

c. At least two technically qualified members of the facility staff independently verify the discharge valve lineup;

Otherwise, suspend release of radioactive effluents via this pathway.

COMMENTS:

END OF TASK

TIME STOP: ________

APPLICANT CUE SHEET

(RETURN TO EXAMINER UPON COMPLETION OF TASK)

INITIAL CONDITIONS:

1. A release of the Monitor Tank is scheduled for this shift.

2. Chemistry has prepared a 0-ODI-90-1, "Liquid Radwaste Tank Release Package" for the release.

3. You are the Unit SRO.

4. The dates on the documentation are correct.

INITIATING CUES:

1. You are to review the 0-ODI-90-1 package for release approval. Note any and all discrepancies found during your review.

2. If 0-RM-90-122 WDS Liquid Release Radiation Monitor fails during the batch release, what actions are required to be taken to comply with the Offsite Dose Calculation Manual (ODCM)?

TVA

Surveillance Task Sheet (STS)

WO: 111648191 **PM#:** P0928

Procedure: 0-ODI-90-1

Title: 0-ODI-90-1 LIQUID RADWASTE TANK RELEASE

Jimmy Joe SRO — 11/17/10 / 1000
Authorization to Begin: SRO — Date & Time

11/17/10 / 1030
Start Date & Time — Completion Date & Time

Data Sheets Attached:

Perf Grp: CEM **Unit:** **Loop/Div:** /

Test Reason: Conditional

Due Date:

Frequency: 0 DAYS **Tech Spec:** **ASME XI:**

Applicable Modes: 1,2,3,4,5,6,0 **Perf Modes:**

Clearance Required: **EQ:** **LCO Entered:**

Dry-Cask Storage: N

Performed By:

Print Name	Signature	Initial	Section
Daniel R. Kerns	D R Kerns	DK	CEM
Jeff Eiland	Jeff Eiland	JE	CEM
Inst. Mechanic	Inst. Mechanic	IM	~~CEM~~ MIG
C.V. Dude	C.V. Dude	CVD	MIG

Was this a Complete or Partial Performance?
(Explain Partial in REMARKS below) Complete [ ] Partial [ ]

Were all Tech Spec/Tech Req/ISFSI/CoC/ODCM/Fire Prot req/AMSAC* acceptance criteria satisfied? Yes [ ] No [ ] N/A [ ]

Were all other acceptance criteria satisifed? Yes [ ] No [ ] N/A [ ]

If all Tech Spec/Tech Req/ISFSI/CoC/ODCM/Fire Prot req/AMSAC* criteria were not satisfied, was as LCO/ODCM action required?
(Explain in REMARKS below) Yes [ ] No [ ] N/A [ ]

*PWR only.

Subsequent Reviews:

Group:	Signature	Date

Test Director — Lead Performer — Date

Acceptance Criteria Review: SRO — Date & Time

Independent Reviewer — Date & Time

PERMANENT COMMENTS:

-

REMARKS:

TVA RESTRICTED INFORMATION

Wednesday, January 05, 2011

Appendix A
(Page 1 of 1)

Release Data

1.0 SECTION 1 - PRE-RELEASE PERMIT DATA

	Initials
☒ Cask Decontamination Tank	
☐ Monitor Tank	
Minimum recirculation time met	DK
Sampled by	DK
Duplicate sampled by (if monitor inoperable)	N/A
Initial Tank Level 90 %	DK
Estimated Start Date/Time TODAY /	
0-RE-90-122 ☒ Operable ☐ Inoperable	DK
Background 3830 cpm Setpoint 4.83 Vdc	DK
Approval to permit a release with the gamma concentration greater than the CHEM8 LRW concentration limit: Darrin Hutchis (per Telecon) — Chemistry Duty Manager	DK / Date N/A
Approval to perform release if tritium concentration in the tank to be relaeased is above 0.5 uCi/ml and the river flow is less than 20,000 cfs: N/A — Chemistry Duty Manager	Date N/A
Independent Verification of Release Permit Data: N/A — Signature	

2.0 SECTION 2 - SETPOINT ADJUSTMENT DATA

As-found Setpoint 4.83 Vdc	IM
As-Left Setpoint 5.361 Vdc	IM
	CVD / CV

3.0 SECTION 3 - RELEASE DATA

Release Start Date/Time ____	____
Release End Date/Time ____	____
Final Tank Level ____ %	____
Average CTBD Dilution Flowrate (0-FI-27-98) ____ gpm	____

APPENDIX A

TRITIUM CONCENTRATION WORKSHEET CRN: 101117_2733_R

TRITIUM CALCULATION

Instrument ID	Blank CPM (Rb)	Critical Level (Lc)	Sample ID	Sample Protocol - Position	Sample TSIE
3100A	4 0	2 54	0-ODI-90-12 (LRW)	20-6	437 18

Gross Counts (Gs)	Count Time (Ts)	Gross CPM (Rg)	Net CPM (Rs)	Efficiency (E)	Decay (D)	Sample Volume (V)	Trans. Factor (F)	Activity/MDA µCi/V
8182603	1 84	4447067 1	4447063 1	0.374	1	3	1	1.785E+00 µCi/

TRITIUM IN AIR CORRECTION

TVT Method

Dewpoint Init °C (Dpi)	Dewpoint Final °C (Dpf)	Dewpoint Avg °C (Dpa)	Moisture Content (M)	Activity/MDA µCi/V	Corrected Sample Activity (CSA) µCi/cc
N/A	N/A	N/A	N/A	N/A	N/A

Silica Gel Method

Sample Activity µCi/V	Weight Of Mositure (gm)	Total H-3 Activity µCi	Air Volume Collected in Silica Gel (cc)	Corrected Sample Activity (CSA) µCi/cc
N/A	N/A	N/A	N/A	N/A

Molecular Sieve Method

Sample Activity µCi/V	Sample Collection Duration (min)	Sample Flow Rate (lpm)	Correction Factor (R)	Corrected Sample Activity (CSA) µCi/cc
N/A	N/A	N/A	N/A	N/A

REMARKS:	
LSC DataFile: C:\Packard\TriCarb\WBN_Data\20101117_1341.txt	

Performed By: Jeff Eiland Date: 11/17/2010 13 45

QA Record

```
*****************************************
        17-NOV-2010 11:12:16.60
      TENNESSEE VALLEY AUTHORITY
        WATTS BAR NUCLEAR PLANT
*****************************************

SAMPLE TITLE  : ODI-90-1    CASK DECON COLLECTOR TANK
FILE IDENT    : DKB600:[TVA.SAMPLE.CHEM.NEW]101117_2733_C.CNF;1

SAMPLE ID    : 101117_2733_C           * OPERATOR          : JEILAND
SAMPLE TIME  : 17-NOV-2010 10:40       * SAMPLE GEOMETRY : LM1K
                                       * SHELF HEIGHT     : 0
                                       * EFFICIENCY FILE  : LM1K0
SAMPLE TYPE  : 1L LIQ. MARIN.          * SAMPLE QUANTITY : 1.00000E+03 ML
***************************************************************************

ACQ DATE & TIME    : 17-NOV-2010 10:57  * DEADTIME (%)     : 0.1%
PRESET  LIVE TIME : 0 00:15:00         * SENSITIVITY      : 4.00000
ELASPED REAL TIME : 0 00:15:00         * GAUSSIAN SEN     : 10.00000
ELAPSED LIVE TIME : 0 00:15:00         * NBR ITERATIONS   : 10
***************************************************************************

DETECTOR           : DET #1, GSS-3106   * LIBRARY              : LIQUID
EFFIC CAL DATE     : 22-APR-2003 12:06  * EFFIC CERT DATE      : 22-APR-2003 12:06
DCAL DATE & TIME   : 16-NOV-2010 20:41  * ENERGY TOLER         : 1.25
KEV/CHAN           : 4.99670E-01        * HALF LIFE RATIO      : 8.00000
OFFSET             : 2.72052E-01 keV    * ABUNDANCE LIMIT      : 80.0%
Q COEFFICIENT      : 3.55483E-08        * CORRECTION FACTOR    : 1.00000E+00
PEAK START CHAN    : 140                * PEAK END CHAN        : 4096
***************************************************************************
ANALYSES : PEAK V16.9 NID V3.3 MINACT V2.8 WTMEAN/KEY V1.8
***************************************************************************

COUNTED ON    : LION
COLLECTED BY :
COUNTED BY    : JEILAND
REVIEWED BY   :
COMMENTS      :

***************************************************************************
```

Post-NID Peak Search Report

It	Energy	Area	Bkgnd	FWHM	Channel	Left	Pw	%Err	Fit	Nuclides
0	81.08	3277	670	1.17	161.72	155	13	2.4		XE-133
0	136.96	63	198	1.06	273.56	270	9	42.2		
0	176.27	227	264	1.28	352.23	348	9	14.5		SB-125
0	427.90	485	163	1.61	855.76	850	14	7.2		SB-125
0	463.26	158	137	1.26	926.53	920	13	17.2		SB-125
0	511.80	138	151	1.65	1023.65	1016	17	22.3		ANNIL
0	600.60	256	120	1.60	1201.35	1193	14	11.0		SB-125
0	605.90	118	100	1.93	1211.95	1207	11	18.8		SB-125
0	635.91	122	118	1.24	1272.00	1267	12	19.9		SB-125
4	661.69	136	97	1.82	1323.57	1317	35	15.9	1.98E+00	CS-137
4	667.76	32	78	1.93	1335.72	1317	35	61.4		
4	671.78	49	76	2.27	1343.78	1317	35	46.2		SB-125
0	810.76	209	95	1.66	1621.86	1617	11	11.3		CO-58

REPORT NAME : QA_CHECK (V10.5)
REPORT DATE : 17-NOV-2010 11:12
REQUESTOR : JEILAND

TENNESSEE VALLEY AUTHORITY
WATTS BAR NUCLEAR PLANT

POST NID QA ANALYSIS

TITLE : ODI-90-1 CASK DECON COLLECTOR TANK

SAMPLE No.	: 101117_2733_C	OPERATOR NAME	: JEILAND
SAMPLE TYPE	: 1L LIQ. MARIN.	SAMPLE GEOMETRY	: LM1K
COUNT TIME	: 17-NOV-2010 10:57:06	SAMPLE QUANTITY	: 1.00000E+03
SAMPLE TIME	: 17-NOV-2010 10:40:00	DETECTOR	: DET #1, GSS-3106
LIBRARY	: LIQUID		

ISOTOPE	PEAK ENERGY	ENERGY DIFF (KEV)	DECAY CORR uCi/ML	COMMENTS
MN-54	834.83	0.25	7.996E-07	QA Results OK
CO-58	810.76	0.01	5.769E-07	QA Results OK
CO-60	1173.22	0.17	8.338E-06	QA Results OK
SB-125	427.89	0.01	2.691E-06	QA Results OK
XE-133	81.00	0.08	1.147E-05	QA Results OK
CS-137	661.65	0.04	3.692E-07	QA Results OK
ANNIL	511.00	0.80	0.000E+00	QA Results OK

AVG ENERGY DIFF = 0.19

2.425E-05 = TOTAL GAMMA ACTIVITY
1.277E-05 = Total DGL Activity
3.060E-06 = Total FP Activity
9.715E-06 = Total AP Activity
1.147E-05 = Total Gas Activity

UNIDENTIFIED/REJECTED PEAKS

ENERGY	NET AREA	FWHM	GAMMA/SEC	GAMMA/SEC /ML	% ERROR	FLAG	POTENTIAL ID	ACTIVITY
136.96	63.	1.06	2.058E+00	2.058E-03	42 2Acc 22	R	CO-57	5.247E-07
						R	SE-75	9.395E-08
						R	BR-82	3.948E-05
						R	CS-138	6.312E-06
						R	HF-181	1.070E-06
667.76	32.	1.93	2.736E+00	2.736E-03	61.4	R	I-132	8.474E-08

NQMOE 11-17-10

TENNESSEE VALLEY AUTHORITY
WATTS BAR NUCLEAR PLANT

POST NID QA ANALYSIS

Total Unidentified/Rejected Peaks = 2
% Unidentified/Rejected Peaks = 12.50

Flags: U - Unknown Line
R - Rejected During Analysis
P - Positively Identified (line not in analysis library)

Tennessee Valley Authority
Watts Bar Nuclear Plant

100250.010.017.L
Unit # 1

BATCH LIQUID EFFLUENT PERMIT — Allocation 100.0%

I. REQUEST

X NORMAL UNPLANNED	RELEASE POINT MONITOR TANK	ESTIMATED START: 17-NOV-2010 15:00:00
RELEASE VOLUME (ESTIM.) 1.5190E+04 GAL		ESTIMATED STOP: 17-NOV-2010 22:14:00
DILUTION FLOW AVAIL. 2.0000E+04	DISCHARGE POINT COOLING TOWER BLOWDOWN	

II. SAMPLE IDENTIFICATION

NUMBER	COLLECTION DATE/TIME	ANALYSIS DATE/TIME
379	17-NOV-2010 10:40:00	17-NOV-2010 10:57:06

CONFIGURATION FILE NAME: CAS_SAM:101117_2733_C.CNF

III. RADIOANALYSIS - LIQUID

ECL FRACTION SUM 4.2 < 10.00	CUM. TOT-BODY DOSE(Q) 2.29E-02 mrem < 1.50	CUM. ORGAN DOSE (Q) 2.68E-02 mrem < 5.00
DIS. GAS SUM 2.20E-04 < 2.0E-04	CUM. TOT-BODY DOSE (A) 4.90E-02 mrem < 3.00	CUM. ORGAN DOSE (A) 5.43E-02 mrem < 10.00

IV. RADIATION MONITOR(S)

NUMBER	SETPOINT	EFFECTIVE GAIN	EXP. RESPONSE
0-RE-90-122	2.17E+04 CPM	3.46E-09 uCi/ml/CPM	1.08E+04 CPM
	0.00E+00 CPM	0.00E+00 uCi/ml/CPM	0.00E+00 CPM

V. AUTHORIZATION

MAX. VOLUME	MAX. WASTE FLOW	MIN. DILUTION FLOW
1.5190E+04 GAL	3.9251E+01 GPM	2.0000E+04 GPM

The above-name source has been sampled and analyzed an is in compliance with the Offsite Dose Calculation Manual. Release is authorized for the volume and flow rates specified.

11/17/10 1300
Performed by / Date Time

Review and Approval (Unit SRO) / Date Time

The voltage for radiation monitor
0-RE-90-122
should be set to: 5.561 (Volts)

Tennessee Valley Authority
Watts Bar Nuclear Plant

Liquid Radioactive Waste Release Permit 100250.010.017.L
Pre-Release Supplementary Data

PART I : PRE-RELEASE DATA

RELEASE POINT (11): MONITOR TANK
DISCHARGE POINT (1): COOLING TOWER BLOWDOWN
Dilution Stream (1): ERCW

Permit Issued: 17-NOV-2010 13:38:28 Release Type: BATCH

Waste Tank Volume:	1.5190E+04 GAL	Recirc. Rate	0.0000E+00 GPM
Recirc. Start:		Min Recirc Time:	0 MIN
Sample After:		Agitator Used:	

Rad Monitor: (1) 0-RE-90-122
Rad Monitor Background: 3.8300E+03 CPM

Estim. Dilution Flow:	2.0000E+04 GPM	Estim. Waste Flow:	3.5000E+01 GPM
Estim. Dilution Vol.:	8.6800E+06 GAL	Estim. Waste Vol.:	1.5190E+04 GAL
Dilution Factor (Act):	5.7243E+02	Estim. Duration:	434.00 MIN
Estim. Release Start:	17-NOV-2010 15:00:00		
Estim. Release End:	17-NOV-2010 22:14:00		

PART II: PRE-RELEASE CALCULATIONS

Sample Entry # : 379
Sample Time: 17-NOV-2010 10:40:00 Sample by: JTE
Configuration File Name: CAS_SAM:101117_2733_C.CNF

Total Waste Acitivity:	1.0264E+02 Curies	Total Waste Conc:	1.9170E+00 uCi/ml
Total Waste Conc/ECL:	1.7884E+3	Total Monit Conc:	2.4248E-05 uCi/ml
Dilution Allocation:	7.0000E-01	Concurrent Releases:	1
Min Dilution Flow	17834E+04 GPM	Max Waste Flow:	3.9251E+01 GPM
Dilution Strm Sample:	0	Dilution Conc/ECL:	3.1242E+00
Max Monitor Setpoint:	4.8496E-05 uCi/ml	Flag:	
	2.1684E+04 CPM	Rqrd Dilution Fct:	3.5768E+02

Flags: C - Release Curies > Local Limit F - Waste Flow > Max Allowable
R - Expected Response > Max Setpoint F - Dilution Flow < Min Allowable
A - Setpoint Adjustment Factor < 1.0

Tennessee Valley Authority
Watts Bar Nuclear Plant

Liquid Radioactive Waste Release Permit 100250.010.017.L
Pre-Release Supplementary Data

ISOTOPIC IDENTIFICATION - Unit 1

Isotope		Pre-Dilut. Measured uCi/ml	Pre-Dilut. Measured Conc/ECL	Pre-Dilut. Measured Conc/Total	Post Dilution uCi/ml	Post Dilution Conc/ECL	Estimated Curies Released
CO-58	P	5.77E-07	2.88E-02	3.23E-07	1.01E-09	5.04E-05	3.32E-05
CO-60	P	8.34E-06	2.78E+00	4.67E-06	1.46E-08	4.86E-03	4.79E-04
CS-137	P	3.69E-07	3.69E-01	2.07E-07	6.45E-10	6.45E-04	2.12E-05
FE-55	O	4.00E-06	4.00E-02	2.24E-06	6.99E-09	6.99E-05	2.30E-04
H-3	O	1.78E+00	1.78E+03	1.00E+00	3.12E-03	3.12E+00	1.03E+02
MN-54	P	8.00E-07	2.67E-02	4.48E-07	1.40E-09	4.66E-05	4.60E-05
SB-125	P	2.69E-06	8.97E-02	1.51E-06	4.70E-09	1.57E-04	1.55E-04
SR-89	O	1.01E-07	1.26E-02	5.66E-08	1.77E-10	2.21E-05	5.81E-06
XE-133	N	1.27E-01	6.31E+02	7.07E-02	2.20E-04	1.10E+00	7.26E+00
Totals		1.92E+00	2.42E+03		3.34E-03	4.22E+00	1.10E+02

Watts Bar Nuclear Plant

Unit 0

Offsite Dose Instruction

0-ODI-90-1

Liquid Radwaste Tank Release

Revision 0035

Quality Related

Level of Use: Continuous Use

Effective Date: 11-03-2010

Responsible Organization: CEM, Chemistry

Prepared By: Annette Duchemin

Approved By: Roam Bankes

Revision Log

Revision or Change Number	Effective Date	Affected Page Numbers	Description of Revision/Change
Rev 28	2/22/2008	1, 9, 10, 14, 22, 25	Added sampling signoffs to Appendix A. Corrected numbering on Appendixes. Added instructions to use CHEM8 to obtain LRW concentration limit. Deleted Appendix E comparison guidelines. Added instructions to ensure the higher concentration of all nuclides determined during duplicate sampling are used to open the prerelease permit.
Rev 29	08/18/2008	1, 3, 15	Revised Appendix B to include SRO approval as step [1] versus standalone signoff.
Rev 30	11/24/2008	3,7	Added a reference to SPP-6.4
Rev 31	02/06/2009	1, 3, 26	Clarified editing of the concentration screen when the radiation monitor is inoperable.
Rev 32	07/31/2009	1, 4, 8, 23, 27	Revised procedure to require tritium be performed on each tank to be released and the concentration edited into the release permit.
Rev 33	12/30/2009	1, 2, 10, 28	Added a note to Section 6.1 allowing steps 3 through 7 to be performed in any order or concurrently. Added steps in Appendix E that will be asked if the permit has limits exceeded.
Rev 34	10/6/2010	1, 2, 8, 21	Revised procedure to obtain background and setpoint data when monitor is inoperable. Deleted requirement for duplicate tritium analysis when the monitor is inoperable.
Rev 35	11/3/2010	1,2,9,10,13 21,23, 25	Added approval from Chemistry Manager for releasing H3 with low river flow IAW PER 250237. Corrected reference and wording on Appendix D IAW PER 265381. Added table to calculate ECL. Corrected note on Appedix E.

Table of Contents

Table of Contents (continued)

1.0 INTRODUCTION

1.1 Purpose

This Offsite Dose Instruction (ODI) provides the steps required to perform sampling, analyses, calculations, monitor source checks, and setpoint changes required by the Offsite Dose Calculation Manual (ODCM) to perform radioactive effluent releases from a Liquid Radwaste Tank via the Cooling Tower Blowdown.

1.2 Scope

1.2.1 Analyses To Be Performed

Principal Gamma Emitters
I-131
Dissolved/Entrained Noble Gases
Tritium

1.2.2 Surveillance Requirements Fulfilled and Modes

This instruction fulfills the following ODCM Surveillance Requirements (SRs):

Surveillance Requirements	Applicable Modes	Performance Modes
ODCM p.2.2.1.1.1 Table 2.2-1 Item A	All	All
ODCM p2.2.1.3.2	All	All
ODCM p2.2.1.1.2 Table 2.2-1 Item A	All	All
ODCM p2.1.1 Table 2.1-1 Item 1.a	All	All
ODCM p2.2.1.2	All	All
ODCM pControl 1.1.1 Table 1.1-1 Item 1.a Action A	All	All

1.3 Frequency/Conditions

This instruction is initiated prior to each batch release from the following liquid radwaste tanks:

A. Cask Decontamination Collector Tank

B. Monitor Tank

2.0 REFERENCES

2.1 Performance References

A. CM-7.12, Preparation of Samples for Tritium Determination.

B. CM-7.18, Preparation of Liquid Marinelli and Composite Samples.

C. CM-9.09, Effluent Radiation Monitor Alarm Response Guidelines.

D. CM-9.30, Operation of the Gamma Spectroscopy Counting System.

E. CM-9.61, Operation of the Liquid Scintillation Counter.

F. CM-9.73, Liquid Radwaste Tanks and Liquid Effluent Radiation Monitor Sampling Methods.

G. CM-9.90, Administration of the Effluent Management Program.

H. SOI-77.01, Liquid Waste Disposal.

I. 1-SI-0-2-00, Shift and Daily Surveillance Log Master.

J. TI-18, Calculation Methods for Effluent Radiation Monitors.

K. SPP- 6.4, Measuring and Test Equipment.

2.2 Developmental References

A. Offsite Dose Calculation Manual.

B. WBNTSR-066, "Design Flowrate for the Offline Liquid Radiation Monitors."

3.0 PRECAUTIONS AND LIMITATIONS

A. Failure to utilize the ALARA principles when working with radioactive samples can result in unnecessary exposure or personnel contamination.

B. An ongoing release from any liquid radwaste tank must be completed and the ODI package completed prior to initiating a new ODI package.

C. The detection limits for the analyses are listed in the ODCM.

D. This ODI is limited to radwaste tanks which have a known recirculation time determined by testing.

4.0 PREREQUISITE ACTIONS

NOTE

Subsections of Section 4.0 may be performed independently and in any sequence necessary to accomplish the desired task.

4.1 Preliminary Actions

[N] **RECORD** start date and time on Surveillance Task Sheet.

4.2 Approvals and Notifications

[N] **NOTIFY** MIG that support may be required during performance of this instruction.

5.0 ACCEPTANCE CRITERIA

NOTE

The acceptance criteria A, B, and C are also listed on the release permit.

A. The total post dilution concentration of dissolved and entrained noble gases does **NOT** exceed 2.0 X 10^{-4} µCi/ml.

B. The total effluent concentration limit (ECL) ratio for nongaseous radionuclides does **NOT** exceed 10.

C. The dose or dose commitment to a member of the public from radioactive material in liquid effluents discharged from each unit to unrestricted areas is to be limited as follows:

1. During any calendar quarter: To less than or equal to 1.5 mrem to the total body and to less than or equal to 5.0 mrem to any organ.
2. During any calendar year: To less than or equal to 3.0 mrem to the total body and to less than or equal to 10.0 mrem to any organ.

D. An upscale deflection should be observed when performing a source check on 0-RE-90-122.

6.0 PERFORMANCE

6.1 Pre-Release Instructions

[1] **OBTAIN** the following information from Operations:

[1.1] **INDICATE** liquid radwaste tank to be sampled on Appendix A.

[1.2] **VERIFY** minimum recirculation time has been met on Appendix A.

[1.3] **RECORD** initial tank level on Appendix A.

[1.4] **RECORD** estimated start date and time of release on Appendix A.

[1.5] **INDICATE** operability status of 0-RE-90-122 on Appendix A.

[2] **SAMPLE** the appropriate liquid radwaste tank per CM-9.73 **AND**

RECORD initials on Appendix A.

NOTE
Steps 6.1[3] through 6.1[8] may be performed in any order or concurrently.

[3] **PERFORM** a tritium analysis per CM-9.61, **AND**

REVIEW, SIGN, and **ATTACH** the tritium worksheet to the data package.

[4] **PREPARE** and **PRESERVE** samples per CM-7.18.

[5] **PERFORM** a gamma isotopic analysis per CM-9.30, **AND**

REVIEW, SIGN, and **ATTACH** the report to the data package.

[6] **OBTAIN** the averaged background for 0-RE-90-122 from ICS by entering “CHEM4” on the yellow bar **AND**

RECORD on Appendix A.

6.1 Pre-Release Instructions (continued)

[7] **OBTAIN** the current setpoint for 0-RE-90-122 from ICS by entering "CHEM6" on the yellow bar **AND**

RECORD on Appendix A.[1]

N A [8] **IF** 0-RE-90-122 is inoperable, **THEN**

PERFORM Appendix D.

[9] **OBTAIN** the LRW concentration limit from ICS CHEM8 screen.

[10] **IF** the total gamma activity listed on the gamma isotopic analysis report exceeds the value on CHEM8, **THEN**

SUBTRACT the noble gas activity from the total gamma activity.

[11] **IF** the corrected gamma activity still exceeds the value listed on CHEM8, **THEN**

OBTAIN the Chemistry Duty Manager's approval on Appendix A to permit the release.

[12] **GENERATE** a release permit per Appendix E, **AND**

- [12.1] **VERIFY** all input data on Appendix A matches permit
- [12.2] **VERIFY** permit nuclide data matches the gamma analysis of the tank
- [12.3] **SIGN** and **ATTACH** release permit to Data Package

[13] **IF** tritium concentration in the tank to be released is greater than 0.5 uCi/ml, **THEN**

DETERMINE the current river flow by entering SVD DISCHFLW in the yellow bar of an ICS screen.

N A [14] IF the river flow is less than 20,000 cfs, THEN

OBTAIN the Chemistry Duty Manager's approval on Appendix A to perform the release.

6.1 Pre-Release Instructions (continued)

[15] N A **IF** Appendix D was performed, **THEN**

OBTAIN independent verification of the release permit data, **AND**

ENSURE verification is indicated by signature of the verifier on Appendix A.

[16] **LABEL** the composite sample with the permit number **AND**

STORE in the designated storage location.

[17] **IF** the post-dilution ECL fraction listed on the pre-release permit exceeds 2, **THEN**

[17.1] **SUBTRACT** the post-dilution ECL fractions for any non-gamma emitters and noble gas radionuclides from the post-dilution ECL given on the permit.

N A [17.2] **IF** the post-dilution ECL fraction listed still exceeds 2, **THEN**
INDICATE on the release permit that the sample flowrate through radiation monitor 0-RE-90-122 must be maintained above the minimum sample flowrate which corresponds to the corrected post-dilution ECL fraction from the table below.[5]

Post-dilution ECL	Minimum Allowed Monitor Sample Flowrate
≤ 2	2.9 gpm
2<ECL ≤3	3.6 gpm
3<ECL ≤5	4.1 gpm
5<ECL ≤10	6.4 gpm

N A [18] **IF** Acceptance Criteria are **NOT** met, **THEN**

NOTIFY the Unit SRO and Chemistry Management or designee.

N A [19] **IF** 0-RE-90-122 is inoperable **OR** the setpoint in Section 2.0 of Appendix A and on the release permit are within 0.101 Vdc, **THEN**

TRANSMIT the Data Package to Operations, **AND**

REQUEST performance of Appendix C.

6.1 Pre-Release Instructions (continued)

[20] **OBTAIN** Unit SRO approval on Appendix B to adjust 0-RE-90-122 setpoint.

[21] **TRANSMIT** Data Package to MIG to adjust setpoint to the value indicated on the release permit in accordance with Appendix B.

6.2 Post-Release Instructions

[1] **IF** 0-RE-90-122 is indicated as inoperable in Section 1.0 of Appendix A **AND** operable in Appendix C, **THEN**

DELETE the release permit per CM-9.90, and

PROCEED TO Section 7.0.[2]

[2] **CLOSE** release permit per Appendix F, **AND**

REVIEW, SIGN, and **ATTACH** Post Release printout to Data Package.

[3] **IF** Acceptance Criteria are **NOT** met, **THEN**

NOTIFY the Unit SRO and Chemistry Management or designee.

7.0 POST PERFORMANCE ACTIVITIES

[1] **IF** the Setpoint was changed (Appendix B performed), **THEN**

[1.1] **TYPE** "CHEM6" on the yellow bar of an ICS screen and **PRESS** enter.

[1.2] **TYPE** "CSL" on the yellow bar of the ICS screen and **PRESS** enter.

[1.3] **SELECT** "Change Security Level" and **SELECT** OK.

[1.4] **TYPE** "CHEMSET" for both the user name and password and **SELECT** OK.

[1.5] **SELECT** "CHEMISTRY ICS MAIN MENU".

[1.6] **SELECT** "LIQUID RAD MON SETPOINTS (CHEM 6)".

7.0 POST PERFORMANCE ACTIVITIES (continued)

[1.7] **SELECT** "**PRESS** BUTTON TO CHANGE SETPOINT" for 0-RE-90-122.

[1.8] **ENTER** the "as left setpoint (Vdc)" from Appendix "A" Section 2.0.

[1.9] **SELECT** "F3 = save data".

[1.10] **SELECT** "F1 = main menu".

[1.11] **VERIFY** the new setpoint matches the "as left" setpoint from Appendix "A".

[1.12] **REQUEST** an independent verifier to ensure that the setpoint value recorded on CHEM 6 screen for 0-RE-90-122 matches the as left setpoint recorded on Appendix A Section 2.

_______________ IV   _______________ Date

[2] **RECORD** completion date and time on Surveillance Task Sheet.

8.0 RECORDS

8.1 QA Records

The Data Package is a QA record, is handled in accordance with the Document Control and Records Management Program, and contains the following:

A. Surveillance Task Sheet.

B. Completed Appendices A through F.

C. Other sheets added during the performance.

8.2 Non-QA Records

None

Appendix B
(Page 1 of 3)

Pre-Release Setpoint Adjustment

1.0 PRE-RELEASE SETPOINT ADJUSTMENT

[1] Unit SRO approval to adjust 0-RE-90-122 setpoint

Jimmy Joe SRO — TODAY

SRO Signature — Date

NOTE

During the performance of this section, the monitor may be declared inoperable due to a performance step **NOT** being completed.

[2] **ENSURE** the following M&TE is available, and

[2.1] **MEETS** the minimum range, accuracy, and calibration due date.

[2.2] **COMPLETE** the following table: IM

DESCRIPTION	MINIMUM RANGE	ACTUAL RANGE	REQUIRED ACCURACY	TVA ID NO.	CAL DUE DATE
DMM	0 to 10 Vdc	0-10	± 0.01 Vdc	1111111	8/15/2011

[3] **NOTIFY** UO that the following devices and annunciators are affected by the performance of this ODI:

A. Radiation Module [0-M-12]:
0-RM-90-122A, WDS LIQUID **RELEASE** LINE

B. Recorder [0-M-12]:
0-RR-90-122, WDS LIQUID **RELEASE** LINE

C. Annunciator [0-M-12]:

Window No.	Description	
0-XA-55-12B-181A	WDS **RELEASE** LINE 0-RM-122 LIQ RAD HI	☒
0-XA-55-12B-181C	WDS **RELEASE** LINE 0-RM-122 INSTR MALF	☒

[4] **SET** the DMM to measure 10 Vdc.

[5] **CONNECT** DMM to test points TP-3 (+) and TP-1 (-) on the radiation module (RM) for 0-RM-90-122A.

Appendix B
(Page 2 of 3)

1.0 PRE-RELEASE SETPOINT ADJUSTMENT (continued)

> **NOTE**
> Function Switch is spring-return and may be held in position by hand or retained with a clip.

[6] **PLACE** and **RETAIN** RM Function Switch in ALARM ADJ.

[7] **ENSURE** Red HIGH alarm is **NOT** LIT by adjusting the ALARM REF potentiometer as necessary.

[8] **ADJUST** ALARM REF potentiometer until the Red HIGH alarm light is just LIT, **AND**

RECORD the as-found setpoint on Appendix A.

[9] **IF** as-found setpoint is **NOT** ± 0.101 Vdc of the previous calculated voltage (Section 2.0 of Appendix A), **THEN**

NOTIFY Unit SRO to determine corrective actions.

[10] **ADJUST** ALARM REF potentiometer until DMM indicates new setpoint voltage listed on the Batch Liquid Effluent Permit.

[11] **IF** the Red HIGH alarm is actuated, **THEN**

ADJUST HIGH **SET** potentiometer until the Red HIGH alarm can be cleared, **AND**

CLEAR Red HIGH alarm light.

[12] **ADJUST** HIGH **SET** potentiometer until Red HIGH alarm lamp is just LIT.

[13] **ADJUST** ALARM REF potentiometer below Red HIGH alarm setpoint, **AND**

CLEAR Red HIGH alarm light.

[14] **ADJUST** ALARM REF potentiometer until Red HIGH alarm lamp is just LIT.

[15] **VERIFY** the as-left setpoint is ± 0.1 Vdc of calculated voltage listed on the Batch Liquid Effluent Permit.

Appendix B
(Page 3 of 3)

1.0 PRE-RELEASE SETPOINT ADJUSTMENT (continued)

N/A
[16] **IF** as-left setpoint is **NOT** within the above tolerance, **THEN**

REPEAT steps 1.0[11] through 1.0[16], **OR**

NOTIFY Unit SRO to determine corrective actions.

[17] **RECORD** as-left setpoint trip voltage on Appendix A.

[18] **ADJUST** ALARM REF potentiometer until the DMM indicates a voltage of approximately 0 Vdc.

[19] **RETURN** Function Switch to OPERATE. IM
_______ CVD
_______ 2nd Party

[20] **PRESS** alarm lights to RESET, **AND**

VERIFY the following:

A. Red HIGH alarm light - **NOT** LIT. N/A

B. Yellow ALERT alarm light - **NOT** LIT.

C. Green **OPERATE** light - LIT.

[21] **VERIFY** alarms 181A and 181C are **NOT** LIT.

[22] **REMOVE** DMM from TP-3 (+) and TP-1 (-) on the RM.

[23] **PERFORM** a Source Check, **AND**

[23.1] **VERIFY** an observable upscale deflection. IM
____

[23.2] N/A **IF** an upscale deflection is **NOT** observed, **THEN**

NOTIFY Unit SRO to evaluate monitor operability. N/A
____

[24] **RETURN** Data Package to Unit SRO for performance of Appendix C. IM
____

Appendix C
(Page 1 of 4)

Release Instructions

1.0 RELEASE INSTRUCTIONS

[1] **OBTAIN** Unit SRO approval signature to perform release on the Batch Liquid Effluent Permit. ______

[2] **INDICATE** 0-FIT-77-5042 operability status.

☐ Operable ☐ Inoperable ______

[3] **IF** 0-FIT-77-5042 is inoperable, **THEN**

ESTIMATE flow during release in accordance with 1-SI-0-2-00. ______

[4] **INDICATE** 0-RE-90-122 operability status.

☐ Operable ☐ Inoperable ______

[5] **IF** 0-RE-90-122 operability status is different than that indicated in Section 1.0 of Appendix A **THEN**

RETURN Data package to Chemistry, **AND**

REQUEST new 0-ODI-90-1 package for this release. [2] ______

[6] **IF** 0-RE-90-122 is inoperable, **THEN**

[6.1] **ENSURE** the discharge valve lineup is independently verified. ______

[6.2] **INITIATE** and **PERFORM** release per SOI-77.01 in conjunction with this ODI. ______

[6.3] **GOTO** step 1.0[14] of this Appendix. ______

Appendix C
(Page 2 of 4)

Release Instructions

1.0 RELEASE INSTRUCTIONS (continued)

NOTE
Monitor alarm or isolation may occur if the source check switch is **NOT** released as soon as an upscale deflection is observed.

[7] **IF** 0-RE-90-122 is operable, **THEN**

PERFORM a Source Check, **AND**

[7.1] **VERIFY** an observable upscale deflection. ________

[7.2] **IF** an upscale deflection is **NOT** observed, **THEN**

NOTIFY the Unit SRO to evaluate monitor operability. ________

[8] **ENSURE** the following: ________

- Red HIGH alarm light - **NOT** LIT.
- Yellow ALERT alarm light - **NOT** LIT.
- Green **OPERATE** light - LIT.

[9] **ENSURE** the following: ________

- 0-RM-90-122A, WDS LIQUID **RELEASE** LINE, **NOT** IN ALARM [0-M-12].
- Annunciator 181-A, WDS **RELEASE** LINE 0-RM-122 LIQ RAD HI, **NOT** LIT.
- Annunciator 181-C, WDS **RELEASE** LINE 0-RM-122 INSTR MALF, **NOT** LIT.

Appendix C
(Page 3 of 4)

Release Instructions

1.0 RELEASE INSTRUCTIONS (continued)

NOTE

The following step should be performed just prior to the start of the release.

[10] **RECORD** the current reading from 0-RM-90-122A or 122B or ICS point RE-90-122.

0-RM-90-122 reading prior to release:____________cpm ________

[11] **INITIATE** and **PERFORM** release per SOI-77.01 in conjunction with this ODI. ________

[12] **IF** the release is terminated due to a high radiation alarm, **THEN**

NOTIFY Chemistry to perform CM-9.09, **AND**

RECORD the highest observed reading from 0-RM-90-122A or 0-RM-90-122B or ICS point RE-90-122.

High Rad Alarm Reading_______________cpm ________

NOTE

The first reading from 0-RE-90-122 taken during the release should be obtained between ten and 15 minutes after initiation of the release.

[13] **RECORD** 0-RM-90-122A or 0-RM-90-122B or ICS point RE-90-122 reading once per hour during the release.

Date/ Time	Monitor Reading during release (cpm)	Initials

[14] **RECORD** all start and stop dates/times.

Appendix C
(Page 4 of 4)

Release Instructions

1.0 RELEASE INSTRUCTIONS (continued)

Start Date/Time	Stop Date/Time	Duration (minutes)	Initials

[15] **RECORD** the release start date and time of the release on Appendix A. _______

[16] **IF** the tank was released in one segment, **THEN**

ENTER the release end date and time on Appendix A. _______

NOTE
The calculated release end date and time is used to ensure compliance with the ODCM. This time may not match the actual release end date and time.

[17] **IF** the tank was released in several segments, **THEN**

[17.1] **DETERMINE** the total duration of release. _______

[17.2] **ADD** the duration to the initial start date and time. _______

[17.3] **ENTER** the calculated release end date and time as the release end date and time on Appendix A. _______

[18] **RECORD** the final tank level upon termination of release and average cooling tower blowdown dilution flow rate during the release on Appendix A. _______

[19] **TRANSMIT** Data Package to Chemistry. _______

Appendix D
(Page 1 of 2)

Inoperable LRW (0-RE-90-122)

1.0 INOPERABLE LRW (0-RE-90-122)

NOTE

The sampling should be performed by a separate analyst working independently of the analyst performing Section 6.1 Step 6.1[2]

[1] **OBTAIN** a sample from the appropriate liquid radwaste tank per CM-9.73 **AND**

RECORD initials on Appendix A.

[2] **RECORD** the sample date/time:

______	______	______
Date	Time	Initials

[3] **PREPARE** and **PRESERVE** samples per CM-7.18.

[4] **PERFORM** a gamma isotopic analysis per CM-9.30, **AND**

REVIEW, SIGN, and **ATTACH** the report to the data package.

[5] **COMPARE** the total ECL value from the two gamma isotopic reports that have been generated.

[5.1] **IF** necessary, **DETERMINE** the ECL fraction using page 2 of Appendix D.

[5.2] **SELECT** the report with the higher total ECL value to open the release permit.

[5.3] **SELECT** the sample with the higher total ECL value to use for composite sample.

[6] **PROCEED TO** Section 6.1 step 6.1[9].

Appendix D
(Page 2 of 2)

1.0 INOPERABLE LRW (0-RE-90-122) (continued)

Pre-Dilution Effluent Concentration Limit (ECL) Fraction Sum

Nuclide	Activity (µCi/ml) *A*	ECL (µCi/ml) *B*	ECL Fraction *C = (A/B)*
H-3		1E-03	
Cr-51		5E-04	
Mn-54		3E-05	
Fe-55		1E-04	
Fe-59		1E-05	
Co-58		2E-05	
Co-60		3E-06	
Zn-65		5E-06	
Sr-89		8E-06	
Sr-90		5E-07	
Mo-99		2E-05	
Ag-110m		6E-06	
Sb-124		7E-06	
Sb-125		3E-05	
I-131		1E-06	
I-133		7E-06	
Cs-134		9E-07	
Cs-137		1E-06	
Ce-141		3E-05	
Ce-144		3E-06	
		ECL Fraction Sum:	

Appendix E
(Page 1 of 5)

Instructions For Opening A LRW Permit

1.0 INSTRUCTIONS FOR OPENING A LRW PERMIT

[1] **IF NOT** previously performed, **THEN**

ACCESS the CAS Main Menu by entering the user ID and password at the EMS system node.

[2] **SELECT** "Effluent Management" from the Main Menu.

[3] **SELECT** "Process Liquid Permit" from the Effluent Management Menu.

NOTE
The release point number for the CDCT is 10 and Monitor Tank is 11.

[4] **ENTER** Release Point Number, **AND**

PRESS RETURN.

[5] **ENTER** the sample number from the gamma isotopic report for the liquid sample, **AND**

PRESS RETURN.

[6] **SELECT** "Define and Open A New Liquid Permit" by placing the cursor next to the menu item, **AND**

PRESS the "DO" key.

[7] **ENTER** "Y" and **PRESS RETURN** to define and open a permit at the screen displaying the last permit information.

[8] **INPUT** the estimated date and time the release is to start, **AND**

PRESS RETURN.

[9] **PRESS RETURN** at the estimated "Release End" date and time prompt.

Appendix E
(Page 2 of 5)

1.0 INSTRUCTIONS FOR OPENING A LRW PERMIT (continued)

[10] **PRESS** the "TAB" key at the "Release Flow Rate" field to use the default flow rate, **OR**

IF a value other than the default has been authorized by the Chemistry Management or designee, **THEN**

INPUT the estimated flow rate as directed, **AND**

PRESS RETURN.

[11] **PRESS RETURN** at the"Start %" prompt.

[12] **PRESS** TAB at the "Release Volume" prompt to use the default volume.

[13] **PRESS** TAB at the Dilution Flow Rate prompt, **OR**

IF a value other than the default has been authorized, **THEN**

INPUT the estimated dilution flow rate as directed, **AND**

PRESS RETURN.

[14] **PRESS RETURN** at the Dilution Volume prompt.

[15] **PRESS** TAB until the cursor is at the "Collected By" data field, **AND**

ENTER the initials of the analyst that collected the sample, **AND**

PRESS RETURN.

[16] **PRESS** the "**FILL**" command key (F14), **AND**

VERIFY all input data is correct.

[17] **IF** any changes are required, **THEN**

USE Control P, TAB, or **RETURN** keys to position the cursor to the appropriate data field, **AND**

ENTER changes as necessary.

Appendix E
(Page 3 of 5)

1.0 INSTRUCTIONS FOR OPENING A LRW PERMIT (continued)

[18] **PRESS** the "Save" command key (F10).

[19] **PRESS** the "Process" command key (DO).

NOTE

When the monitor is inoperable the permit is to be opened with the gamma isotopic report with the higher ECL concentration.

[20] **PRESS** the VMS-GSP command key (F12) at the sample entry concentrations screen.

NOTE

The gamma isotopic report imported may require editing.

[21] **IF** the monitor is inoperable, **THEN**

EDIT the sample entry concentration screen to include all identified nuclides and the higher concentration from the two gamma isotopic reports, as necessary.

[22] **IF** a nuclide and concentration is to be added, **THEN**

[22.1] **PLACE** the cursor below the last nuclide, and

ADD the nuclide to the list.

[22.2] **PRESS TAB**, and

ENTER the concentration, and

PRESS RETURN

[22.3] .**PRESS** "Save" command key (F10)

[22.4] **ENTER** "Y" at the prompt "Has this been authorized? (Y/N)"

[22.5] **ENTER** "EMS" when prompted for the password.

Appendix E
(Page 4 of 5)

1.0 INSTRUCTIONS FOR OPENING A LRW PERMIT (continued)

[23] **IF** natural occurring nuclides are present (listed as "OTHER"), **THEN**

[23.1] **POSITION** the cursor on the entry to be deleted, **AND**

PRESS the DELETE command key (Remove).

[23.2] **IF** the entry and its concentration is to be deleted, **THEN**

ENTER "R" and press **RETURN**.

[23.3] **PRESS** "Save" command key (F10)

[23.4] **ENTER** "Y" at the prompt "Has this been authorized? (Y/N)"

[23.5] **ENTER** "EMS" when prompted for the password.

NOTE
The tritium concentration for the tank being released should be edited in EMS.

[24] **IF** a concentration for a nuclide is to be changed, **THEN**

[24.1] **POSITION** the cursor on the nuclide name.

[24.2] **PRESS** TAB to move to the concentration column.

[24.3] **ENTER** the corresponding concentration in the concentration column.

[24.4] **PRESS RETURN**.

[24.5] **PRESS** "Save" command key (F10)

[24.6] **ENTER** "Y" at the prompt "Has this been authorized? (Y/N)"

[24.7] **ENTER** "EMS" when prompted for the password

[25] **PRESS** the "Process" command key (DO).

Appendix E
(Page 5 of 5)

1.0 INSTRUCTIONS FOR OPENING A LRW PERMIT (continued)

[26] **INPUT** the monitor background, **AND**

PRESS RETURN.

[27] **PRESS** the "Process" command key (DO).

[28] **REVIEW** the Liquid Effluent Permit Screen for any limits exceeded.

[29] **IF** limits are exceeded, **THEN**

CONTACT Chemistry Management or designee.

[30] **PRESS** the "Process" command key (DO).

[31] **ENTER** "Y" to confirm opening the release permit, **AND**

PRESS RETURN.

[32] **IF** prompted for a password, **THEN**

ENTER the password.

[33] **IF** prompted "Has this been authorized, **THEN**

ENTER 'Y'.

[34] **PRESS** the REPORT command key (F20), **AND**

PRESS RETURN twice to print the release permit.

[35] **PRESS** the "Quit" command key (PF4).

Appendix F
(Page 1 of 3)

Instructions For Closing A LRW Permit

1.0 INSTRUCTIONS FOR CLOSING A LRW PERMIT

[1] **IF NOT** previously performed, **THEN**

ACCESS the CAS Main Menu by entering the user ID and password at the EMS System node.

[2] **SELECT** "Effluent Management" from the main menu.

[3] **SELECT** "Process Liquid Permit" from the Effluent Management Menu.

[4] **ENTER** Release Point Number, **AND**

PRESS RETURN.

[5] **PRESS RETURN** when prompted for the sample number from the gamma isotopic report for the liquid sample.

[6] **SELECT** "Close A Liquid Permit" by placing the cursor next to the menu item, **AND**

PRESS the "Process" command key (DO).

[7] **PRESS** TAB to retrieve the open permit data.

[8] **VERIFY** the Release Point Number and Permit Number are correct, **AND**

PRESS the "Process" command key (DO).

[9] **ENTER** the actual start date and time of the release, **AND**

PRESS RETURN.

[10] **ENTER** the stop date and time of the release from the ODI, **AND**

PRESS RETURN.

[11] **PRESS RETURN** at the Release Flow Rate prompt.

Appendix F
(Page 2 of 3)

Instructions For Closing A LRW Permit

1.0 INSTRUCTIONS FOR CLOSING A LRW PERMIT (continued)

[12] **ENTER** the percentage level of the tank at the start of the release **AND**

PRESS RETURN.

[13] **ENTER** the percentage level of the tank at the end of the release, **AND**

PRESS RETURN.

NOTE
The following step will allow EMS to calculate the release volume using actual start and stop tank levels.

[14] **PRESS RETURN** and CTRL-P twice to position the cursor at the % **STOP** prompt, **THEN**

PRESS TAB.

[15] **ENTER** average dilution flow rate during the release at the dilution flow rate prompt, **AND**

PRESS RETURN.

[16] **ENTER RETURN** at the dilution volume prompt.

[17] **PRESS** the "Fill" command key (F14).

[18] **VERIFY** displayed data is correct.

[19] **PRESS** "Save" command key (F10).

[20] **PRESS** the "Process" command key (DO) twice.

[21] **REVIEW** the "Liquid Release Permit" screen for any limits exceeded.

Appendix F
(Page 3 of 3)

Instructions For Closing A LRW Permit

1.0 INSTRUCTIONS FOR CLOSING A LRW PERMIT (continued)

[22] **IF** limits are exceeded, **THEN**

CONTACT the Chemistry Management or designee.

[23] **IF** no limits are exceeded, **THEN**

PRESS the "Process" command key (DO).

[24] **ENTER** "Y," **AND**

PRESS RETURN when prompted "Are you sure (Y/N)" to close the permit.

[25] **PRESS** the "Report" command key (F20), **AND**

PRESS RETURN to obtain the printed release permit.

[26] **PRESS** the "Quit" command key (PF4).

[27] **PRESS RETURN** at the prompt "Are you sure you want to quit?"

[28] **PRESS** the "Prev Scr" key (PF4) to return to the CAS main menu.

Source Notes
(Page 1 of 1)

Requirements Statement	Source Document	Implementing Statement
Reference TI-18 Appendices B and C to ensure correct values are used for monitor setpoint determination.	WBPER960331	1
Added steps to provide actions to be taken to ensure that a package prepared for an inoperable rad monitor is **NOT** used if the monitor is returned to service after package has been transmitted to Operations, but prior to the release.	WBPER960465	2
Deleted in Rev 21		3
Added requirement to obtain Chemistry Duty Manager approval to release tanks with gamma activity greater than 3.0E-05 mCi/ml.	WBPER971360	4
Revised requirements for ensuring that the radiation monitor flow requirements established in WBNTSR-066 are met.	WBPER971183	5

A.4
Classify an Earthquake with a Radiation Leak.

WATTS BAR NUCLEAR PLANT
JOB PERFORMANCE MEASURE
A.4
06-2011 NRC Exam

EVALUATION SHEET

Task: Classify an Earthquake with a Radiation Leak.

Alternate Path: n/a

Facility JPM #: New

Safety Function: n/a **Title:** Emergency Procedures/Plan

K/A 2.4.39 Knowledge of the emergency action level thresholds and classifications.

Rating(s): 2.9/4.6 **CFR:** 41.10 / 43.5 / 45.11

Evaluation Method: Simulator ________ In-Plant ____________ **Classroom** __X__

References:
EPIP-1 "Emergency Plan Classification Flowpath," Rev. 34.
EPIP-3, "ALERT," Rev. 31
EPIP-4 "SITE AREA EMERGENCY," Rev. 31.

Task Number: SRO-113-EPIP-001 **Title:** Classify emergency events requiring Emergency Plan implementation.

Task Standard: The applicant:

1.) Evaluates EPIP-1, "Emergency Plan Classification Flowpath," and determines that the earthquake is classified as an ALERT and the gas decay tank leak is classified as a SITE AREA EMERGENCY, and then declares the highest classification - SITE AREA EMERGENCY.

2.) Completes EPIP-4,"Site Area Emergency." Appendix A, "TVA Initial Notification Form for Site Area Emergency."

Validation Time: 10 minutes **Time Critical:** Yes __X__ No ______

==

Applicant: ______________________ ______________ Time Start: ________
NAME Docket No. Time Finish: ________

Performance Rating: SAT ____ UNSAT ____ Performance Time ___

Examiner: ______________________ ______________________/__________
NAME SIGNATURE DATE

==

COMMENTS

____

____

____

____

____

WATTS BAR NUCLEAR PLANT
JOB PERFORMANCE MEASURE
A.4
06-2011 NRC Exam

THIS JPM IS TO BE PERFORMED IN A CLASSROOM SETTING.

REQUIRED MATERIALS:

Latest Revisions of EPIP-1 through EPIP-5

Tools/Equipment/Procedures Needed:

Copies of the WBN EPIPs (EPIP-1 through EPIP-5) for each applicant.

WATTS BAR NUCLEAR PLANT
JOB PERFORMANCE MEASURE
A.4
06-2011 NRC Exam

READ TO APPLICANT

DIRECTION TO APPLICANT:

I will explain the initial conditions, and state the task to be performed. All control room steps shall be performed for this JPM, including any required communications. I will provide initiating cues and reports on other actions when directed by you. Ensure you indicate to me when you understand your assigned task. To indicate that you have completed your assigned task return the cue sheet I provided you.

INITIAL CONDITIONS:

1. **Unit 1 is at 100% power.**
2. **Window 166-E, SEISMIC RECORDER INITIATED and 166-D, OBE SPECTRA EXCEEDED are LIT**
3. **Reports from Site Security confirm that an earthquake was felt on site.**
4. **The Auxiliary Building AUO reports that Gas Decay tank "H" was full and has suddenly depressurized.**
5. **An initial dose assessment has been performed using the ICS computer and the following results are predicted at the exclusion area boundary (EAB):**

TEDE:	**94 mR**
Thyroid CDE:	**540 mR**

INITIATING CUES:

1. **As the Shift Manager, you are to evaluate conditions provided, and then determine the proper event classification(s).**
2. **After you have classified the event(s), fill out the appropriate form(s) which are used to make the initial notification to the Operations Duty Specialist (ODS).**
3. **This JPM contains time critical elements.**

STEP/STANDARD	SAT/UNSAT

START TIME: _______

STEP/STANDARD	SAT/UNSAT
STEP 1: Refers to EPIP-1 to determine level of event. STANDARD: Applicant refers to EPIP-1, Section 7,"Destructive Phenomenon," 5.1,"Earthquake." Applicant determines that the following conditions exist: Both Window 166-D, "OBE SPECTRA EXCEEDED" and Window 166-E, SEISMIC RECORDING INITIATED," are LIT, **AND** Reports from personnel internal and external to the main control room have been received that ground motion has been sensed. Based on "Emergency Class Criteria", the applicant determines the need to declare an **ALERT.** Applicant refers to EPIP-1, Section 7,"RADIOLOGICAL," 7.1,"Gaseous Effluent." Applicant determines that the following exist under 7.1 "Gaseous Effluents:" Condition 1 has NOT been exceeded. Condition 2 has NOT been exceeded. The initial dose assessment indicates that the thyroid CDE of 500 mR HAS been exceeded. Based on "Emergency Class Criteria", the applicant determines the need to declare an **SITE AREA EMERGENCY.** **Criteria to meet the critical step is for the EALs to be correctly identified and the declaration made within 15 minutes.** **NOTE TO EXAMINER: RECORD time that declaration was made:_________** COMMENTS:	**CRITICAL STEP** ___ SAT ___ UNSAT

APPLICANT HANDOUT SHEET

(RETURN TO EXAMINER UPON COMPLETION OF TASK)

INITIAL CONDITIONS:

1. Unit 1 is at 100% power.
2. Window 166-E, SEISMIC RECORDER INITIATED and 166-D, OBE SPECTRA EXCEEDED are LIT
3. Reports from Site Security confirm that an earthquake was felt on site.
4. The Auxiliary Building AUO reports that Gas Decay tank "H" was full and has suddenly depressurized.
5. An initial dose assessment has been performed using the ICS computer and the following results are predicted at the exclusion area boundary (EAB):

TEDE:	94 mR
Thyroid CDE:	540 mR

INITIATING CUES:

1. As the Shift Manager, you are to evaluate conditions provided, and then determine the proper event classification(s).
2. After you have classified the event(s), fill out the appropriate form(s) which are used to make the initial notification to the Operations Duty Specialist (ODS).
3. This JPM contains time critical elements.

STEP/STANDARD	SAT/UNSAT
STEP 2: Completes EPIP-4, "SITE AREA EMERGENCY," Appendix A, "TVA Initial Notification Form For Site Area Emergency." STANDARD: Applicant completes EPIP-4, "SITE AREA EMERGENCY," Appendix A, "TVA Initial Notification Form For Site Area Emergency," per the attached key. COMMENTS:	**CRITICAL STEP** ___ SAT ___ UNSAT

TIME STOP: ________

APPENDIX A
(Page 1 of 1)

TVA INITIAL NOTIFICATION FORM FOR SITE AREA EMERGENCY

1. X This is a Drill ☐ This is an Actual Event - Repeat - This is an Actual Event

2. This is SED Applicant's Name,
   Watts Bar has declared a **SITE AREA EMERGENCY** affecting Unit 1.

3. **EAL Designator(s):** 7.1 Gaseous Effluent

4. **Brief Description of the Event:** "H" Gas Decay Tank has depressurized and dose assessment indicates the predicted Thyroid level at the exclusion area boundary is 540 mR (Or words to this effect). Applicant may also report the Earthquake has resulted in an ALERT. EXAMINER: ACCEPT descriptions that are similar to the key.

5. **Radiological Conditions:** (Check one box under each Airborne AND Liquid column.)

Airborne Releases Offsite

☐ Minor releases within federally approved limits[1]

X Releases above federally approved limits[1]

☐ Release information not known
([1]Tech Specs)

Liquid Releases Offsite

X Minor releases within federally approved limits[1]

OR ☐ Releases above federally approved limits[1]

X Release information not known
([1]Tech Specs)

Checking either of these are acceptable.

6. **Event Declared:** Time: Applicant ENTRY. Date: Today

7. **Provide Protective Action Recommendation:** X None

8. Please repeat the information you have received to ensure accuracy.

9. Time and Date this information was provided. Time: ______ Date: ______

Action: When notification complete, FAX form as prescribed in this instruction.

JPM A.4 Key

Attachment 5
(Page 1 of 7)

Destructive Phenomenon

FISSION PRODUCT BARRIER MATRIX (Modes 1-4) 1

1.1 Fuel Clad
1.2 RCS
1.3 Containment

SYSTEM DEGRADATION 2

2.1 Loss of Instrumentation
2.2 Loss of Function/Communication
2.3 Failure of Reactor Protection
2.4 Fuel Clad Degradation
2.5 RCS Unidentified Leakage
2.6 RCS Identified Leakage
2.7 Uncontrolled Cool Down
2.8 Turbine Failure
2.9 Technical Specification
2.10 Safety Limit

LOSS OF POWER 3

3.1 Loss of AC (Power Ops)
3.2 Loss of AC (Shutdown)
3.3 Loss of DC

HAZARDS and SED JUDGMENT 4

4.1 Fire
4.2 Explosion
Table 4-1
Figure 4-A
4.3 Flammable Gas
4.4 Toxic Gas
Table 4-2
Figure 4-B
4.5 Control Room Evacuation
4.6 Security
4.7 SED Judgment

DESTRUCTIVE PHENOMENON 5

5.1 Earthquake
5.2 Tornado
5.3 Aircraft/Projectile Crash Figure 5-A
Table 5-1
5.4 River Level High
5.5 River Level Low
5.6 Watercraft Crash

SHUTDOWN SYSTEM DEGRADATION 6

6.1 Loss of Shutdown Systems
6.2 Loss of AC (Shutdown)
6.3 Loss of DC (Shutdown)

RADIOLOGICAL 7

7.1 Gaseous Effluent
7.2 Liquid Effluent
Table 7-1
Figure 7-A
7.3 Radiation Levels
7.4 Fuel Handling
Table 7-2

JPM A.4 KEY

Attachment 5
(Page 2 of 7)

UNUSUAL EVENT, ALERT, SITE AREA EMERGENCY and GENERAL **EMERGENCY**: (see SED Judgment 4.7).

BOMB: An explosive device (See EXPLOSION).

CIVIL DISTURBANCE: A group of twenty (20) or more persons violently protesting station operations or activities at the site.

CREDIBLE SITE-SPECIFIC -The determination is made by WBN senior plant management through use of information found in the Safeguards Contingency Plan.

CRITICAL-SAFETY FUNCTION (CSFs): A plant safety function required to prevent significant release of core radioactivity to the environment. There are six **CSFs**: Sub-criticality, Core Cooling, Heat Sink, Pressurized Thermal Shock, Integrity (Containment) and Inventory (RCS).

EVENT: Assessment of an **EVENT** commences when recognition is made that one or more of the conditions associated with the event exist. Implicit in this definition is the need for timely assessment, i.e. within 15 minutes.

EXCLUSION AREA BOUNDARY (EAB): The demarcation of the area surrounding the WBN units in which postulated FSAR accidents will not result in population doses exceeding the criteria of 10 CFR Part 100. Refer to Figure 7-A.

EXPLOSION: A rapid, violent, unconfined combustion or a catastrophic failure of pressurized equipment that potentially imparts significant energy to near-by structures and materials.

EXTORTION: An attempt to cause an action at the station by threat of force.

FAULTED: (Steam Generator) Existence of secondary side leakage (i.e., steam or feed line break) that results in an uncontrolled decrease in steam generator pressure or the steam generator being completely depressurized.

FIRE: Combustion characterized by heat and light. Source of smoke such as slipping drive belts or overheated electrical components do not constitute fires. Observation of flame is preferred but is NOT required if large quantities of smoke and heat are observed.

FLAMMABLE GAS: Combustible gases maintained at concentrations less than the **LOWER EXPLOSIVE LIMIT (LEL)** will not explode due to ignition.

HOSTAGE: A person(s) held as leverage against the station to ensure that demands will be met by the station.

HOSTILE ACTION: An act toward a nuclear power plant or its personnel that includes the use of violent force to destroy equipment, take hostages, and/or intimidates the licensee to achieve an end. This includes attack by air, land, or water; using guns, explosives, projectiles, vehicles, or other devices used to deliver destructive force. Other acts that satisfy the overall intent may be included. HOSTILE ACTION should NOT be construed to include acts of civil disobedience or felonious acts that are not part of a concerted attack on the nuclear power plant. Non-terrorism-based EALs should be used to address such activities, (e.g., violent acts between individuals in the owner controlled area.)

HOSTILE FORCE: Individual(s) involved with a HOSTILE ACTION. One or more individuals who are engaged in a determined assault, overtly or by stealth and deception, equipped with suitable weapons capable of killing, maiming, or causing destruction.

INEFFECTIVE: The specified restoration action(s) does not result in a reduction in the level of severity of the RED PATH condition within 15 minutes from identification of the Core Cooling CSF Status Tree RED PATH. A reduction in the level of severity is an improvement in the applicable parameters, e.g., Increasing Trend in Reactor Vessel Water Level (Full RVLIS) and/or Decreasing Trend on Core Thermocouple Temperatures.

INITIATING CONDITIONS: Plant Parameters, radiation monitor readings or personnel observations that identify an Event for purposes of Emergency Plan Classification.

INTRUSION/INTRUDER: Suspected hostile individual present in a protected area without authorization.

ODCM: Offsite Dose Calculation Manual.

ORANGE PATH: Monitoring of one or more CSFs by FR-0 which indicates that the CSF(s) is under severe challenge.

PROJECTILE: An object ejected, thrown, or launched towards a plant structure. The source of the projectile may be onsite or offsite. Damage is sufficient to cause concern regarding the integrity of the affected structure or the operability or reliability of safety equipment contained therein.

PROTECTED AREA: Encompasses all owner controlled areas within the security protected area fence as shown on Figure 4-A.

RED PATH: Monitoring of one or more CSFs by the FR-0 which indicates that the CSF(s) is under extreme challenge; prompt operator action is required.

RUPTURED: (Steam Generator) Existence of primary to secondary leakage of a magnitude greater than charging pump capacity.

SABOTAGE: Deliberate damage, misalignment, or mis-operation of plant equipment with the intent to render the equipment inoperable.

SECURITY CONDITION- Any Security Event as listed in the approved security contingency plan that constitutes a threat/compromise to site security, threat/risk to site personnel, or a potential degradation to the level of safety of the plant. A SECURITY CONDITION does not involve a HOSTILE ACTION.

SIGNIFICANT TRANSIENT: An UNPLANNED event involving one or more of the following: (1) An automatic turbine runback > 15% thermal reactor power; (2) Electrical load rejection > 25% full electrical load; (3) Reactor Trip or (4) Safety Injection System Activation.

SITE PERIMETER: Encompasses all owner controlled areas in the immediate site environs as shown on Figures 4-A and 7-A.

STRIKE ACTION: A work stoppage within the PROTECTED AREA by a body of workers to enforce compliance with demands made on TVA. The STRIKE ACTION must threaten to interrupt normal plant operations.

TOXIC GAS: A gas that is dangerous to life or limb by reason of inhalation or skin contact (e.g., chlorine).

UNPLANNED: An event or action that is not the expected result of normal operations, testing, or maintenance. Events that result in corrective or mitigative actions being taken in accordance with abnormal or emergency procedures are UNPLANNED.

UNPLANNED: (With specific regard to radioactivity releases) A release of radioactivity is UNPLANNED if the release has not been authorized by a Discharge Permit (DP). Implicit in this definition are unintentional releases, unmonitored releases, or planned releases that exceed a condition specified on the DP, e.g., alarm setpoints, minimum dilution flow, minimum release times, maximum release rates, and/or discharge of incorrect tank.

VALID: An indication or report or condition is considered to be VALID when it is conclusively verified by (1) an instrument channel check, or (2) indications on related or redundant indicators, or (3) by direct observation by plant personnel. Implicit in this definition is the need for timely assessment, i.e., within 15 minutes.

VISIBLE DAMAGE: Damage to equipment that is readily observable without measurements, testing, or analyses. Damage is sufficient enough to cause concern regarding the continued operability or reliability of affected safety structure, system, or component. Example damage includes: deformation due to heat or impact, denting, penetration, rupture, cracking, and/or paint blistering. Surface blemishes (e.g., paint chipping, scratches) should NOT be included.

VITAL AREA: Is any area within the PROTECTED AREA which contains equipment, systems, devices, or material, the failure, destruction, or release of which could directly or indirectly endanger the public health and safety by exposure to radiation.

Attachment 5
(Page 3 of 7)

Classification	5.1 Earthquake Mode	5.1 Earthquake Initiating/Condition	5.2 Tornado Mode	5.2 Tornado Initiating/Condition
GENERAL		*Refer to "Fission Product Barrier Matrix"*		*Refer to "Fission Product Barrier Matrix"*
SITE		*Refer to "Fission Product Barrier Matrix"*		*Refer to "Fission Product Barrier Matrix"*
ALERT	All	**Earthquake detected by site seismic instrumentation** *(1 and 2)* 1. *(a and b)* a. Ann.166 D indicates "OBE Spectra Exceeded" b. Ann.166 E indicates "Seismic Recording Initiated" 2. *(a or b)* a. Ground motion sensed by Plant personnel b. National Earthquake Information Center at 1-(303) 273-8500 can confirm the event.	All	**Tornado <u>or</u> High Winds strikes any structure listed in Table 5-1 and results in VISIBLE DAMAGE** *(1 and 2)* 1. Tornado or High Winds (Sustained >80 mph > one minute) strikes any structure listed in Table 5-1 2. *(a or b)* a. Confirmed report of any **VISIBLE DAMAGE** b. Control Room indications of degraded Safety System <u>or</u> component response due to event *Note: Site Met Data Instrumentation fails to 0 at >100 mph. National Weather Service Morristown 1-(423) 586-8400 can provide additional information if needed.*
UNUSUAL EVENT	All	**Earthquake detected by site seismic instrumentation** *(1 and 2)* 1. Ann. 166 E indicator "Seismic Recording Initiated" 2. *(a or b)* a. Ground motion sensed by Plant personnel b. National Earthquake Information Center at 1-(303) 273-8500 can confirm the event.	All	**Tornado within the SITE PERIMETER** 1. Plant personnel report a Tornado has been sighted within the **SITE PERIMETER** (Refer to Figure 5-A)

JPM A.4 KEY

Attachment 5
(Page 4 of 7)

5.3 Aircraft / Projectile Crash

	Mode	Initiating/Condition
GENERAL		*Refer to "Fission Product Barrier Matrix"*
SITE		*Refer to "Fission Product Barrier Matrix"*
ALERT	All	**Aircraft <u>or</u> PROJECTILE impacts (Strikes) any Plant structure listed in Table 5-1 resulting in VISIBLE DAMAGE** *(1 and 2)* 1. Plant personnel report aircraft **<u>or</u>** PROJECTILE has impacted any structure listed in Table 5-1 2. *(a or b)* a. Confirmed report of any VISIBLE DAMAGE b. Control Room indications of degraded Safety System **<u>or</u>** component response due to the event within the specified areas
UNUSUAL EVENT	All	**Aircraft crash <u>or</u> PROJECTILE impact within the SITE PERIMETER** 1. Plant personnel report a Aircraft Crash **<u>or</u> PROJECTILE** impact within the **SITE PERIMETER** (Refer to Figure 5-A)

Table 5-1
Plant Structures Associated With Tornado/Hi Wind and Aircraft EALs

Unit #1 and 2 Reactor Buildings
Auxiliary Building
Control Building
Diesel Generator Building
Additional Diesel Generator Building
Intake Pumping Station
Additional Equipment Buildings (Units 1 & 2)
CDWE Building
Turbine Building
RWST
CST

DESTRUCTIVE PHENOMENON U1

Attachment 5
(Page 5 of 7)

	5.4 River Level HIGH		5.5 River Level LOW	
	Mode	Initiating/Condition	Mode	Initiating/Condition
GENERAL		*Refer to "Fission Product Barrier Matrix"*		*Refer to "Fission Product Barrier Matrix"*
SITE		*Refer to "Fission Product Barrier Matrix"*		*Refer to "Fission Product Barrier Matrix"*
ALERT	All	**River Reservoir level is at Stage II Flood Warning** *(1 or 2)* 1. River Reservoir level >727 Ft 2. Stage II Flood Warning (AOI-7) has been issued by River Systems Operations	All	**River Reservoir level is <668 Ft (AOI-22) as reported by River Systems Operations**
UNUSUAL EVENT	All	**River Reservoir level is at Stage I Flood Warning** *(1 or 2 or 3)* 1. River Reservoir level >726.5 Ft from April 16 thru September 30 2. River Reservoir level >714.5 Ft from October 1 thru April 15 3. Stage I Flood Warning (AOI-7) has been issued by River Systems Operations	All	**River Reservoir level is ≤673 Ft (AOI-22) as reported by River Systems Operations**

JPM A.4 KEY

Attachment 5
(Page 6 of 7)

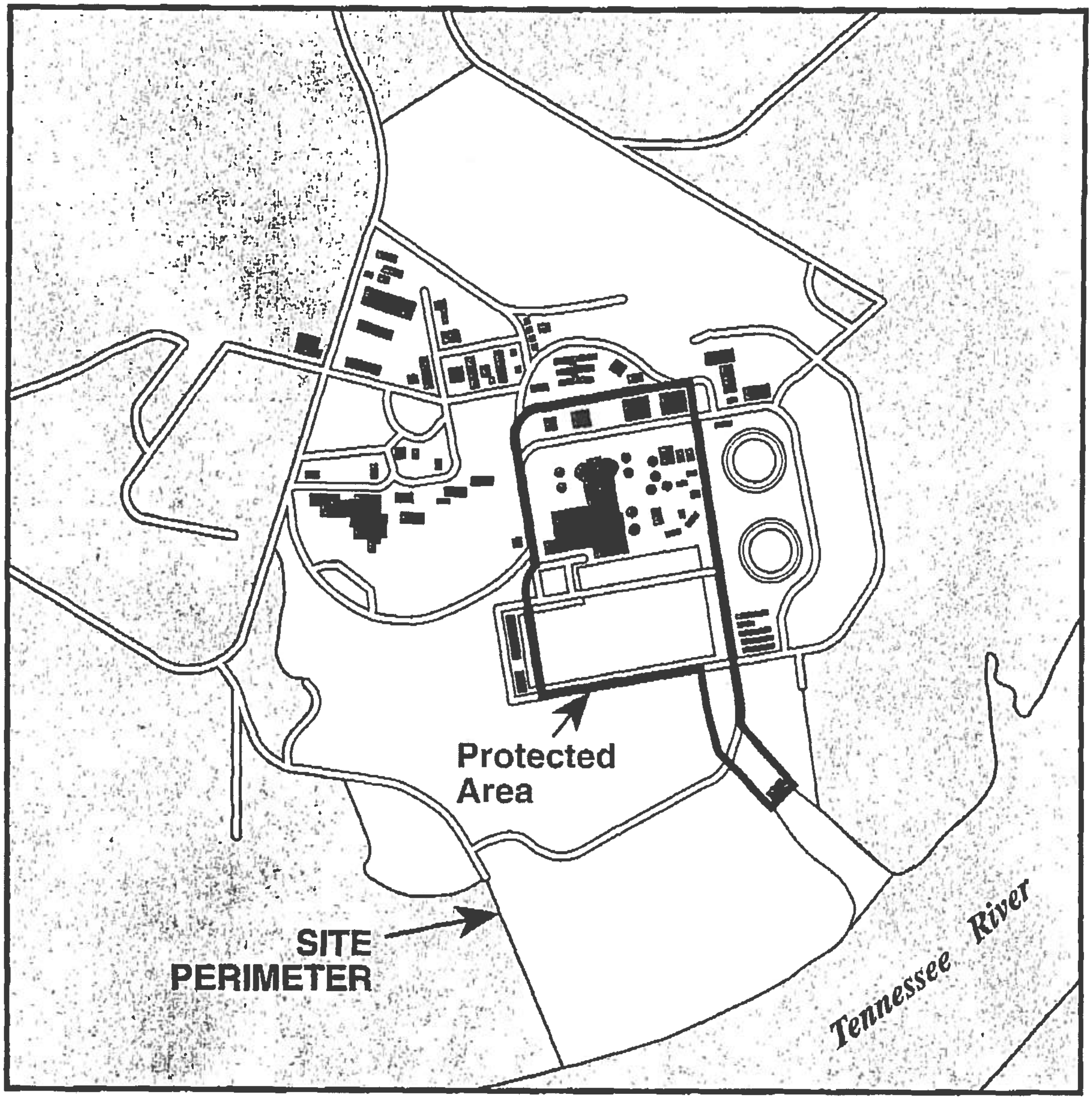
5.6 Watercraft Crash		
	Mode	Initiating/Condition
GENERAL		*Refer to "Fission Product Barrier Matrix"*
SITE		*Refer to "Fission Product Barrier Matrix"*
ALERT		*Refer to "Fission Product Barrier Matrix"*
UNUSUAL EVENT	All	**Watercraft Strikes the Intake Pumping Station resulting in a reduction of Essential Raw Cooling Water (ERCW) or Raw Cooling Water (RCW)** *(1 and 2)* 1. Plant personnel report a Watercraft has struck the Intake Pumping Station 2. (**a or b or c**) a. ERCW Supply Header Pressure Train A 0-PI-67-18A is <15 psig b. ERCW Supply Header Pressure Train B 0-PI-67-17A is <15 psig c. RCW Supply Header Pressure 0-PI-24-22 is <15 psig

DESTRUCTIVE PHENOMENON U1

JPM A.4 KEY

Attachment 5
(Page 7 of 7)

Figure 5-A
PROTECTED AREA/SITE PERIMETER



Attachment 7
(Page 1 of 7)
Radiological

FISSION PRODUCT BARRIER MATRIX (Modes 1-4) — 1

1.1 Fuel Clad
1.2 RCS
1.3 Containment

SYSTEM DEGRADATION — 2

2.1 Loss of Instrumentation
2.2 Loss of Function/Communication
2.3 Failure of Reactor Protection
2.4 Fuel Clad Degradation
2.5 RCS Unidentified Leakage
2.6 RCS Identified Leakage
2.7 Uncontrolled Cool Down
2.8 Turbine Failure
2.9 Technical Specification
2.10 Safety Limit

LOSS OF POWER — 3

3.1 Loss of AC (Power Ops)
3.2 Loss of AC (Shutdown)
3.3 Loss of DC

HAZARDS and SED JUDGMENT — 4

4.1 Fire
4.2 Explosion
Table 4-1
Figure 4-A
4.3 Flammable Gas
4.4 Toxic Gas
Table 4-2
Figure 4-B
4.5 Control Room Evacuation
4.6 Security
4.7 SED Judgment

DESTRUCTIVE PHENOMENON — 5

5.1 Earthquake
5.2 Tornado
5.3 Aircraft/Projectile Crash Figure 5-A
Table 5-1
5.4 River Level High
5.5 River Level Low
5.6 Watercraft Crash

SHUTDOWN SYSTEM DEGRADATION — 6

6.1 Loss of Shutdown Systems
6.2 Loss of AC (Shutdown)
6.3 Loss of DC (Shutdown)

RADIOLOGICAL — 7

7.1 Gaseous Effluent
7.2 Liquid Effluent
Table 7-1
Figure 7-A
7.3 Radiation Levels
7.4 Fuel Handling
Table 7-2

Attachment 7
(Page 2 of 7)

UNUSUAL EVENT, ALERT, SITE AREA EMERGENCY and GENERAL **EMERGENCY**: (see SED Judgment 4.7).

BOMB: An explosive device (See EXPLOSION).

CIVIL DISTURBANCE: A group of twenty (20) or more persons violently protesting station operations or activities at the site.

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EVENT: Assessment of an **EVENT** commences when recognition is made that one or more of the conditions associated with the event exist. Implicit in this definition is the need for timely assessment, i.e. within 15 minutes.

EXCLUSION AREA BOUNDARY (EAB): The demarcation of the area surrounding the WBN units in which postulated FSAR accidents will not result in population doses exceeding the criteria of 10 CFR Part 100. Refer to Figure 7-A.

EXPLOSION: A rapid, violent, unconfined combustion or a catastrophic failure of pressurized equipment that potentially imparts significant energy to near-by structures and materials.

EXTORTION: An attempt to cause an action at the station by threat of force.

FAULTED: (Steam Generator) Existence of secondary side leakage (i.e., steam or feed line break) that results in an uncontrolled decrease in steam generator pressure or the steam generator being completely depressurized.

FIRE: Combustion characterized by heat and light. Source of smoke such as slipping drive belts or overheated electrical components do not constitute fires. Observation of flame is preferred but is NOT required if large quantities of smoke and heat are observed.

FLAMMABLE GAS: Combustible gases maintained at concentrations less than the **LOWER EXPLOSIVE LIMIT (LEL)** will not explode due to ignition.

HOSTAGE: A person(s) held as leverage against the station to ensure that demands will be met by the station.

HOSTILE ACTION: An act toward a nuclear power plant or its personnel that includes the use of violent force to destroy equipment, take hostages, and/or intimidates the licensee to achieve an end. This includes attack by air, land, or water; using guns, explosives, projectiles, vehicles, or other devices used to deliver destructive force. Other acts that satisfy the overall intent may be included. HOSTILE ACTION should NOT be construed to include acts of civil disobedience or felonious acts that are not part of a concerted attack on the nuclear power plant. Non-terrorism-based EALs should be used to address such activities, (e.g., violent acts between individuals in the owner controlled area.)

HOSTILE FORCE: Individual(s) involved with a HOSTILE ACTION. One or more individuals who are engaged in a determined assault, overtly or by stealth and deception, equipped with suitable weapons capable of killing, maiming, or causing destruction.

INEFFECTIVE: The specified restoration action(s) does not result in a reduction in the level of severity of the RED PATH condition within 15 minutes from identification of the Core Cooling CSF Status Tree RED PATH. A reduction in the level of severity is an improvement in the applicable parameters, e.g., Increasing Trend in Reactor Vessel Water Level (Full RVLIS) and/or Decreasing Trend on Core Thermocouple Temperatures.

INITIATING CONDITIONS: Plant Parameters, radiation monitor readings or personnel observations that identify an Event for purposes of Emergency Plan Classification.

INTRUSION/INTRUDER: Suspected hostile individual present in a protected area without authorization.

ODCM: Offsite Dose Calculation Manual.

ORANGE PATH: Monitoring of one or more CSFs by FR-0 which indicates that the CSF(s) is under severe challenge.

PROJECTILE: An object ejected, thrown, or launched towards a plant structure. The source of the projectile may be onsite or offsite. Damage is sufficient to cause concern regarding the integrity of the affected structure or the operability or reliability of safety equipment contained therein.

PROTECTED AREA: Encompasses all owner controlled areas within the security protected area fence as shown on Figure 4-A.

RED PATH: Monitoring of one or more CSFs by the FR-0 which indicates that the CSF(s) is under extreme challenge; prompt operator action is required.

RUPTURED: (Steam Generator) Existence of primary to secondary leakage of a magnitude greater than charging pump capacity.

SABOTAGE: Deliberate damage, misalignment, or mis-operation of plant equipment with the intent to render the equipment inoperable.

SECURITY CONDITION- Any Security Event as listed in the approved security contingency plan that constitutes a threat/compromise to site security, threat/risk to site personnel, or a potential degradation to the level of safety of the plant. A SECURITY CONDITION does not involve a HOSTILE ACTION.

SIGNIFICANT TRANSIENT: An UNPLANNED event involving one or more of the following: (1) An automatic turbine runback > 15% thermal reactor power; (2) Electrical load rejection > 25% full electrical load; (3) Reactor Trip or (4) Safety Injection System Activation.

SITE PERIMETER: Encompasses all owner controlled areas in the immediate site environs as shown on Figures 4-A and 7-A.

STRIKE ACTION: A work stoppage within the PROTECTED AREA by a body of workers to enforce compliance with demands made on TVA. The STRIKE ACTION must threaten to interrupt normal plant operations.

TOXIC GAS: A gas that is dangerous to life or limb by reason of inhalation or skin contact (e.g., chlorine).

UNPLANNED: An event or action that is not the expected result of normal operations, testing, or maintenance. Events that result in corrective or mitigative actions being taken in accordance with abnormal or emergency procedures are UNPLANNED.

UNPLANNED: (With specific regard to radioactivity releases) A release of radioactivity is UNPLANNED if the release has not been authorized by a Discharge Permit (DP). Implicit in this definition are unintentional releases, unmonitored releases, or planned releases that exceed a condition specified on the DP, e.g., alarm setpoints, minimum dilution flow, minimum release times, maximum release rates, and/or discharge of incorrect tank.

VALID: An indication or report or condition is considered to be VALID when it is conclusively verified by (1) an instrument channel check, or (2) indications on related or redundant indicators, or (3) by direct observation by plant personnel. Implicit in this definition is the need for timely assessment, i.e., within 15 minutes.

VISIBLE DAMAGE: Damage to equipment that is readily observable without measurements, testing, or analyses. Damage is sufficient enough to cause concern regarding the continued operability or reliability of affected safety structure, system, or component. Example damage includes: deformation due to heat or impact, denting, penetration, rupture, cracking, and/or paint blistering. Surface blemishes (e.g., paint chipping, scratches) should NOT be included.

VITAL AREA: Is any area within the PROTECTED AREA which contains equipment, systems, devices, or material, the failure, destruction, or release of which could directly or indirectly endanger the public health and safety by exposure to radiation.

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	7.1 Gaseous Effluents		7.2 Liquid Effluents	
	Mode	**Initiating/Condition**	**Mode**	**Initiating/Condition**
GENERAL	All	**EAB dose resulting from an actual <u>or</u> imminent release of Gaseous Radioactivity that exceeds 1000 mrem TEDE <u>or</u> 5000 mrem Thyroid CDE for the actual <u>or</u> projected duration of the release** *(1 or 2 or 3)* 1. A **VALID** Rad monitor reading exceeds the values under General in Table 7-1 for >15 minutes, unless assessment within this time period confirms that the **Criterion** is **<u>Not</u>** exceeded. 2. Field survey results indicate >1000 mrem/hr gamma <u>or</u> an I-131 concentration of 3.9E-6 µ Ci/cc at SP 3. EP dose assessment results indicate EAB dose >1000 ~~mrem TEDE or~~ >5000 mrem Thyroid CDE for the actual <u>or</u> projected duration of the release (Figure 7-A)		Not Applicable
SITE	All	**EAB dose resulting from an actual <u>or</u> imminent release of Gaseous Radioactivity that exceeds 100 mrem TEDE <u>or</u> 500 mrem Thyroid CDE for the actual <u>or</u> projected duration of the release** *(1 or 2 or 3)* 1. A **VALID** Rad monitor reading exceeds the values under Site in Table 7-1 for >15 minutes, unless assessment within this time period confirms that the **Criterion** is **<u>Not</u>** exceeded 2. Field survey results indicate >100 mrem/hr gamma <u>or</u> an I-131 concentration of 3.9E-7 µ Ci/cc at SP 3. EP dose assessment results indicate EAB dose >100 mrem TEDE <u>or</u> >500 mrem Thyroid CDE for the actual <u>or</u> projected duration of the release (Figure 7-A)		Not Applicable
ALERT	All	**Any UNPLANNED release of Gaseous Radioactivity that exceeds 200 times the ODCM Limit for >15 minutes** *(1 or 2 or 3)* 1. A **VALID** Rad monitor reading exceeds the values under Alert in Table 7-1 for >15 minutes, unless assessment within this time period confirms that the **Criterion** is **<u>Not</u>** exceeded 2. Field survey results indicate >10 mrem/hr gamma at SP >15 minutes 3. EP dose assessment results indicate EAB dose >10 mrem TEDE for the duration of the release (Figure 7-A)	All	**Any UNPLANNED release of Liquid Radioactivity that exceeds 200 times the ODCM Limit for >15 minutes** *(1 or 2)* 1. A **VALID** Rad monitor reading exceeds the values under Alert in Table 7-1 for >15 minutes, unless assessment within this time period confirms that the **Criterion** is **<u>Not</u>** exceeded. 2. Sample results exceed 200 times the ODCM limit value for an unmonitored release of liquid radioactivity >15 minutes in duration
UNUSUAL EVENT	All	**Any UNPLANNED release of Gaseous Radioactivity that exceeds 2 times the ODCM Limit for >60 minutes** *(1 or 2 or 3)* 1. A **VALID** Rad monitor reading exceeds the values under **UE** in Table 7-1 for >60 minutes, unless assessment within this time period confirms that the **Criterion** is **<u>Not</u>** exceeded 2. Field survey results indicate >0.1 mrem/hr gamma at SP for >60 minutes 3. EP dose assessment results indicate EAB dose >0.1 mrem TEDE for the duration of the release (Figure 7-A)	All	**Any UNPLANNED release of Liquid Radioactivity to the Environment that exceeds 2 times the ODCM Limit for >60 minutes** *(1 or 2)* 1. A **VALID** Rad monitor reading exceeds the values under **UE** in Table 7-1 for >60 minutes, unless assessment within this time period confirms that the **Criterion** is **<u>Not</u>** exceeded. 2. Sample results exceed 2 times the ODCM limit value for an unmonitored release of liquid radioactivity >60 minutes in duration

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TABLE 7-1
EFFLUENT RADIATION MONITOR EALS

NOTE

The values below, if exceeded, indicate the need to perform the specific assessment. If the assessment cannot be completed within 15 minute (60 minutes for NOUE), the declaration shall be made based on the **VALID** reading. As used here, the radiation monitor indications on **ICS** are the primary indicators. If **ICS** is unavailable, utilize the radiation monitor readings in the control room or local indication as necessary.

Monitor	ICS Screen	Units	UE	Alert	Site	General
Total Site (GAS)	EFF1	µCi/s (2)	1.98E+05	1.98E+07	2.88E+07	2.88E+08
U1 Shield Building 1-RE-90-400	EFF1	µCi/s	1.98E+05	1.98E+07	2.88E+07	2.88E+08
U2 Shield Building 2-RE-90-400	EFF1	µCi/s	1.98E+05	1.98E+07	2.88E+07	2.88E+08
Auxiliary Building 0-RE-90-101B	4RM1	cpm	4.77E+04	4.77E+06	6.93E+06	*****(1)
Service Building 0-RE-90-132B	4RM1	cpm	1.09E+06	*****(1)	*****(1)	*****(1)
U1 Condenser Vacuum Exhaust 1-RE-90-404 A&B	3PAM	µCi/cc(3)	9.32E+00	9.32E+02	1.36E+03	1.36E+04
S/G Discharge Monitors 1-RE-90-421 thru 424	4RM2	mR/hr(4)	NA	5.72E+02	8.31E+02	8.31E+03
Total Site (LIQUID)	N/A	µCi/ml(2)	1.01E-02	1.01E+00	N/A	N/A
0-RE-90-122	4RM2	cpm	9.92E+05	*****(1)	N/A	N/A
1-RE-90-120, 121	4RM2	cpm	5.68E+05	*****(1)	N/A	N/A
0-RE-90-225	4RM2	cpm	9.92E+05	*****(1)	N/A	N/A
0-RE-90-212	4RM2	cpm	1.18E+04	1.18E+06	N/A	N/A
Release Duration		**Minutes**	**60**	**15**	**15**	**15**
ASSESSMENT METHOD: ICS or radiation monitor (RM) readings in the MCR or local indication as necessary						

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(1) Table values are calculated values. The ***** indicates the monitor is off scale, and other confirmatory data is required for event classification. The maximum output which can be read is 1E+07 cpm.

(2) These EALs are based on the assumption that an emergency release is restricted to one pathway from the plant. In all cases, the total site EAL is the limiting value. Therefore, in the case where there are multiple release paths from the plant, it is the total release EAL (obtained from ICS or other analysis) that will determine whether an emergency classification is warranted.

(3) This Eberline channel (1-RM-90-450) reads out in cpm in the **MCR**. Indications of a radioactivity release via this pathway would be S/G blowdown monitors or other indications of primary-to-secondary leakage such as S/G level increase or pressurizer level decrease. ICS calculates µCi/cc and has a visual indication of an alarm condition when the indications exceed 12.2 µCi/cc. This channel was included in the table to provide a means to further assess a release detected by other indications and to provide a path for possible escalation.

(4) These unit values are based on flow rates through one [1] PORV of 970,000 lb/hr at 1,185 psig, 600°F. Before using these values, ensure a release to the environment is ongoing (e.g. PORV).

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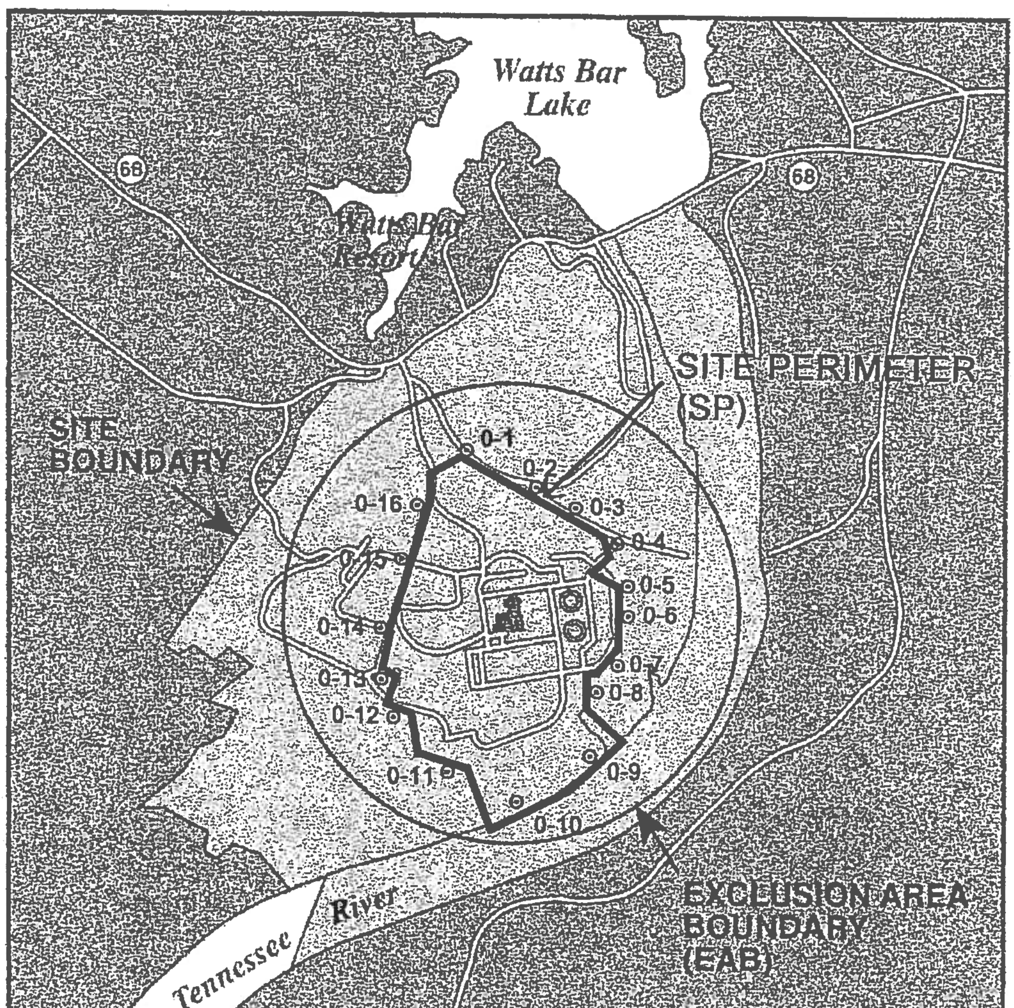
Figure 7-A
EXCLUSION AREA, SITE BOUNDARY and SITE PERIMETER

NOTES
1) The Site Boundary used here is consistent with the definition in the Offsite Dose Calculation Manual. Do not confuse this boundary with the SITE PERIMETER defined in these EALs, or with other definitions of "Site Boundary."
2) Numbered points are [SP] radiological survey point for all sectors.



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	7.3 Radiation Levels		7.4 Fuel Handling	
	Mode	**Initiating/Condition**	**Mode**	**Initiating/Condition**
GENERAL		*Refer to "Fission Product Barrier Matrix" or "Gaseous Effluents" (7.1)*		*Refer to "Gaseous Effluents" (7.1)*
SITE		*Refer to "Fission Product Barrier Matrix" or "Gaseous Effluents" (7.1)*		*Refer to "Gaseous Effluents" (7.1)*
ALERT	All	**UNPLANNED increases in Radiation levels within the Facility that impedes Safe Operations or establishment or maintenance of Cold Shutdown** *(1 or 2)* 1. **VALID** area Radiation Monitor readings or survey results exceed 15 mrem/hr in the Control Room or CAS 2. *(a and b)* a. **VALID** area radiation monitor readings exceed values listed in Table 7-2 b. Access restrictions impede operation of systems necessary for Safe Operation or the ability to establish Cold Shutdown *See UNUSUAL EVENT Note Below*	All	**Major damage to Irradiated Fuel, or Loss of water level that has or will uncover Irradiated Fuel outside the Reactor Vessel** *(1 and 2)* 1. VALID alarm on 0-RE-90-101B or 0-RE-90-102 or 0-RE-90-103 or 1-RE-90-130/131 or 1-RE-90-112 or 1-RE-90-400 or 2-RE-90-400 2. *(a or b)* a. Plant personnel report damage of Irradiated Fuel sufficient to rupture Fuel Rods b. Plant personnel report water level drop has or will exceed makeup capacity such that Irradiated Fuel will be uncovered
UNUSUAL EVENT	All	**UNPLANNED increase in Radiation levels within the Facility** 1. **VALID** area Radiation Monitor readings increase by a factor 1000 over normal levels *Note: In Either the UE or ALERT EAL, the SED must determine the cause of Increase in Radiation Levels and Review Other INITIATING/CONDITIONS for Applicability (e.g., a dose rate of 15 mrem/hr in the Control Room could be caused by a release associated with a DBA).*	All	**UNPLANNED loss of water level in Spent Fuel Pool or Reactor Cavity or Transfer Canal with fuel remaining covered** *(1 and 2 and 3)* 1. Plant personnel report water level drop in Spent Fuel Pool, or Reactor Cavity, or Transfer Canal 2. **VALID** alarm on 0-RE-90-102 or 0-RE-90-103 or 1-RE-90-59 or 1-RE-90-60 3. Fuel remains covered with water.

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Table 7-2
ALERT - RADIATION LEVELS

Monitor No.	Location Building and Elevation		Monitor Reading *
1&2 RE-90-1	Auxiliary	El. 757.0 (spent fuel pool)	2.5 x 10^3 mR/hr
1-RE-90-2	Auxiliary	El. 757.0 (personnel air lock)	2.5 x 10^0 R/hr
0-RE-90-3	Auxiliary	El. 729.0 (waste pac. area)	2.5 x 10^3 mR/hr
0-RE-90-4	Auxiliary	El. 713.0 (decon room)	1.5 x 10^3 mR/hr
0-RE-90-5	Auxiliary	El. 737.0 (spt. fuel pool pmp. ar.)	1.5 x 10^3 mR/hr
1&2-RE-90-6	Auxiliary	El. 737.0 (comp. cl. wtr. ht. ex. ar.)	1.5 x 10^3 mR/hr
1&2-RE-90-7	Auxiliary	El. 713.0 (sample room)	2 x 10^3 mR/hr
1&2-RE-90-8	Auxiliary	El. 713.0 (aux. feed pump area)	1.5 x 10^3 mR/hr
0-RE-90-9	Auxiliary	El. 692.0 (wst. cond. evap. tk. ar.)	1.5 x 10^3 mR/hr
1&2-RE-90-10	Auxiliary	El. 692.0 (cvcs area)	1.5 x 10^3 mR/hr
0-RE-90-11	Auxiliary	El. 676.0 (ctmt. spry. & rhr pmp ar.)	1.5 x 10^3 mR/hr
1-RE-90-61	Auxiliary	El. 736.0 (RB low. cmpt. inst. rm.)	2.5 x 10^3 mR/hr
0-RE-90-230	Turbine	El. 685.0 (conden. demin.)	1.5 x 10^3 mR/hr
0-RE-90-231	Turbine	El. 685.0 (conden. demin.)	1.5 x 10^3 mR/hr

* These monitors read out in mR/hr. It is assumed that this is equivalent to mrem/hr.

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