Final Submittal

(Blue Paper)

FINAL SIMULATOR SCENARIOS

HARRIS JAN./FEB. 2006 EXAM

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Facility:	Shearon Harris	Scenario No.:	1	Op Test No.:	2006 NRC
Examiners:		Operators:			

Initial Conditions:
- IC-11 – 90% power (MOL).
- Exception to IC-11 Fact Sheet: Inform crew that RCS Boron is 864 ppm.
- RHR Pump "B" is inoperable and under clearance while a possible oil leak is investigated. OWP-RH-02 is in effect. 60 hours remain on TSAS 3.5.2.a.

Turnover: Raise power to 100% at a loading rate of 2 DEH Units/minute.

The Power Range Heat Balance is SAT.

GP-005, Step 137.b is complete.

Event No.	Malf. No.	Event Type*	Event Description
1	N/A	N-BOP, SRO R-RO	Raise power.
2	TT:144 JTB143B	I-RO, SRO	Letdown temperature control transmitter fails LOW. 1CS-50, LETDOWN DIVERT VALVE, fails in auto.
3	XD1I121	C-BOP, SRO TS-SRO	MCC 1A34 Feeder Breaker trip: Loss of both fans on Containment Fan Cooler AH-3.
4	LT:476	I-BOP, SRO TS-SRO	Controlling level channel on a SG fails HIGH.
5	PT:444	I-RO, SRO	PT-444, PZR Pressure instrument fails HIGH.
6	RCS09C	M-ALL	Steadily rising vibration on RCP "C".
7	RPS01B	C-ALL	ATWS
8	PRS04A	M-ALL	PZR Safety valve fails OPEN.
9	EPS05A DSG04A	C-ALL	Electrical fault on vital bus with running CSIP "A". EDG B Load Sequencer failure.

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

SHNPP 2006 NRC ES-D-1 SCENARIO 1 SUMMARY DESCRIPTION

The crew assumes the watch with the unit at 90% power and directions to raise power at 10% per hour in accordance with GP-005, POWER OPERATIONS. Prior to entering the simulator the crew will hold a "pre-brief" on the power change to reduce planning/discussion time. RHR Pump "B" is inoperable and under clearance while a possible oil leak is investigated. This will not be a factor in the scenario until the termination point.

On cue from the Lead Evaluator the letdown temperature transmitter fails low, causing the temperature control valve to close and the letdown diversion valve (1CS-50) fails to re-direct flow in auto. The crew should respond in accordance with alarm response procedure APP-ALB-007, 3-2, DEMIN FLOW DIVERSION HIGH TEMP. The operator should manually re-position 1CS-50 and take manual control of the temperature control valve to restore temperature. Depending on the progress of the scenario, the crew may restore the normal letdown flowpath.

On cue from the Lead Evaluator, the feeder breaker to both fans on Containment Fan Cooler AH-3 will open. The crew should initially respond in accordance with alarm response procedure APP-ALB-001, 6-5, ESF SYS TRAIN A BYP OR INOP. They should determine that AH-3 lost power due to the feeder breaker trip. The SRO should enter the action statement for an inoperable Containment Fan Cooler. As containment temperature and pressure begin to rise, the crew should start a standby unit and restore normal containment purge.

On cue from the Lead Evaluator the controlling level channel on SG "A" fails HI. The crew should respond in accordance with APP-ALB-014, 1-1B, SG A NR LVL/SP HI/LO DEV. The operator should determine the channel has failed and take manual control of the associated feedwater regulating valve. The SRO should enter the required instrumentation technical specifications. The channel does not have to be removed from service to continue with the scenario. Anytime after the SG level technical specification has been entered the Lead Evaluator can cue the PZR pressure instrument failure. The crew should respond to ALB-9 alarms and enter AOP-019, MALFUNCTION OF RCS PRESSURE CONTROL. The operator should perform the immediate actions from memory. The crew should then work through the procedure and restore RCS pressure to normal. The Lead Evaluator can cue the next event before the channel is removed from service.

On cue from the Lead Evaluator, RCP "C" vibration will begin to rise. The crew will respond to alarms and/or indications and enter AOP-018, REACTOR COOLANT PUMP ABNORMAL CONDITIONS. The SRO should direct a manual reactor trip when the vibration limits are exceeded. Attempts to trip the reactor from the control room will fail. During the ensuing transient a PZR Safety Valve will fail open. The bus with the operating CSIP will trip on electrical fault and the sequencer on the opposite train fails to actuate. The crew should enter PATH-1, transition to FRP-S.1, and then return to PATH-1 to mitigate the LOCA. Among other high-level actions, the crew should direct actions to make the reactor sub-critical, start one train of ECCS equipment and stop the RCP's. The scenario can be terminated at Lead Evaluator discretion or at the transition to EPP-012, LOSS OF EMERGENCY COOLANT RECIRCULATION.

IC-11, 89% power, EOL

Rack out B RHR pump (initial condition)
irf rhr023 (n 00:00:00 00:00:00) RACK_OUT

1CS-50 fails to auto bypass letdown demineralizers on high temperature (initial condition)
imf jtb143b (n 00:00:00 00:00:00) FAIL_RESET,FAIL_ASIS

Auto and manual reactor trip failure (initial condition)
imf rps01b (n 00:00:00 00:00:00) 3 3

#Conditional Triggers (for Rx trip and SI respectively)
TRG 7 "JPPLP4"
TRG 8 "JPPLSI"

Letdown temperature control failure (TE-144 fails low)
imf tt:144 (1 00:00:00 00:00:00) 50.0 00:03:00 –

MCC 1A34 feeder bkr trip; loss of both AH-3 fans
idi xdli121 (2 00:00:00 00:00:00) TRIP

A SG controlling level channel failure
imf lt:476 (3 00:00:00 00:00:00) 100.0 00:01:00

PRZ master press controller input failure
imf pt:444 (4 00:00:00 00:00:00) 2500.0 00:05:00 –

C RCP vibration increase to trip level
imf rcs09c (5 00:00:00 00:00:00) 30.0 00:03:00 –

# Delete Rx Trip failure
trg= 6 dmf rps01b

PRZ safety valve fails open (on Rx Trip)
imf prs04a (7 00:00:00 00:00:00) 100 00:00:00 0

Loss of 1A-SA (on SIAS)
imf eps05a (8 00:00:00 00:00:00) true
imf dsg03 (8 0 0) A

B sequencer failure (on SIAS)
imf dsg04a (8 00:00:00 00:00:00) 1 2

Op Test No.: 1	Scenario # 1	Event # 1	Page 4 of 28
Event Description:	Power Increase		

Time	Position	Applicant's Actions or Behavior
Booth Operator Instructions:		
Indications Available:		
Evaluator Note:		**The Lead Evaluator can cue initiation of Event 2 (Letdown Temperature Control Transmitter Failure) whenever the evaluating team members have completed their evaluation of Event 1.**
	SRO	Provides direction per GP-005, Step 137.c
	BOP	Depresses Load Rate MW/MIN pushbutton.
	BOP	Enters/verifies desired load rate in DEMAND display then depresses ENTER.
	BOP	Depresses REF pushbutton, enters or verifies 960 in DEMAND display.
	BOP	Informs RO/SRO that turbine load increase is being initiated.
	BOP	Depresses GO pushbutton.
	BOP	Monitors turbine and feedwater system response.
	SRO	Direct Radwaste Control Room to supply Auxiliary Steam from Extraction Steam per OP-130.01 Section 8.5 or Section 8.6.
Simulator Operator:		**Respond as Radwaste Operator but no simulator actions are required.**

Op Test No.: 1	Scenario # 1	Event # 1	Page 5 of 28
Event Description:	Power Increase		

Time	Position	Applicant's Actions or Behavior
Evaluator's Note:		**The crew may elect to start a dilution before the power change is initiated.**
Evaluator's Note:		**OP-107 is a "Reference Use" procedure.**
	RO	DETERMINE the volume of makeup water to be added. This may be done by experience or via the reactivity plan associated with the Simulator IC.
	RO	SETS FIS-114, TOTAL MAKEUP WTR BATCH COUNTER, to obtain the desired quantity.
	RO	SET total makeup flow as follows:
		• IF performing DIL in Step 8, **THEN SET** controller 1CS-151, FK-114 RWMU FLOW, for less than or equal to 90 gpm.
		• IF performing ALT DIL in Step 8, **THEN SET** controller 1CS-151, FK-114 RWMU FLOW, for the desired flow rate.
	RO	VERIFY the RMW CONTROL switch has been placed in the STOP position.
	RO	VERIFY the RMW CONTROL switch green light is lit.
	RO	PLACE the control switch RMW MODE SELECTOR to the DIL **OR** the ALT DIL position.

Op Test No.: 1	Scenario # 1	Event # 1	Page 6 of 28
Event Description:	Power Increase		

Time	Position	Applicant's Actions or Behavior
Procedure Note:		**When PRZ backup heaters are energized in manual, PK-444A1, PRZ Master Pressure Controller (a PI controller) will integrate up to a greater than normal output, opening PRZ Spray Valves to return and maintain RCS pressure at setpoint. The result is as follows:** • **PORV PCV-444B will open at a lower than expected pressure.** • **ALB-009-3-2, PRESSURIZER HIGH PRESS DEVIATION CONTROL, will activate at a lower than expected pressure.** • **Increased probability for exceeding Tech Spec DNB limit for RCS pressure.**
	RO	OPERATE the pressurizer backup heaters as required to limit the difference between the pressurizer and the RCS boron concentration to less than 10 ppm.
Note:		**SRO concurrence should be obtained prior to energizing the BUH in MANUAL.**
	RO	START the makeup system as follows:
		• TURN control switch RMW CONTROL to START momentarily.
		• VERIFY the red indicator light is lit.
	RO	VERIFY Tavg and rod motion responds as desired.
	RO	VERIFY dilution automatically terminates when the desired quantity has been added.
	RO	PLACE Reactor Makeup in Auto per Section 5.1.

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Event Description: Power Increase

Time	Position	Applicant's Actions or Behavior
	RO	VERIFY the RMW CONTROL switch:
		• Is in the STOP position.
		• The green light is lit.
	RO	PLACE the RMW MODE SELECTOR to AUTO.
	RO	START the makeup system as follows:
		• TURN control switch RMW CONTROL to START momentarily.
		• VERIFY the red indicator light is lit.

Op Test No.: 1	Scenario # 1	Event # 2	Page 8 of 28
Event Description:	Letdown Temperature Control Xmtr Fails LOW (TI-144)/1CS-50 fails to automatically divert flow.		

Time	Position	Applicant's Actions or Behavior
Booth Operator Instructions: Trigger 1		
Indications Available:		
	RO	Responds to alarm and enters APP-ALB-007-3-2.
	RO	CONFIRM alarm using TI-143, LP Letdown Temperature.
	RO	VERIFY Automatic Functions:
		• Manually positions 1CS-50, Letdown to VCT/Demin, to divert flow to the VCT.
	RO	PERFORM Corrective actions:
		• VERIFY that 1CS-50 diverts flow to the VCT, bypassing the BTRS and Purification Demineralizers.
		• PERFORM the following as needed to lower letdown temperature:
		• VERIFY proper charging flow is established. (YES)
		• LOWER letdown flow. (N/A – CCW Problem)
		• IF CCW flow to the Letdown Heat Exchanger appears low, THEN:
		• TAKE manual control of TK-144.
		• OPEN 1CC-337, to raise CCW flow.
	SRO	Contacts Work Control for assistance.
Evaluator's Note:		**The SRO may initiate an Equipment Failure Checklist for any failure.**
Simulator Operator Note:		**Initiate Event 3 (MCC 1A34 Feeder Breaker trip) with concurrence from the Lead Evaluator.**

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Event Description: MCC 1A34 Feeder Breaker Trip

Time	Position	Applicant's Actions or Behavior
Booth Operator Instructions: Trigger 2		
Indications Available:		
	RO	Responds to alarm ALB-001-6-5, Engineering Safeguard Features System Train A Bypassed or Inoperable.
	RO	Refers to APP-ALB-001-6-5 and APP-ESF-A-4-1.
	RO	Reports alarm condition(s) on Engineered Safeguard Feature Bypass Panel A.
	RO	Refer to APP-ESF-A-4-1 for the window indicated in alarm on ESF Bypass Panel A.
	RO/BOP	Reports Containment Fan Cooler AH-3 tripped.
	BOP	Reports no power to 1A34.
	SRO	Dispatches AO to investigate.
Simulator Operator Note: Report 1A34 feeder breaker is open.		
	SRO	Directs start of a standby Containment Fan Cooler.
	BOP	Enters OP-169, Section 5.0.
	BOP	Verifies Initial Conditions.
	BOP	Places control switch for both fans in the selected cooler to LO-SPD.

Op Test No.: 1	Scenario # 1	Event # 3	Page 10 of 28
Event Description:	MCC 1A34 Feeder Breaker Trip		

Time	Position	Applicant's Actions or Behavior
Evaluator's Note:		**Procedure Note indicates the next two steps must be completed without delay to avoid coastdown.**
	BOP	Place control switch for selected fan cooler to STOP.
	BOP	Place control switch for selected fan cooler to HI-SPD.
	BOP	Refers to OP-168 and restores normal containment purge:
		• Opens normal inlet/discharge CP9/CP5
		• Opens normal inlet/discharge CP6/CP3
		Places switch for Normal Purge Supply Fan to START.
Note:		**Controls are now aligned for the fan to auto start if/when CNMT pressure reaches the negative value setpoint.**
	SRO	Contacts Work Control for assistance.
	SRO	Enters TS 3.6.2.3 Action a.
Simulator Operator Note:		**Ensure the BOP Operator is available to respond to Event 4. Initiate Event 4 (SG A Controlling Level Channel Fails HI) with concurrence from the Lead Evaluator.**

Op Test No.: 1	Scenario # 1	Event # 4	Page 11 of 28
Event Description:	SG "A" Controlling Level Channel Fails HI (LT-476)		

Time	Position	Applicant's Actions or Behavior
Booth Operator Instructions: Trigger 3		
Indications Available:		
	BOP	Responds to alarms ALB-014-1-1B and 4-3B.
	SRO	Enters and directs actions of APP-ALB-014-1-1B and/or 4-3B.
Evaluator's Note:		**The APP-ALB-014-1-B and 4-3B actions are similar.** **In accordance with OMM-1, the operator may take MANUAL control of a malfunctioning controller before being directed by a procedure.**
	BOP	CONFIRM alarm using LI-474 SA, LI-475 SB, or LI-476 SA, Steam Generator A level indicators. Reports LI-476 reading or failed high.
	BOP	VERIFY Automatic Functions: NONE
	BOP	PERFORM Corrective Actions:
		• CHECK Steam Flow (FI-474, FI-475) AND Feed Flow (FI-476, 477) for deviation. (YES)
		• IF FCV-478, SG A auto level controller, is NOT sufficiently correcting level, THEN: (YES)
		• SWITCH to MANUAL.
		• RESTORE level to normal (57% NR).
	SRO	**The SRO may enter AOP-010 based on the flow transient. If so, the outcome will be the same – the associated FRV in MANUAL.**
	SRO	Refer to OWP-RP-05 to remove channel from service.

Op Test No.: 1	Scenario # 1	Event # 4	Page 12 of 28
Event Description:	SG "A" Controlling Level Channel Fails HI (LT-476)		

Time	Position	Applicant's Actions or Behavior
	SRO	Contacts I&C to have channel removed from service.
Evaluator's Note:		**Channel does NOT have to be removed from service to continue the scenario. Cue Event 5 (PRZ Pressure Instrument Failure) after SG level is under control and the TS has been identified.**
	SRO	Enters Instrumentation TS 3.3.1 Action 6 and 3.3.2 Action 19.

Op Test No.: 1 Scenario # All Event # 5 Page 13 of 28

Event Description: PZR Pressure Instrument Fails HI (PT-444)

Time	Position	Applicant's Actions or Behavior
Booth Operator Instructions: Trigger 4		
Indications Available:		
	RO	Responds to multiple ALB-09 alarms.
	RO	Reports channel failure or malfunction of RCS Pressure control.
	SRO	Enters AOP-019.
	RO	Perform AOP-019.
	RO	Perform AOP-019 Immediate Actions.
Immediate Action	RO	CHECK that a bubble exists in the PRZ. (YES)
Immediate Action	RO	VERIFY ALL PRZ PORVs AND associated block valves properly positioned for current PRZ pressure and plant conditions. (YES)
Immediate Action	RO	CHECK Both PRZ spray valves properly positioned for current PRZ pressure and plant conditions. (NO)
Immediate Action	RO	CONTROL PRZ spray valves in MANUAL using ONE of the following (listed in order of preference):
Immediate Action		• PK-444A, Master Pressure Controller
		OR
Immediate Action		• Both individual spray valve controllers
	SRO	GO TO Section 3.1, Pressure Control Malfunctions While Operating With a Pressurizer Bubble.

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Event Description: PZR Pressure Instrument Fails HI (PT-444)

Time	Position	Applicant's Actions or Behavior
	SRO	Inform SSO to REFER to PEP-110, Emergency Classification and Protective Action Recommendations, AND ENTER the EAL Network at entry point X.
	RO	MONITOR PRZ pressure by observing other reliable indication.
	SRO	CHECK plant in MODE 1 OR 2. (YES)
	RO	CHECK PRZ pressure CONTROLLED. (YES)
	RO	CHECK PRZ pressure 2335 PSIG OR LESS. (YES)
	RO	CHECK ALL of the following PRZ PORV block valves OPEN:
		• 1RC-117 (for PCV-445A SA) (YES)
		• 1RC-115 (for PCV-445B) (YES)
		• 1RC-113 (for PCV-44B SB) (YES)
	RO	CHECK that a malfunction of one or more of the following has occurred:
		• PT-444 (YES)
		• PK-444A
		• PRZ heater(s)
		• PRZ spray valve(s) or controller(s)
	RO	CHECK PK-444A controlling properly in AUTO. (NO)
	RO	PERFORM the following:
		• VERIFY PK-444A in MANUAL.
		• ADJUST PK-444A output as necessary, to attempt to restore and maintain PRZ pressure.

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Event Description: PZR Pressure Instrument Fails HI (PT-444)

Time	Position	Applicant's Actions or Behavior
	RO	CONTROL PRZ pressure as follows:
Note:		**If individual spray valve controllers are already in MAN, do NOT return to AUTO.**
	RO	• CHECK BOTH PRZ spray valve controllers in AUTO AND BOTH spray valves operating as desired. (YES)
	RO	CHECK ALL PRZ heaters operating as desired. (YES)
		• Manually OPERATE control switches for heater groups as necessary to control PRZ pressure. (N/A)
	RO	CHECK at least one of the following conditions present:
		• PRZ pressure is UNCONTROLLED (NO)
		• Status of a normal spray valve or a PRZ heater bank is UNCONTROLLED (NO)
	SRO	REFER TO Tech Spec 3.2.5 AND IMPLEMENT action where appropriate. (Limit is 2185 psig – restore within 2 hours)
Simulator Operator's Note:		**Insert Event 6 (Rising vibration on RCP C) on cue from the Lead Evaluator or after TS 3.2.5 is evaluated.**

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Event Description: Rising Vibration On RCP "C"/Rx Trip Failure/PRZ Safety Fails OPEN/1A-SA Bus and 1B Sequencer failure.

Time	Position	Applicant's Actions or Behavior
Booth Operator Instructions: Trigger 5 for RCP vibration (other events auto initiated)		
Indications Available:		
	RO	Responds to alarm ALB-010-1-5.
Evaluator's Note:		**Crew may enter ALB-010-1-5 but will likely go directly to AOP-018 when high vibration is recognized.**
	SRO	Enters and directs actions of AOP-018.
Immediate Action	RO	Perform Immediate Action
		• Verifies one CSIP running. (YES)
	SRO	Inform SSO to refer to PEP-110, Emergency Classification and Protective Action Recommendations.
	SRO	Proceeds to Section 3.2.
	SRO	Check all RCP's operating within limits of Attachment 1.
Evaluator's Note:		**The answer may be YES at this time but the limit will be exceeded in short order.**
	SRO	Check reactor power > P-8. (YES)
	SRO	Directs RO to initiate a Reactor trip and then stop RCP "C".
	RO	Attempts to initiate a MANUAL reactor trip and reports failure.
	SRO	Enters PATH-1.

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Event Description: Rising Vibration On RCP "C"/Rx Trip Failure/PRZ Safety Fails OPEN/1A-SA Bus and 1B Sequencer failure.

Time	Position	Applicant's Actions or Behavior
	SRO	Transitions to FRP-S.1 and directs RO to perform immediate actions of the procedure.
Immediate Action	RO	Verify Reactor Trip:
		• Check for all of the following:
		• Check for any of the following:
		• Trip breakers RTA AND BYA – OPEN (NO)
		• Trip breakers RTB AND BYB – OPEN (NO)
		• Rod bottom lights – LIT (NO)
		• Neutron flux – DECREASING (NO)
Immediate Action		IF the reactor will NOT trip (automatically OR using either manual trip switch), THEN verify negative reactivity inserted by any of the following while continuing with this procedure:
		• Manually insert control rods.
		• Verify control rods inserting in automatic. (YES)
Immediate Action	BOP	Verify Turbine Trip:
		• Check for any of the following:
		• All turbine throttle valves – SHUT (NO)
		• All turbine governor valves – SHUT (NO)
		Manually trip turbine from MCB. (YES)
Immediate Action	BOP	Verify All AFW Pumps – RUNNING. (YES)
Immediate Action	RO	Check Reactor Trip Status:
		• Check reactor – TRIPPED (NO)

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Event Description: Rising Vibration On RCP "C"/Rx Trip Failure/PRZ Safety Fails OPEN/1A-SA Bus and 1B Sequencer failure.

Time	Position	Applicant's Actions or Behavior
Immediate Action	RO/SRO	Direct an NLO to contact OR report to the main control room (to receive instructions to locally trip the reactor).
Simulator Operator's Note:		**If the announcement is made in the step above then delete RPS01B (Trigger 6) after Emergency Boration is initiated.**
	SRO	Perform the following:
		• Inform STA to initiate monitoring the Critical Safety Function Status Trees.
		• Inform SSO to Evaluate EAL Network using entry point X (Refer to PEP-110).
	RO	Initiate Emergency Boration of RCS:
		• Check SI flow – GREATER THAN 200 GPM. (NO)
		• Emergency borate from the BAT:
		• Start a boric acid pump.
		• Perform any of the following (listed in order of preference):
		• Open Emergency Boric Acid Addition valve:
		1CS-278
		• Open normal boration valves:
		FCV-113A
		FCV-113B
		• Verify boric acid flow to CSIP suction – AT LEAST 30 GPM.
		• Verify CSIP flow to RCS – AT LEAST 30 GPM.
	RO	• Check PRZ Pressure – LESS THAN 2335 PSIG. (YES)

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Event Description: Rising Vibration On RCP "C"/Rx Trip Failure/PRZ Safety Fails OPEN/1A-SA Bus and 1B Sequencer failure.

Time	Position	Applicant's Actions or Behavior
Evaluator's Note:		**A PRZ Safety Valve will fail open when the reactor trips.**
	BOP	Isolate CNMT Ventilation:
		• Stop the following fans: (If running)
		• AH-82A NORMAL PURGE SUPPLY FAN
		• AH-82B NORMAL PURGE SUPPLY FAN
		• E-5A CNMT PRE-ENTRY PURGE EXHAUST FAN
		• E-5B CNMT PRE-ENTRY PURGE EXHAUST FAN
		• Verify the valves and dampers listed in the table – SHUT.

TRAIN A Components	TRAIN B Components
1CB-2 SA VACUUM RELIEF	1CB-6 SB VACUUM RELIEF
CB-D51 SA VACUUM RELIEF	CB-D52 SB VACUUM RELIEF
1CP-9 SA NORMAL PURGE INLET	1CP-6 SB NORMAL PURGE INLET
1CP-5 SA NORMAL PURGE DISCH	1CP-3 SB NORMAL PURGE DISCH
1CP-10 SA PRE-ENTRY PURGE INLET	1CP-7 SB PRE-ENTRY PURGE INLET
1CP-4 SA ENTRY PURGE DISCH	1CP-1 SB PRE-ENTRY PURGE DISCH

	RO	Check Trip Status:
		• Check reactor – TRIPPED (YES)
Evaluator's Note:		**The crew may stop RCP "C" at any time after the reactor trip is verified.**
	BOP	Check turbine – TRIPPED (YES)
Critical Task:		
Evaluator's Note:		**Critical task is to meet both "Check Reactor Subcritical" criteria before exiting FRP-S.1.**
	RO	Check Reactor Subcritical:
		• Check for both of the following:

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Event Description: Rising Vibration On RCP "C"/Rx Trip Failure/PRZ Safety Fails OPEN/1A-SA Bus and 1B Sequencer failure.

Time	Position	Applicant's Actions or Behavior
		• Power range channels – LESS THAN 5% (YES)
		• Intermediate range startup rate channels – NEGATIVE (YES)
	SRO	Implement Function Restoration Procedures As Required.
	SRO	RETURN TO PATH-1.
	RO	AUTO or MANUAL reactor trip successful. (YES)
	RO/BOP	Verify Turbine Trip. (YES)
	BOP	1A-SA and 1B-SB Buses energized by off-site power or EDGs (NO)
	BOP	1A-SA or 1B-SB energized (YES-1B)
	SRO	CONTINUOUS ACTION: As time allows restore power to de-energized emergency bus while continuing with EOP implementation.
		Dispatches an NLO to investigate 1A-SA bus failure.
Simulator Operator's Note:		**Report lockout relay operation. Request maintenance assistance.**
	RO	SI actuated (YES – may report symptoms/indications)
	SRO	Perform the following:
		• Initiate monitoring the Critical Safety Function Status Trees.

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Event Description: Rising Vibration On RCP "C"/Rx Trip Failure/PRZ Safety Fails OPEN/1A-SA Bus and 1B Sequencer failure.

Time	Position	Applicant's Actions or Behavior
		• Inform SSO to evaluate EAL Network using entry point X (Refer to PEP-110).
	SRO	Foldout A applies.
Note:		**The crew may review the foldout criteria.**
	RO	Verify ALL CSIPs AND RHR pumps – RUNNING.
Critical Task		• **Starts CSIP "B"**
Note:		**The CSIP must be started by no later than the completion of GUIDE 1, Attachment 6.**
		• Reports no RHR Pumps running (No power to "A", "B" inoperable)
	RO	Check SI Flow:
		SI flow – GREATER THAN 200 GPM. (YES)
	RO	Informs SRO that Foldout A criteria met for stopping RCP's
Critical Task	RO	Stops any running RCP ("C" may have been stopped already).
	RO	Verifies CSIP miniflow valves closed (YES)
	RO	RCS pressure – GREATER THAN 230 PSIG. (YES)
	RO/BOP	Check Main Steam Isolation:
		Main steam isolation – ACTUATED. (NO – if CNMT Press <3 psig)

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Event Description: Rising Vibration On RCP "C"/Rx Trip Failure/PRZ Safety Fails OPEN/1A-SA Bus and 1B Sequencer failure.

Time	Position	Applicant's Actions or Behavior
	SRO	May direct manual Main Steam Isolation if the setpoint is being approached.
	RO	Check CNMT Pressure – HAS REMAINED LESS THAN 10 PSIG. (YES)
	RO/BOP	Check AFW Status:
		AFW flow – AT LEAST 210 KPPH AVAILABLE. (YES)
Evaluator's Note for the following step: • **Equipment powered from Bus 1A-SA will be out of position (no power available).** • **Equipment normally started from Load Sequencer B must be started manually.**		
	BOP	Verify Alignment of Components From Actuation of ESFAS Signals Using Attachment 6, "Safeguards Actuation Verification", While Continuing with this Procedure.
		Starts:
		• CSIP "B" if not started previously
	RO	Control RCS Temperature:
		Control feed flow and steam dump to stabilize RCS temperature between 555°F AND 559°F using Table 1.

Op Test No.: 1 Scenario # 1 Event # 6 Page 23 of 28

Event Description: Rising Vibration On RCP "C"/Rx Trip Failure/PRZ Safety Fails OPEN/1A-SA Bus and 1B Sequencer failure.

Time	Position	Applicant's Actions or Behavior
		TABLE 1: RCS TEMPERATURE CONTROL GUIDELINES FOLLOWING RX TRIP
		• Guidance is applicable until another procedure directs otherwise.
		• IF no RCPs running, THEN use wide range cold leg temperature.
		LESS THAN 557°F AND DECREASING: • Stop dumping steam • Control feed flow • Maintain total feed flow greater than 210 KPPH until level greater than 25% [40%] in at least one on intact SG GREATER THAN 557°F AND INCREASING: • IF condenser available THEN transfer steam dump to STEAM PRESSURE mode using OP-126, Section 5.3 AND dump steam to condenser OR • Dump steam using intact SG PORVs • Control feed flow to maintain SG levels STABLE AT OR TRENDING TO 557°F: • Control feed flow and steam dump to establish and maintain RCS temperature between 555°F AND 559°F
	BOP	Energize AC buses 1A1 AND 1B1. (No power available to 1A1)
	RO	Check PRZ PORVs – SHUT (YES)
	RO	Check PZR PORV block valves – AT LEAST ONE OPEN. (YES)
	RO	PRZ spray valves – SHUT. (YES)

Op Test No.: 1 Scenario # 1 Event # 6 Page 24 of 28

Event Description: Rising Vibration On RCP "C"/Rx Trip Failure/PRZ Safety Fails OPEN/1A-SA Bus and 1B Sequencer failure.

Time	Position	Applicant's Actions or Behavior
	RO/BOP	Identify any faulted SG:
		Check for any of the following:
		• Any SG pressures – DECREASING IN AN UNCONTROLLED MANNER (NO)
		• Any SG – COMPLETELY DEPRESSURIZED. (NO)
	CREW	Check Secondary Radiation:
		Check for all of the following:
		• Condenser Vacuum Pump Effluent radiation – NORMAL. (YES)
		• SG Blowdown radiation – NORMAL. (YES)
		• Main Steamline radiation – NORMAL. (YES)
	SRO	Check RCS Intact:
		Check for all of the following:
		• CNMT pressure – NORMAL. (NO)
		Proceeds TO Step 44.
	SRO	CONTINUOUS ACTION: Implement Function Restoration Procedures As Required. (None required)
	SRO	CONTINUOUS ACTION: Foldouts A and B Apply.
Note:		**The crew may review foldout criteria.**
	RO	Maintain RCP Seal Injection flow between 8 GPM AND 13 GPM.
	BOP	Check Intact SG Levels:
		Any level – GREATER THAN 25% [40%]. (YES)

Op Test No.: 1 Scenario # 1 Event # 6 Page 25 of 28

Event Description: Rising Vibration On RCP "C"/Rx Trip Failure/PRZ Safety Fails OPEN/1A-SA Bus and 1B Sequencer failure.

Time	Position	Applicant's Actions or Behavior
	BOP	Control feed flow to maintain all intact levels between 25% AND 50% [40% AND 50%].
	BOP	Verify AC buses 1A1 AND 1B1 – ENERGIZED. (NO, only 1B1)
	RO	Check PRZ PORVs – SHUT. (YES)
	RO	Check PZR PORV block valves – AT LEAST ONE OPEN. (YES)
	SRO	CONTINUOUS ACTION: IF a PRZ PORV opens on high pressure, THEN verify it shuts after pressure decreases to less than opening setpoint.
	RO	Check SI Termination Criteria:
		RCS subcooling – GREATER THAN (NO)
		10°F [40°F] – C
		20°F [50°F] – M
	SRO	WHEN the SI termination criteria are met, THEN GO TO EPP-008, "SI TERMINATION", Step 1.
	RO	Check CNMT Spray Status:
		Check any CMT Spray Pump – RUNNING. (NO)
	SRO	CONTINUOUS ACTION: WHEN directed by plant operations staff, THEN place the Containment Spray system in standby alignment.

Op Test No.: 1 Scenario # 1 Event # 6 Page 26 of 28

Event Description: Rising Vibration On RCP "C"/Rx Trip Failure/PRZ Safety Fails OPEN/1A-SA Bus and 1B Sequencer failure.

Time	Position	Applicant's Actions or Behavior
	RO	Check Source Range Detector Status:
		Intermediate range flux – LESS THAN $5x10^{-11}$ AMPS.
		• Verify source range detectors – ENERGIZED.
		• Transfer nuclear recorder to source range scale.
	RO	RCS Pressure greater than 230 PSIG (YES)
Evaluator's Note:		**The evaluation/trend of RCS pressure in the next several steps is dependent on how long it took the crew to reach these steps (decay heat/break flow/ECCS flow).**
	RO	RCS pressure – STABLE OR INCREASING. (NO)
	RO	Check for both of the following:
		• All SG Pressures – STABLE OR INCREASING. (YES)
		• RCS pressure – STABLE OR DECREASING. (YES)
Evaluator's Note:		**If the crew gets into a repetitious loop because RCS Pressure is stable or increasing at this point then terminate the scenario. If not, then continue until the transition to EPP-012.**
	RO	For each running CCW pump, open the associated CCW Return From RHR HX valve:
		• Train A: 1CC-147 (Train A not running)
		• Train B: 1CC-167 (OPENs)
	RO	If CCW flow is established to both RHR HX's, shut one train of non-essential header supply and return valves. (NO-flow only on Train B)

Op Test No.: 1 Scenario # 1 Event # 6 Page 27 of 28

Event Description: Rising Vibration On RCP "C"/Rx Trip Failure/PRZ Safety Fails OPEN/1A-SA Bus and 1B Sequencer failure.

Time	Position	Applicant's Actions or Behavior
	BOP	Check AC emergency buses 1A-SA AND 1B-SB – ENERGIZED BY OFFSITE POWER (NO)
		• Verify AC buses 1A1 AND 1B1 – ENERGIZED (NO-Only 1BI)
		• Verify compressors 1A AND 1B – RUNNING (NO, only 1B)
		• Load the following equipment:
		• One train of CRDM fans. (Train B)
		• Turbine Normal Bearing Oil Pump. (No power)
		• WHEN Turbine Normal Bearing Oil Pump running, THEN stop the DC Bearing Oil Pump.
		• Restore offsite power to AC emergency buses using OP-156.02, "AC Electrical Distribution", Section 8.17.
	BOP	Check any EDG – RUNNING UNLOADED. (YES-Both)
	RO	Reset SI.
	BOP	Shutdown any unloaded EDGs using OP-155, "Diesel Generator Emergency Power System", Section 7.0.
	SRO	RHR system – CAPABLE OF COLD LEG RECIRCULATION.
		(NO-no RHR Pump available).
	SRO	GO TO EPP-012, "Loss of Emergency Coolant Recirculation", Step 1.
		Terminate the scenario at Lead Evaluator discretion or the transition to EPP-012.

Op Test No.: 1	Scenario # 1	Event # 6	Page 28 of 28
Event Description:	Rising Vibration On RCP "C"/Rx Trip Failure/PRZ Safety Fails OPEN/1A-SA Bus and 1B Sequencer failure.		

Time	Position	Applicant's Actions or Behavior

CRITICAL TASK DESCRIPTION:

- Meet both "Check Reactor Subcritical" criteria before step 16.c RNO "Allow RCS to heat up" is implemented or a transition is made to any other procedure.
  - Power range channels – LESS THAN 5%
  - Intermediate range startup rate channels – NEGATIVE
- Start CSIP "B" to establish HHSI flow by no later than the completion of GUIDE 1, Attachment 6 - Safeguards Actuation Verification.
- Stop any running RCP after Foldout A criteria is met and before the transition to EPP-012.

Facility:	Shearon Harris	Scenario No.:	4	Op Test No.:	***2006 NRC***
Examiners:		Operators:			

Initial Conditions:

- IC-18, 100% power, BOL
- GP-006, Step 5.2.3 has been completed.

Turnover:

- Beginning at GP-006, Step 5.2.4, reduce power to ≤ 90% @ 4 DEH Units/minute to perform turbine valve testing this shift. The Load Dispatcher has been notified.

Event No.	Malf. No.	Event Type*	Event Description
1	N/A	N-BOP, SRO R-RO	Controlled power reduction.
2	DSG-5A XN24A03	TS-SRO	EDG "A" alarm.
3	PT:446	I-RO, SRO TS-SRO	Controlling Turbine 1st Stage Pressure Channel fails LOW.
4	GEN01	C-BOP, SRO	AUTO Main Generator Voltage Regulator failure.
5	CVC07	C-RO, SRO	Letdown pressure control valve fails CLOSED.
6	FT:474	I-BOP, SRO	Controlling SF channel on SG "A" fails LOW.
7	EPS01 DSG06B	M-ALL	Loss of Off-site power. EDG B breaker fails to close.
8	Z1974TDI Z1975TDI	C-BOP, SRO	TDAFW Pump fails to start automatically.
9	SGN05B	M-ALL	Progressive SGTR on SG "B" after Bus 1B recovery.

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

Shearon Harris 2006 NRC ES-D-1 SCENARIO 4 SUMMARY DESCRIPTION

The crew will assume the watch with the unit at 100% power and directions to lower power to perform turbine valve testing. Prior to entering the simulator the crew will hold a "pre-brief" on the power change to reduce planning/discussion time.

When the evaluation team is satisfied that the power change is under control, the Lead Evaluator can cue the EDG alarm. The crew will respond to alarms/indications but control room actions are minimal. A report from the field will indicate a control air problem. The SRO should enter the correct TS action statement.

After the EDG action statement has been entered the Lead Evaluator can cue failure of the main turbine first stage pressure transmitter. The crew should respond to uncontrolled rod motion and enter AOP-001, MALFUNCTION OF ROD CONTROL AND INDICATION SYSTEM. The RO should terminate rod motion by placing rod control in MANUAL as part of the immediate actions. The crew will work through the procedure, diagnose the failure and restore Tavg within the band. The SRO should enter the correct TS instrumentation action statement(s). The scenario may proceed with rod control in MANUAL and the channel not tripped.

On cue from the Lead Evaluator main generator voltage regulator will fail. The crew should respond to indications/alarms in accordance with APP-ALB-022. The BOP operator should attempt to control voltage with the voltage regulator in MANUAL but this will fail and the base adjuster must be used. The SRO should contact maintenance for troubleshooting assistance.

On cue from the Lead Evaluator the letdown pressure control valve will fail closed in AUTO. The crew should respond in accordance with letdown relief line alarm procedure APP-ALB-007, 3-1 and/or 3-5, take MANUAL control of letdown line pressure and ensure the relief valve re-seats.

On cue from the Lead Evaluator the controlling steam flow channel on SG "A" will fail low. The crew should respond to in accordance with SF/FF mismatch alarm procedure APP-ALB-14, 4-1B. The BOP should take MANUAL control of the associated feedwater regulating valve, raise flow and restore SG level to the desired band. The crew may also enter AOP-010, FEEDWATER MALFUNCTION. When SG level is within or trending to the control band, the Lead Evaluator can cue the loss off-site power. Coupled with failure of EDG "B" breaker to close and the inoperable EDG "A", a station blackout will result. The crew will enter PATH-1, confirm the reactor/turbine trip and transition to EPP-1, LOSS OF POWER TO 1A-SA AND 1B-SB BUSES. In the early stages of EPP-1 the crew must start the TDAFW Pump and close in EDG "B" breaker to energize the bus. If the crew does not close EDG "B" breaker then the Load Dispatcher will authorize restoration of off-site power to Bus 1B. After Bus 1B is energized, the crew will return to PATH-1 and a progressive SGTR on SG "B" will be initiated. The SGTR should be diagnosed in PATH-1 or EPP-9 and the crew will transition to PATH-2. The scenario can be terminated when SG "B" has been isolated.

See EXAMINER NOTE on page 27. Attach GUIDE-1 pages 21, 23, 25, 27, 29, 31, 33 to the back of this scenario guide for use by the evaluators in case the crew goes to EPP-009 before transitioning to PATH-2.

IC-18

Place synch switch key in "B" EDG selector

TD AFW auto start failure (initial condition)
imf z1974tdi (n 00:00:00 00:00:00) FAIL_ASIS
imf z1975tdi (n 00:00:00 00:00:00) FAIL_ASIS

#a EDG trip circuit failure (w/alarm)
imf dsg05a (1 00:00:00 00:00:00) true
ian xn24a03 (1 00:00:00 00:00:00) ALARM_ON
ian xn24b03 (1 00:00:00 00:00:00) ALARM_ON

Turbine 1st stage pressure channel failure
imf pt:446 (2 00:00:00 00:00:00) 0.0 00:00:10 –

Generator voltage regulator failure
imf gen01 (3 00:00:00 00:00:00) 110.0 00:01:00

CVCS letdown press control failure
imf cvc07 (4 00:00:00 00:00:00) 0.0 00:01:00 –

A SG controlling steam flow channel failure
imf ft:474 (5 00:00:00 00:00:00) 0.0 00:01:00

Loss of off-site power with B EDG output breaker (126) failure to close
imf eps01 (6 00:00:00 00:00:30) W/O_DELAY
imf dsg06b (6 00:00:00 00:00:00) true

SGTR in B SG
imf sgn05b (7 00:00:00 00:00:00) 420 00:02:00 0

Provisional trigger (if needed) to simulate local manual closure of B EDG output breaker (106)
irf dsg41 (9 00:00:00 00:00:00) CLOSE

Op Test No.: 1	Scenario # 4	Event # 1	Page 4 of 30
Event Description: Power Reduction			

Time	Position	Applicant's Actions or Behavior
Booth Operator Instructions:		
Indications Available:		
	SRO	GP-006, Step 5.2.4.
Note:		**When PRZ backup heaters are energized in manual, PK-444A1, PRZ Master Pressure Controller (a PI controller) will integrate up to a greater than normal output, opening PRZ Spray Valves to return and maintain RCS pressure at setpoint. The result is as follows:** • **PORV PCV-444B will open at a lower than expected pressure.** • **ALB-009-3-2, PRESSURIZER HIGH PRESS DEVIATION CONTROL, will activate at a lower than expected pressure.** • **Increased probability for exceeding Tech Spec DNB limit for RCS pressure.**
	RO	ENERGIZE all available Pressurizer Backup Heaters.
Procedure Note:		**Routine load changes should be coordinated with the Load Dispatcher to meet system load demands.**
	SRO	INFORMS Load Dispatcher that a load reduction to 90% will begin. (N/A, per Initial Conditions)

Op Test No.: 1	Scenario # 4	Event # 1	Page 5 of 30
Event Description: Power Reduction			

Time	Position	Applicant's Actions or Behavior
Procedure Caution:		**A failure of the Vidar in the DEH computer has resulted in a plant trip in the past. This failure would affect operation in Operator Auto, and can be detected in either of the following ways:** • **If OSI-PI is available, the process book PLANTSTATUS.PIW, DEH Trends function of the Plant Process Computer: DEH (menu) contains a point for DEH MEGAWATTS. With a failure of the Vidar, this point will not be updating.** • **If OSI-PI is NOT available, accessing the ANALOG INPUTS screen on the Graphics display computer (in the Termination Cabinet room near the ATWS panel) will show several points, most of which should be updating if the Vidar is functioning properly.**
	SRO	DIRECTS BOP to start power reduction and specifies a rate. May direct initiation of a boration before the power reduction begins.
	BOP	DEPRESS the LOAD RATE MW/MIN push-button.
	BOP	ENTER the desired rate, **NOT** to exceed 5 MW/MIN, in the DEMAND display.
	BOP	DEPRESS the ENTER push-button.
	BOP	DEPRESS the REF push-button.
	BOP	ENTER the desired load (120 MW if shutting down) in the DEMAND display.
	BOP	DEPRESS the ENTER push-button. The HOLD push-button should illuminate.

Op Test No.: 1	Scenario # 4	Event # 1	Page 6 of 30
Event Description:	Power Reduction		

Time	Position	Applicant's Actions or Behavior
Procedure Note:		**The unloading of the unit can be stopped at any time by depressing the HOLD push-button. The HOLD lamp will illuminate and the GO lamp will extinguish. The load reduction can be resumed by depressing the GO push-button. The HOLD lamp will extinguish and the GO lamp will illuminate.**
	BOP	DEPRESS the GO push-button to start the load reduction.
	BOP	VERIFY the number in the REFERENCE display decreases.
	BOP	VERIFY Generator load is decreasing.
	BOP	WHEN Turbine load is less than 95%, THEN VERIFY the 3A and 3B Feedwater Vents have been opened per OP-136, Section 7.2.
Simulator Operator:		**Acknowledge direction. No simulator response actions are required.**
	RO	MONITORS primary systems response.
	RO	INITIATES boration, as necessary (with SRO concurrence).
Note:		**OP-107 is a "Reference Use" procedure.**
	RO	DETERMINE the reactor coolant boron concentration from chemistry OR the Main Control Room status board.
	RO	DETERMINE the magnitude of boron concentration increase required.

Op Test No.: 1	Scenario # 4	Event # 1	Page 7 of 30
Event Description: Power Reduction			

Time	Position	Applicant's Actions or Behavior
	RO	DETERMINE the volume of boric acid to be added using the reactivity plan associated with the IC.
Note:		**FIS-113, BORIC ACID BATCH COUNTER, has a tenths position.**
Procedure Caution:		**If the translucent covers associated with the Boric Acid and Total Makeup Batch counters FIS-113 and FIS-114, located on the MCB, are not closed, the system will not automatically stop at the preset value.**
	RO	SET FIS-113, BORIC ACID BATCH COUNTER, to obtain the desired quantity.
Note:		**Boration of the RCS will be dependent on charging and letdown flow rate. Placing additional letdown orifices in service will increase the boric acid delivery rate to the RCS.**
	RO	SET controller 1CS-283, FK-113 BORIC ACID FLOW, for the desired flow rate.
	RO	VERIFY the RMW CONTROL switch has been placed in the STOP position.
	RO	VERIFY the RMW CONTROL switch green light is lit.
	RO	PLACE control switch RMW MODE SELECTOR to the BOR position.

Op Test No.: 1	Scenario # 4	Event # 1	Page 8 of 30
Event Description:	Power Reduction		

Time	Position	Applicant's Actions or Behavior
Procedure Note:		**When PRZ backup heaters are energized in manual, PK 444A1, PRZ Master Pressure Controller (a PI controller) will integrate up to a greater than normal output, opening PRZ Spray Valves to return and maintain RCS pressure at setpoint. The result is as follows:** • **PORV PCV-444B will open at a lower than expected pressure** • **ALB-009-3-2, PRESSURIZER HIGH PRESS DEVIATION CONTROL, will activate at a lower than expected pressure** • **Increased probability for exceeding Tech Spec DNB limit for RCS pressure**
	RO	OPERATE the pressurizer backup heaters as required to limit the difference between the pressurizer and RCS boron concentration to less than 10 ppm.
	SRO/RO	FOR large boron changes, PERFORM the following:
		• DIRECT Chemistry to sample the RCS for boron concentration.
		• MAKE boron concentration adjustments as dictated from sample results.
Procedure Note:		**Boration may be manually stopped at any time by turning control switch RMW CONTROL to STOP.**
	RO	START the makeup system as follows:
		• TURN control switch RMW CONTROL to START momentarily.
		• VERIFY the RED indicator light is LIT.
Procedure Caution:		**The operation should be stopped if an unanticipated reactivity effect is seen. Do not resume the operation until the cause has been corrected.**

Op Test No.: 1 Scenario # 4 Event # 1 Page 9 of 30

Event Description: Power Reduction

Time	Position	Applicant's Actions or Behavior
	RO	VERIFY Tavg responds as desired.
	RO	IF rod control is in AUTO, THEN VERIFY the control rods are stepping out to the desired height.
	RO	VERIFY boration automatically terminates when the desired quantity of boron has been added.
	RO	PLACE Reactor Makeup in Auto per Section 5.1.
		VERIFY the RMW CONTROL switch:
		• Is in the STOP position.
		• The GREEN light is LIT.
		PLACE the RMW MODE SELECTOR to AUTO.
		START the makeup system as follows:
		• TURN control switch RMW CONTROL to START momentarily.
		• VERIFY the RED indicator light is LIT.
Evaluator's Note:		**The Lead Evaluator can cue initiation of Event 2 (EDG "A" alarm) whenever the evaluating team members have completed their evaluations of Event 1.**

Op Test No.: 1	Scenario # 4	Event # 2	Page 10 of 30
Event Description:	EDG "A" Trip Alarm		

Time	Position	Applicant's Actions or Behavior
Booth Operator Instructions: Trigger 1		
Indications Available:		
	BOP	RESPONDS to alarms ALB-024-3-1 and 3-2.
	SRO	ENTERS and directs actions of APP-ALB-024-3-1 and/or 3-2.
Note:		**Both alarm response procedures dispatch an AO to the local panel.**
	SRO	DISPATCHES an AO to the local panel.
Simulator Operator's Note:		**As AO, report 86DG Lockout Relay actuated and local alarm G-1, Loss of Both GEN POT CKS Trip, is actuated. Request Maintenance assistance.**
	SRO	REFERS to OWP-DG.
	SRO	May direct an Outside Operator to place EDG "A" in the LOCAL-MAINTENANCE mode per OP-155, Section 8.17.
Simulator Operator:		**If directed to place EDG "A" in the LOCAL-MAINTENANCE mode, use remote functions:** • **irf dsg005 LOCAL** • **rf dsg006 MAINTAIN**
	SRO	ENTERS TS 3.8.1.1.b; Action b
Evaluator's Note:		**EDG "A" will remain unavailable for the remainder of the scenario. The Lead Evaluator can cue Event 3 (First Stage Pressure Fails LOW) after the EDG TS is identified.**

Op Test No.: 1	Scenario # 4	Event # 3	Page 11 of 30
Event Description:	Turbine 1st Stage Pressure Fails LOW (PT-446)		

Time	Position	Applicant's Actions or Behavior
Booth Operator Instructions: Trigger 2		
Indications Available:		
	RO	RESPONDS to uncontrolled rod motion.
	SRO	ENTERS and directs actions of AOP-001.
	RO	PERFORM immediate actions.
Immediate Actions	RO	CHECK that LESS THAN TWO control rods are dropped. (YES)
Immediate Actions	RO	POSITION Rod Bank Selector Switch to MAN.
Immediate Actions	RO	CHECK Control Bank motion STOPPED. (YES)
	SRO	READS immediate actions then proceeds to Section 3.2.
	RO	CHECK that instrument channel failure has NOT OCCURRED by observing the following: (NO)
		• TURBINE first stage pressure.
	RO	PERFORM the following:
		• IF a power supply is lost, THEN GO TO AOP-024, Loss of Uninterruptible Power Supply. (NO)
		• IF an individual instrument failed, THEN MAINTAIN manual rod control until corrective action is complete. (YES-Turbine 1st Stage Pressure)
		• IF a Power Range NI Channel failed. (NO)

Op Test No.: 1 Scenario # 4 Event # 3 Page 12 of 30

Event Description: Turbine 1st Stage Pressure Fails LOW (PT-446)

Time	Position	Applicant's Actions or Behavior
	RO	MANUALLY OPERATE affected control bank to restore the following:
		• EQUILIBRIUM power and temperature conditions.
		• RODS above the insertion limits of Tech Spec 3.1.3.6 and PLP-106, Technical Specification Equipment List Program and Core Operating Limits Report.
	RO	VERIFY proper operation of the following:
		• CVCS demineralizers (YES)
		• BTRS (N/A)
		• Reactor Makeup Control System (YES)
	SRO	CHECK that this section was entered due to control banks MOVING OUT. (NO)
		GO TO Step 6.
	RO	CHECK that NEITHER of the following OCCURRED: (YES)
		• UNEXPLAINED RCS boration
		• UNPLANNED RCS dilution
	RO	CHECK that an automatic Rod Control malfunction OCCURRED. (NO)
	RO	MAINTAIN manual rod control until appropriate corrective action is complete.
	SRO	EXIT this procedure.
	SRO	REFERS to OWP-RP-11. May direct one of the Operators to perform MCB actions.

Op Test No.: 1	Scenario # 4	Event # 3	Page 13 of 30
Event Description:	Turbine 1st Stage Pressure Fails LOW (PT-446)		

Time	Position	Applicant's Actions or Behavior
Evaluator's Note:		**Ensure OWP-RP-11 MCB actions are completed before moving to the next event. Completion of maintenance actions are not required.**
	BOP	Places Steam Dump Mode Selector in STM Press.
	RO	SELECTS 1st Stage Pressure Control Switch to 447 position.
Evaluator Note:		**Rod Control can be returned to AUTO after PT-447 is selected but there is no procedural step.**
	BOP	PLACES SG LVL ATWS PANEL BYPASS Switch to BYPASS.
	SRO	REQUEST Maintenance assistance to troubleshoot PT-446 and to complete OWP-RP-11 actions.
	SRO	ENTERS TS 3.3.1; Action 7 (Turbine Impulse Pressure P-13).
Evaluator's Note:		**The Lead Evaluator can cue Event 4 (Main Generator Voltage Regulator Failure) after the OWP-RP-11 MCB actions are complete and the TS has been entered.**

Op Test No.: 1 Scenario # 4 Event # 4 Page 14 of 30

Event Description: Main Generator Voltage Regulator Failure

Time	Position	Applicant's Actions or Behavior
Booth Operator Instructions: Trigger 3		
Indications Available:		
	RO	RESPONDS to alarms ALB-022-4-3 and 9-4.
	SRO	ENTERS and directs actions of APP-ALB-022-4-3.
Evaluator's Note:		**Alarm ALB-022-9-4 is a computer alarm. ALB-022-4-3 will initiate corrective actions.**
	BOP	CONFIRM alarm using:
		• AT MCB:
		• EI-525, Generator Frequency.
		• EI-520, Generator Phase Volts. (YES-Reports voltage regulation problem)
		• EI-540, Gen Exciter Field Volts.
		• EI-541, Gen Exciter Field Current.
		• AT Gen Protective Relay Panel 1B, Gen Over Excitation Prot Backup Protection relay status flag:
		• AT Gen Protective Relay Panel 1B, Gen Over Excitation Prot Backup Protection relay status flag.
	BOP	VERIFY Automatic Functions:
		• VOLTAGE Regulator Limiter decreases Generator excitation.
		• IF Voltage Limiter is unable to control excitation increase, a Generator Lockout occurs.
	BOP	PERFORM Corrective Actions:
		• CHECK for the following at MCB:
		• EI-525, Generator Frequency, stable at 60 Hz. (YES)

Op Test No.: 1 Scenario # 4 Event # 4 Page 15 of 30

Event Description: Main Generator Voltage Regulator Failure

Time	Position	Applicant's Actions or Behavior
		• EI-520, Generator Phase Volts, stable at 22 KV. (NO)
		• EI-540, Gen Exciter Field Volts stable. (YES)
		• EI-541, Gen Exciter Field Current stable. (YES)
Note:		**An automatic transfer to manual Generator voltage control is indicated by GENERATOR VOLTAGE REGULATOR switch ON and the GREEN light LIT. Both the AMBER light and RED light will be OFF.**
		• OPERATE GENERATOR VOLTAGE ADJUSTER switch to restore Generator voltage to 22 KV and reduce MVARS.
		• IF GENERATOR VOLTAGE ADJUSTER switch is ineffective THEN PERFORM the following to transfer and maintain voltage manually:
		• OPERATE the GENERATOR VOLTAGE ADJUSTER to attempt to zero the REGULATOR OUTPUT BAL VOLT meter.
		• PLACE GENERATOR VOLTAGE REGULATOR switch in the TEST position and observe AMBER light LIT and RED light OFF.
		• OPERATE GENERATOR BASE ADJUSTER switch to restore Generator voltage to 22 KV.
	SRO	• REFERENCE AOP-028, Grid Instability. (N/A – the problem is not on the grid)
	BOP	• VERIFY Main Generator is operating per the Generator Capability Curve.
Evaluator's Note:		**When Main Gen Voltage is under control, cue Event 5 (Letdown Pressure Control Valve Fails Closed).**

Op Test No.: 1	Scenario # 4	Event # 5	Page 16 of 30
Event Description:	Letdown Pressure Control Valve Fails CLOSED (1CS-38/PCV-145)		

Time	Position	Applicant's Actions or Behavior
Booth Operator Instructions: Trigger 4		
Indications Available:		
	RO	RESPONDS to alarm ALB-007-3-5.
	SRO	ENTERS and directs actions of APP-ALP-007-3-5.
	RO	CONFIRM alarm using PI-145, LP Ltdn Press. Report 1CS-38 CLOSED.
	RO	VERIFY Automatic Functions: (None)
	RO	PERFORM Corrective Actions:
		• IF necessary to lower letdown pressure, THEN: (YES – the crew may isolate letdown as an initial response)
		• REFER to OP-107, Chemical and Volume control System.
		• REMOVE or change in-service letdown orifices.
		• TAKE manual control of PK-145.1, Ltdn Pressure, AND ADJUST 1CS-38 to lower letdown pressure.
	SRO	Contact Work Control for assistance.
Evaluator's Note:		**When letdown pressure is being controlled or letdown is isolated, cue Event 6 (SG "A" SF Channel Fails LO).**

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Event Description: SG "A" SF Channel Fails LO (FT-474)

Time	Position	Applicant's Actions or Behavior
Booth Operator Instructions: Trigger 5		
Indications Available:		
	BOP	RESPONDS to alarms ALB-014-4-1A and 1-1B.
	SRO	ENTERS and directs actions of ALB-014-4-1A and/or 1-1B.
Note:		**Both procedures accomplish the same action; MANUAL control of the associated FRV.**
	BOP	CONFIRM alarm using:
		• FI-476, FI-477, SG A Feed Flow.
		• FI-474, FI-475, SG A Steam Flow. (Reports FI-474 failed)
		• LI-474 SA, LI-475 S, LI-476 SA, Steam Generator A Narrow Range level indicators.
	BOP	VERIFY Automatic Functions. (None)
	BOP	PERFORM Corrective Actions:
		• IF FW-133, Feedwater Reg Valve, is NOT controlling SG level, THEN MANUALLY CONTROL FK-478 AND REDUCE feed flow.
Note:		**The SRO may enter AOP-010 based on the flow transient. If so, the outcome will be the same – the associated FRV in MANUAL.**
	SRO	REFERS to OWP-RP-08.

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Event Description:	SG "A" SF Channel Fails LO (FT-474)		

Time	Position	Applicant's Actions or Behavior
Evaluator's Note:		**It is NOT necessary to have the channel removed from service or to complete the TS evaluation to continue the scenario.** **When SG "A" level is in the desired band or trending to it, the Lead Evaluator can cue Event 7 (Loss of Off-site Power).**
	SRO	TS 3.3.1 Action 6 for SF/FF mismatch is applicable.

Op Test No.: 1	Scenario # 4	Event # 7, 8, 9	Page 19 of 30
Event Description:	Loss of All AC Power / TDAFWP Fails to AUTO Start Automatically/ SGTR		

Time	Position	Applicant's Actions or Behavior
Booth Operator Instructions: Trigger 6 for LOSP (& EDG B bkr 126 fail to close)		
Indications Available:		
	RO	RESPONDS to reactor trip.
	RO	PERFORM immediate actions of PATH-1.
	RO	VERIFY Reactor Trip:
		AUTO or MANUAL Reactor Trip successful:
		CHECK for any of the following:
		• TRIP breakers RTA and BYA OPEN (YES)
		• TRIP breakers RTB and BYB OPEN (YES)
		ROD Bottom lights LIT (NO - No power)
		NEUTRON flux decreasing (YES)
	RO	VERIFY Turbine Trip:
		CHECK for any of the following:
		• ALL turbine throttle valves – SHUT (YES)
		• ALL turbine governor valves – SHUT (YES)
	RO	VERIFY power to AC Emergency Buses
		1A-SA and 1B-SB Buses energized by off-site power or EDG's (NO)
		1A-SA or 1B-SB energized (NO)
	SRO	ENTERS EPP-001.
	RO	VERIFY Reactor Trip (YES)
	RO	VERIFY Turbine Trip (YES)

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Event Description: Loss of All AC Power / TDAFWP Fails to AUTO Start Automatically/ SGTR

Time	Position	Applicant's Actions or Behavior
	RO	CHECK if RCS isolated:
		• CHECK PRZ PORVs – SHUT. (YES)
		• CLOSE letdown isolation valves.
		• 1CS-7, 1CS-8, 1CS-9
		• 1CS-1 (LCV-459)
		• 1CS-2 (LCV-460)
		• VERIFY excess letdown valves – SHUT. (YES)
		• 1CS-460
		• 1CS-461
	BOP	VERIFY AFW Flow and Control SG Levels:
		• VERIFY AFW Flow – GREATER THAN 210 KPPH. (NO)
		PERFORM the following:
Critical Task		• **STARTS TDAFW pump.**
		• ADJUST TDAFW pump speed controller as necessary to increase flow.
		• VERIFY TDAFW pump discharge pressure – GREATER THAN SG PRESSURE.
		• VERIFY AFW valves – PROPERLY ALIGNED.
	BOP	• ANY level – GREATER THAN 25% [40%]. (NO)
		• Maintain 210 KPPH until >25% in ≥1 SG.
	SRO	EVALUATE EAL Network using Entry Point X.

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Event Description: Loss of All AC Power / TDAFWP Fails to AUTO Start Automatically/ SGTR

Time	Position	Applicant's Actions or Behavior
	BOP	ENERGIZE AC Emergency Buses using EDGs:
		• CHECK EDGS 1A and 1B– AVAILABLE
		• EDG emergency trips CLEAR (NOT PRESENT). (1A-NO, 1B-YES)
		• EDG output breakers – NORMAL (NOT TRIPPED). (YES)
	SRO	DO NOT start EDG or close output breaker until problem corrected.
		EMERGENCY stop any running EDG with tripped output breaker. (1B Running – breaker not tripped.)
		IF NO EDG available, THEN GO TO Step 7.
	BOP	• CHECK any EDG – RUNNING. (YES)
	SRO	• GO TO Step 6e.
	BOP	• CHECK any AC emergency bus – ENERGIZED:
		• 1A-SA bus voltage (NO)
		• 1B-SB bus voltage (NO)
		Simulator Operator Note: If AO is contacted for local closure of B EDG output breaker 106 in the following step, perform promptly using Trigger 9.
	BOP	PERFORM the following:
		• MANUALLY close the output breaker of the running EDG at MCB OR locally perform at switchgear:
		• EDG B: Breaker 126

Op Test No.: 1	Scenario # 4	Event # 7, 8, 9	Page 22 of 30
Event Description:	Loss of All AC Power / TDAFWP Fails to AUTO Start Automatically/ SGTR		

Time	Position	Applicant's Actions or Behavior
Evaluator's Notes:		**The synch. switch must be turned on to close the breaker from the MCB even though the bus is not being paralleled.** **Re-energizing 1B-SB Bus from B EDG or off-site power and starting MDAFW Pump B is critical if the TDAFW Pump has NOT been started.**
	SRO	• GO TO Step 6h.
		Simulator Operator's Note: If the Load Dispatcher is contacted regarding the status of off-site power, respond that a fault on "A" SUT has been isolated. Authorize re-energizing "B" SUT only from off-site power.
	BOP	CHECK any AC emergency bus – ENERGIZED:
		• 1A-SA bus voltage (NO)
		• 1B-SB bus voltage (YES) **Evaluator Note: If the answer to 1B-SB energized is NO then EPP-1 will direct the crew to restore off-site power using Attachment 1.**
	SRO	IMPLEMENT Function Restoration Procedures as required.
	SRO	Transitions to PATH-1, Step 4.
Simulator Operator's Note:		**Insert Event 9, IMF SGN05B, using Trigger 7 at the transition back to PATH-1.**

Op Test No.: 1 Scenario # 4 Event # 7, 8, 9 Page 23 of 30

Event Description: Loss of All AC Power / TDAFWP Fails to AUTO Start Automatically/ SGTR

Time	Position	Applicant's Actions or Behavior
	RO	CHECK SI Actuation:
		Check for any of the following – LIT: (NO)
		• SI Actuated bypass permissive light
		• ALB-11-2-2
		• ALB-11-5-1
		• ALB-11-5-3
		• ALB-12-1-4
	RO	CHECK SI actuation criteria by observing any of the following:
		• CNMT pressure – GREATER THAN 3.0 PSIG (NO)
		• PRZ pressure – LESS THAN 1850 PSIG (NO)
		• STEAM pressure – LESS THAN 601 PSIG (NO)
	RO	SI actuation – REQUIRED (NO)
	SRO	TRANSITIONS to EPP-004.
Evaluator's Note:		**The Crew should recognize the SGTR while performing EPP-4. Accordingly, a MANUAL or AUTO SI will occur. When it does, the SRO should return to PATH-1, Entry Point A, in accordance with the EPP-4 Foldout Criteria.**
	SRO	IMPLEMENT Function Restoration Procedures as required.
	SRO	EVALUATE EAL Network using Entry Point X.

Op Test No.: 1 Scenario # 4 Event # 7, 8, 9 Page 24 of 30

Event Description: Loss of All AC Power / TDAFWP Fails to AUTO Start Automatically/ SGTR

Time	Position	Applicant's Actions or Behavior
	BOP	CHECK RCS Temperature:
		• CHECK SG Blowdown isolation valves – SHUT. (YES)

SG	(MLB-1A-SA)	(MLB-1B-SB)
A	1BD-11	1BD-1
B	1BD-30	1BD-20
C	1BD-49	1BD-39

	BOP	• STABILIZE and maintain temperature between 555°F and 559°F using Table 1.

Evaluator Note: Steam Dump is already in the STM PRESS Mode.

TABLE 1: RCS TEMPERATURE CONTROL GUIDELINES FOLLOWING RX TRIP

- Guidance is applicable until another procedure directs otherwise.
- IF no RCPs running, THEN use wide range cold leg temperature.

	RCS TEMPERATURE TREND		
	LESS THAN 557°F AND DECREASING	GREATER THAN 557°F AND INCREASING	STABLE AT OR TRENDING TO 557°F
OPERATOR ACTION	• Stop dumping steam • Control feed flow • Maintain total feed flow greater than 210 KPPH until level greater than 25% at least one intact SG • IF cooldown continues, THEN, shut MSIVs and Bypass valves	• IF condenser available THEN transfer steam dump to STEAM PRESSURE mode using OP-126, Section 5.3 AND dump steam to condenser OR • Dump steam using intact SG PORVs • Control feed flow to maintain SG levels	• Control feed flow and steam dump to establish and maintain RCS temperature between 555°F and 559°F

Op Test No.: 1 Scenario # 4 Event # 7, 8, 9 Page 25 of 30

Event Description: Loss of All AC Power / TDAFWP Fails to AUTO Start Automatically/ SGTR

Time	Position	Applicant's Actions or Behavior
	RO	CHECK RCP Status:
		• CHECK RCPs – AT LEAST ONE RUNNING. (NO)
	BOP	CHECK Feed System Status:
		• RCS Temperature – LESS THAN 564°F. (YES/NO)
		• VERIFY feed reg valves – SHUT. (YES)
		• CHECK feed flow to SGs – GREATER THAN 210 KPPH. (YES)
	RO	CHECK Control Rod Status:
		• CHECK DRPI – AVAILABLE. (NO – No power)
		• VERIFY all control rods – FULLY INSERTED. (YES)
	RO	CHECK PRZ Level – GREATER THAN 17%. (YES/NO)
Note:		**By this point the SGTR should be evident. While not required, they should initiate a MANUAL SI and return to PATH-1, Entry Point A.**
	SRO	TRANSITIONS to PATH-1, Entry Point A.
	SRO	FOLDOUT A applies.
Note:		**Crew may brief on foldout criteria.**
	RO	VERIFY ALL CSIPs AND RHR pumps – RUNNING. (NO-"A" Bus has no power)
	RO	CHECK SI Flow:
		• SI flow – GREATER THAN 200 GPM. (YES)

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Event Description: Loss of All AC Power / TDAFWP Fails to AUTO Start Automatically/ SGTR

Time	Position	Applicant's Actions or Behavior
	RO	RCS pressure – GREATER THAN 230 PSIG. (YES)
	BOP	CHECK Main Steam Isolation:
		• MAIN steam isolation – ACTUATED. (NO)
	BOP	MAIN steam isolation – REQUIRED (NO)
		• STEAM line pressure – LESS THAN 601 PSIG.
		• CNMT pressure – GREATER THAN 3.0 PSIG.
		• MANUAL closure of all MSIVs AND bypass valves is desired.
	RO	CHECK CNMT Pressure – HAS REMAINED LESS THAN 10 PSIG. (YES)
	BOP	CHECK AFW Status:
		• AFW flow – AT LEAST 210 KPPH AVAILABLE. (YES)
	SRO	ASSIGNS crew member to perform the following:
		• VERIFY alignment of components from actuation of ESFAS Signals using Attachment 6, "Safeguards Actuation Verification", while continuing with implementation of EOPs.
Evaluator Note:		**All equipment will be properly aligned except for that powered from Bus 1A-SA.**
	BOP	CONTROL RCS Temperature:
		• STABILIZE AND maintain temperature between 555°F AND 559°F using Table 1.
Evaluator Note:		**This was already initiated in EPP-4.**

Op Test No.: 1 Scenario # 4 Event # 7, 8, 9 Page 27 of 30

Event Description: Loss of All AC Power / TDAFWP Fails to AUTO Start Automatically/ SGTR

Time	Position	Applicant's Actions or Behavior
	BOP	VERIFY AC buses 1A1 AND 1B1 – ENERGIZED. (Only 1B1 can be energized)
	RO	CHECK PRZ PORVs – SHUT. (YES)
	RO	AT least one PRZ PORV Block Valve OPEN. (YES)
	RO	PRZ spray valves – SHUT. (YES)
	BOP	IDENTIFY any faulted SG:
		• CHECK for any of the following:
		• ANY SG pressures – DECREASING IN AN UNCONTROLLED MANNER (NO)
		• ANY SG – COMPLETELY DEPRESSURIZED. (NO)
	SRO	CHECK Secondary Radiation: (N/A – No power)
		EXAMINER NOTE: Although the uncontrolled SG level change indication of a SGTR is present, no power is available to the radiation monitors. The SRO may elect to transition to PATH-2 at this point based on the uncontrolled level rise in SG "B" (consistent with guidance in EOP-REDIAGNOSIS). However, if "check secondary radiation normal" is answered YES (because power is not available) and EOP-REDIAGNOSIS is not applied, the crew will continue to EPP-009 and then go to PATH-2 on FOLDOUT criteria. If that is the case, PATH-1 steps from "check secondary radiation" to the EPP-009 transition have been attached to the back of this scenario guide for evaluator use.
	SRO	RUPTURED SG – IDENTIFIED. (YES-SG B)
	BOP	RUPTURED SG level – GREATER THAN 25% (YES)

Op Test No.: 1 Scenario # 4 Event # 7, 8, 9 Page 28 of 30

Event Description: Loss of All AC Power / TDAFWP Fails to AUTO Start Automatically/ SGTR

Time	Position	Applicant's Actions or Behavior
Critical Task	BOP	**STOP feed flow by shutting the MDAFW (1AF-93) AND TDAFW (1AF-143) isolation valves to SG "B".**
	SRO	TRANSITIONS to PATH-2, J.
	SRO	FOLDOUT C applies.
Note:		**Crew may brief on the foldout criteria at this time.**
	SRO	EVALUATE EAL Network using Entry Point U.
	SRO	IMPLEMENT Function Restoration Procedures as required.
	RO	CHECK RCP Trip Criteria: (RCP's tripped on loss of off-site power)
		• ANY RCP – RUNNING. (NO)
		IDENTIFY any Ruptured SG:
		• CHECK for any of the following:
		• SG level – INCREASING IN AN UNCONTROLLED MANNER. (YES – SG "B")
Caution:		• **At least one SG must be maintained available for RCS cooldown.** • **If the TDAFW pump is the only available source of feed flow, one steam supply valve from an intact SG must be maintained opened.**

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Event Description: Loss of All AC Power / TDAFWP Fails to AUTO Start Automatically/ SGTR

Time	Position	Applicant's Actions or Behavior
Critical Task		ISOLATE Flow from Ruptured SG:
		• **ADJUST ruptured SG PORV controller setpoint to 88% (1145 PSIG) and place in AUTO.**
		• CHECK ruptured SG PORV – SHUT.
		• **SHUT ruptured SG steam supply valve to TDAFW pump:**
		• **SG B: 1MS-70**
		• VERIFY Blowdown isolation valves from ruptured SG – SHUT.
		• SHUT ruptured SG main steam drain isolation before MSIV:
		• SG B: 1MS-266
		• **SHUT ruptured SG MSIV and bypass valve.**
		TERMINATE SCENARIO after SG Isolation block of steps if SG "B" has been isolated. Otherwise, continue to the RCS cooldown initiation to allow the crew the opportunity to recover the error.

CRITICAL TASK SUMMARY

- Energize Bus 1B-SB prior to transitioning out of EPP-001.
- Isolate SG "B" prior to initiating the RCS cooldown.
- Stop AFW flow to SG "B" prior to exceeding 95% NR level.