KEWAUNEE

May 2001

PROPOSED
Scenarios

Simulation Facility Kewaunee | Scenario No.: 1

Examiners: _____ | Applicant: _____ SRO

_____ | _____ RO

_____ | _____ BOP

Initial Conditions: IC-14: 83% power, end of cycle (EOC).

Turnover: The plant is at 83% power. Backdown is underway with plant going to COLD SHUTDOWN conditions for refueling. Directions are to go to 40% power to support Reactor Engineering testing (RXT 8). Currently performing steps 4.3.5, 6 and 7 of N-0-03.
Directions are to continue the plant backdown at 0.5 %/ min.
Diesel Generator "A" has been tested 4 hours ago (Following SW Pump B2 failure)
All ESF features for Train A have been verified OPERABLE
Equipment Out of Service: RHR Pump "B"
Internal Containment Spray Pump "B"
Service Water Pump "B2"

Event No.	Malf. No.	Event Type*	Event Description
Preload	RD11		Failure of Reactor Trip Breakers to open (can be opened locally)
Preload	CC04B		CC Pump "B" fails to auto start
Preload	RH04A		RHR Pump "A" fails to auto start
1	—	N BOP SRO	Decrease turbine load at 0.5%/min. When < 50% (< 60%) power, Stop FW Pump, Cond Pump & align condensate to condenser for Mode II
		R RO	Decrease reactor power using rods and/or boration
2	SO3–3, 4.47E6 (RX215)	I BOP SRO	FI-464, S/G A controlling steam flow channel fails high
3	S02 – 9, 21% (RX206)	I RO SRO	Controlling Przr level channel (LT-428) fails to No-Load value
4	CC05A, 95% (CC04C)	C RO SRO	Running Component Cooling Water Pump "A" trips & Pump "B" fails to auto start
5	MS02A, 20%	M RO BOP SRO	Main Steamline Break inside containment on the "A" Header (~ 350,000 lbm/hr)
6	(RD11)	M RO BOP SRO	Reactor Trip Breakers Fail to open on trip signal
7	(RH04A)	C RO SRO	RHR Pump "A" fails to auto start
8	RC05, 100%	M BOP RO SRO	Przr steam space LOCA (~500,000 lbm/hr)

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

SCENARIO 1

NOTES TO SIMULATOR OPERATOR:

1. PULL-OUT Service Water Pump B2 HS, 46527 and TAG

2. PULL-OUT RHR Pump B HS, 46304 and TAG

3. PULL-OUT ICS Pump B HS, 46306 and TAG

4. Event 2, trip bistable when directed with following Remote Functions:

   - RP5 (RP177) 464A Hi S.A.L.
   - RP5 (RP178) 464B Hi/Hi S.A.L.
   - RP6 (RP182) 466C FWF < SF
   - RP6 (RP181) 466B FWF > SF

5. Event 3, trip bistable when directed with following Remote Functions:

   - RP4-9 (RP155) 428A HIGH LEVEL TRIP

6. In Event 4, when asked the AO reports the CC pump tripped on overcurrent and the motor casing is very hot.

7. For Event 6 when directed by the Control Room to manually trip the trip breakers and open the MG Drive breakers, after approximately ONE minute:

   - Remove MALF RD11
   - Toggle REMOTE FUNCTION RD2 - 2 (RD102) MG Set 1A STOP
   - Toggle REMOTE FUNCTION RD2 - 3 (RD103) MG Set 1B STOP

8. Event 8 should occur within two minutes following closure of MSIV MS-1A.

9. In Event 8 (E-1 step 17.c) if contacted as Technical Support Staff concerning implementation of E-MDS-30, report it will not be implemented at this time but evaluation of conditions will continue and you will notify Control Room if situation changes.

SCENARIO 1 OVERVIEW

Event 1 - The plant is at 83% power, end of cycle. Plant backdown is in progress for refueling. Operations Management has directed a backdown rate of 0.5%/min. to 40% power to support Reactor Engineering testing (RXT 8). Currently performing steps 4.3.5, 6 and 7 of N-0-03. When directed, the BOP operator will remove from service a Feedwater Pump (N-FW-05A), a Condensate Pump (N-CD-03), and condensate will be aligned to North end of condenser for Mode II (N-BT-07A). He may also direct placing of the Heating Boiler in operation (N-HS-22).

Event 2 – After the load reduction is started, S/G A steam flow channel (controlling channel for Main Feedwater Control Valve FW-7A), FT-464, will fail high. This results in an indicated steam flow - feedwater flow mismatch, and a demanded opening of FW-7A causing S/G level to increase. The operator responds to annunciator 47061-B SG A SF > FF alarm. The operator is expected to recognize this condition, take manual control of the FW-7A and adjust it to restore S/G A level to normal. The actions of A-MI-87 are implemented for the failed S/G steam flow channel, including selection of the alternate steam flow channel (FT-465) for control. Once S/G levels are stabilized, FW-7A controller may be restored to AUTO per procedure A-FW-05A. The SRO should review Technical Specification 3.5 for actions associated with the failed steam flow channel.

Event 3 – After Steam Generator levels are stabilized and when actions are complete for responding to S/G A steam flow channel failure, the controlling Przr level channel fails to its no-load value of 21. The operators will respond to Computer alarm LO428A for level deviation and determine the failure of LT-428. The operators should also note the increase in Przr level and increase in the controlled Charging Pump speed indication. If Przr level program increases above 31% [~558°F] (as Tavg increase with load), then annunciator 47043-E PRESSURIZER LEVEL DEVIATION will alarm. The operators will select the alternate channel for control (Position 2-1) and recorder (Position 1) and remove LT-428 (Channel 3) from service as directed by procedure A-MI-87. The SRO will address TS 3.5 for actions for the failed Przr level instrument.

Event 4 - When actions are complete for responding to the Przr level channel failure, the running CCW Pump ("A") trips. CCW Pump "B" should auto start on low CCW header pressure but will fail to do so, requiring the operator to manually start the pump. (NOTE: The operator may manually start the pump prior to the automatic start by standard practice.) Normal CCW cooling should be verified once the pump is started. The SRO should review Technical Specification 3.3.d for applicability to the tripped CCW Pump and order a plant shutdown. If failure of the auto start of CCW Pump B is noted, I&C should be notified to investigate cause.

Events 5, 6, 7 & 8 – After the plant shutdown is started, a main steamline break of ~ 350,000 lbm/hr occurs on the S/G A steam header inside containment. Containment humidity, temperature and pressure will rise. An automatic actuation of Safety Injection will occur due to Low Steam Line Pressure. The operators will recognize the failure of the reactor to trip, enter E-0 and transfer to FR-S.1 from E-0 step 1 contingency. The operators will perform the immediate actions of FR-S.1. The operators will open the feeder breakers to the buses supplying the Rod Drive MG Sets (Bus 33 & 43) and direct the local operators to open the Rod Drive MG Sets Breakers and the reactor trip breakers. Transition to E-0 will occur at step 5.d. Steam flow will remain higher than expected for S/G A, resulting in closure of MSIV MS-1A. The RO will determine RHR Pump "A" failed to auto start and will manually start the pump when directed (and allowed by SI sequencing). One minute following MSIV closure, a Przr steam space break occurs, which will further reduce RCS pressure resulting in adverse containment conditions and reduction in RCS subcooling requiring the RXCPs to be stopped. Transition from E-0 is made to E-2 at step 21. Upon entry into E-2, the operators will isolate steam flow from S/G A by closing the supply to the TD AFW Pump (MS-100A) and isolate AFW flow to the S/G by closing AFW-2A and AFW-10A. Transition from E-2 is made at step 8 to procedure E-1. The operators will reset SI and evaluate SI termination. The running RHR Pump will be stopped as directed and when S/G A has completed its blowdown, the evaluation for RCS cooldown and depressurization will be made. The scenario ends upon the transition to ES-1.2.

Critical Tasks

1. E-CC A: Manually start at least one CCW Pump required to provide adequate component cooling flow for the operating safeguards train prior to Rx Trip.

2. PRZR B: Prevent a Rx Trip by shifting PRZR level controlling channel or by taking manual control of charging pumps.

3. FR-S.1 — C: Insert negative reactivity into the core by at least one of the following methods before completing immediate action steps of FR-S.1: • Open the Bus 33 and Bus 43 supply breakers to de-energize the rod drive MG sets; • Manually insert control rods.

Scenario No: 1		Event No. 1
Event Description:		Ramp DOWN power to 40% at 0.5% per minute.
Time	Position	Applicant's Actions or Behavior
	CUE:	Turnover direction to continue power decrease to 40% at 0.5% per minute rate.
	CRS	Implement actions of N-0-03.
	CRS	Direct decrease to 40% power at 0.5 %/min.
	CREW	Review applicable Precautions, and Limitations and Actions
	RO	Perform reactivity estimate based on planned load decrease (if required)
	BOP	Decrease load per N-TB-54: • Review applicable Precautions & Limitations • Determine maximum unloading rate per Figures 2 & 3 • Set setter to desired load (40%) • Verify/set loading rate to ½%/min. • Inform GenCo of rate and amount of load reduction • Depress GO • Verify load decreases • Maintain Reactive load within limits of Figure 5

	RO	Perform reactivity adjustments:
		
		Rod Control (inward motion at 1.5°F difference Tave-Tref)
		
		AND/OR
		
		Boron Concentration Control (initiate boration) per N-CV-35A
		
		• Review applicable Precautions & Limitations
		• Verify at least one RXCP in operation.
		• Determine rate and magnitude of boration.
		• Position Reactor Makeup Mode Selector to BORATE
		• Adjust CVC-403/CV-31092, Blender Control BA Flow, to required flow rate.
		• Set Boric Acid Totalizer to required quantity.
		• Position Reactor Makeup Control switch to START.
		• Verify required change has been achieved by monitoring:
		  • Rod Position
		  • Boron Concentration
		  • Tave
		• When boration is complete:

Comments: _____

Scenario No: 1		Event No. 1
Event Description:		Ramp DOWN power to 40% at 0.5% per minute.
Time	Position	Applicant's Actions or Behavior

	RO (cont.)	• Close CVC-406/CV-31904 BA Blender to VCT.
		• Perform 20 gallon Alternate Dilute
		• Position CVC-406 to AUTO
		
		Alternate Dilution actions (to flush lines):
		• *Position Reactor Makeup Mode Selector to ALT DIL.*
		• *Adjust MU-1022/CV-31095, Blender Control Rx Mu Flow, to desired flow rate.*
		• *Set Rx Make-up Totalizer to 20 gal.*
		• *Position Reactor Makeup Control switch to START.*
		• *When dilution is complete:*
		  • *Position Reactor Makeup Mode Selector to AUTO.*
		  • *Position Reactor Makeup Control switch to START.*
		  • *Adjust CVC-403/CV-31092, Blender Control BA Flow, to current RCS boron concentration.*
		
		• If RCS boron concentration has been changed by >50 ppm, operate Przr heaters as necessary to equalize RCS and Przr boron.

	BOP	Adjust Heater Drain Pump speed as required to maintain equal loading on pumps
		
		When Turbine Power is < 50% (275 Mwe) :
		• Stop one Feedwater Pump per N-FW-05A:
		  • Verify turbine power < 60%
		  • Position FW-2A/MV-32025 (FW-2B/MV-32026) Feedwater Pump A(B) and Discharge Valve C/S to STOP/PULLOUT
		  • Verify FW-101A/CV-31028 (FW-101B/CV-31029) Feedwater Pump A(B) Recirc CV closed
		  • Direct operator to locally perform actions for Feedwater Pump shutdown
		
		• Stop one Condensate Pump per N-CD-03:
		  • Verify Feedwater Pump A or B off
		  • Stop Condensate Pump B(A)
		  • Direct operator to locally open C-50A(B) AND close SW-3001A(B) for the stopped Condensate Pump

Comments: _____

Scenario No: 1		Event No. 1
Event Description:		Ramp DOWN power to 40% at 0.5% per minute.
Time	Position	Applicant's Actions or Behavior
	BOP (cont.)	• Align condensate to North end of condenser for Mode II per N-BT-07A • Direct the local operator to shutdown the filter system per N-BT-07C • Direct the local operator to slowly close BT-1003A and BT-1003B • When these actions are completed, close BT-2A/MV-32077, BT-3A/MV-32078, BT-2B/MV-32079 and BT-3B/MV-32080 (S/G Blowdown Isol) • Direct the local operator to continue actions of N-BT-07A, 4.3.2 • When Moisture Separators are 58-62 psig, direct local operator to place Heating Boiler in operation per N-HS-22
		NOTE: Event 2 may be initiated during load backdown.

Comments: _____

Scenario No: 1		Event No. 2
Event Description:		S/G A controlling steam flow channel, FI-464, fails high. Feedwater flow and S/G level will initially increase in response to sensed steam demand. FW-7A will throttle open. The operator is required to take manual control of FW-7A and restore level to reference value.
Time	Position	Applicant's Actions or Behavior
	CUE:	Annunciator alarms: 47061-B S/G A SF > FF 47061-C S/G A FEED FLOW EXCESSIVE (due to non-failed channels) 47062-B S/G/ A BYPASS CV LEVEL DEVIATION Steam flow FI-464 reading at top of scale (while FT-465 reads approx. same as S/G B steam flow channels FI-474 and FI-475 Unexpected rise in S/G A level (LI-461/462) Stable turbine load
	BOP/CRS	Identify/report unusual response of FW-7A/failure of steam flow channel FT-464
	BOP	Take MAN control of FW-7A Restore S/G A level to program
	CRS	Implement Alarm Response Sheet, A-MI-87 "Bistable Tripping for Failed Reactor Protection or Safeguards Inst.", Attachment I "FT-464 STEAM GENERATOR STEAM FLOW RR-109" – "REMOVAL FROM SERVICE", and direct operator action.
	BOP	Perform prerequisite alignments: • Place Steam Flow Channel Selector switch for S/G A 46547/HFC-465 to 465/WHITE (Ch II)
	BOP/CRS	Direct actions to remove FT-464 (Red Channel) from service: • Perform partial SP 47-316A to check redundant channel bistable contacts for FT-464 removal from service. • Direct I&C to enter Relay Rack RR-109 to trip associated bistables for FT464.

	BOP	When conditions permit, position balance S/G A level, steam flow and feed flow and restore FW-7A to AUTO
		
		• Verify the following:
		  • Annunciator 47063-I MAIN STEAM HEADER A FLOW HI-HI in alarm
		  • Annunciator 47062-I STEAM HEADER A ISOLATION ALERT in alarm
		  • Annunciator 47061-C S/G A FEED FLOW EXCESSIVE in alarm
		  • Annunciator 47061-B S/G A SF > FF in alarm

Comments: _____

Scenario No: 1		Event No. 2
Event Description:		S/G A controlling steam flow channel, FI-464, fails high. Feedwater flow and S/G level will initially increase in response to sensed steam demand. FW-7A will throttle open. The operator is required to take manual control of FW-7A and restore level to reference value.
Time	Position	Applicant's Actions or Behavior
	BOP (cont)	• 44908-0501 MS Hdr A Hi Flow Status Light lit • 44908-0601 MS Hdr A Hi-Hi Flow Status Light lit • 44907-0901 S/G A SF > FF Status Light lit

	CRS	Review Technical Specification 3.5.b & c:
		• Table 3.5-2:
		  • No. 16 Steam Flow/Feedwater Flow Mismatch
		Determine continued operation acceptable (1 channel required OPERABLE)
		
		• Table TS 3.5-4:
		  • No. 2.a. Hi-Hi Steam Flow with Safety Injection Steamline Isolation
		  • No. 2.b. Hi Steam Flow and 2 of 4 Lo-Lo T_{avg} with Safety Injection Steamline Isolation
		Determine continued operation acceptable (One channel required OPERABLE)

	CRS	Inform I&C/Maintenance of S/G A steam flow channel FT-464 failure/status

Comments: _____

Scenario No: 1	Event No. 3	
Event Description:	Controlling Pressurizer level channel III (LT-428) fails to its no-load value (21%).	
Time	Position	Applicant's Actions or Behavior
	CUE:	Przr level Channel: 47043-F ,PRZR Level Deviation Computer alarm L0428A Charging Pump "A" (AUTO) speed increase to maximum Przr level increase on LI-426 and LI-427 After Przr level channel swap: 47014-I & L, RXCP A(B) LABRYNTH SEAL DP LOW 47014-I & L, RXCP A(B) LABRYNTH SEAL DP LOW 47041-K REGEN HX LETDOWN TEMP HIGH 47043-J CHARGING PUMP IN AUTO HIGH/LOW SPEED
	RO/CRS	Identify/report failed Przr level channel - LT-428.
	CRS	Implement Alarm Response Sheet and A-MI-87 "Bistable Tripping for Failed Reactor Protection or Safeguards Inst.", Attachment I "LT-428 PRESSURIZER LEVEL RR-112" – "REMOVAL FROM SERVICE" and direct operator action.
	RO **[CT]** **PRZR B**	Check Przr level: • Verify level normal (27-29% based on RCS Tave). Determine level is increasing above normal for given RCS Tave • Position Przr Level Control Channel Selector switch to **2-1**. • Position Przr Level Recorder Input Selector switch to **1**. • Verify Przr level restores to reference level
	RO/CRS	Direct actions to remove LT-428 from service: • Perform partial SP 47-316C to check redundant channel bistable contacts for LT-428 removal from service. • Direct I&C to enter Relay Rack RR-112 to trip associated bistable 428A. • Verify the following: • Annunciator 47041-E PRESSURIZER LEVEL HI in alarm • 44907-0407 Pressurizer Hi Level Status Light lit

Comments: _____

Scenario No: 1	Event No. 3	
Event Description:	Controlling Pressurizer level channel III (LT-428) fails to its no-load value (21%).	
Time	Position	Applicant's Actions or Behavior
	CRS	Review Technical Specification 3.5.b & c: • Table TS3.5-2, No. 9 Pressurizer High Water Level Determine continued operation acceptable (2 channels required OPERABLE).

Comments: _____

Scenario No: 1-2		Event No. 4
Event Description:		Component Cooling Water Pump "A" trips due to overcurrent condition. Component Cooling Water Pump "B" fails to auto start (on low CCW header pressure), but may be started manually.
Time	Position	Applicant's Actions or Behavior
	CUE	Annunciators: 40103-F BUS 51 FEEDER BKR TRIP (SER point 746) 47021-I RXCP CC FLOW LOW 47023-I RHR PUMPS CC FLOW LOW 47024-I ICS PUMPS CC FLOW LOW 47021-H CC PUMPS DISCH PRESSURE LOW(if Pump is not manually started shortly following CCW Pump "A" trip) CC Pump "A" C/S WHITE light lit CC return flow indication FI-619 decreasing CC discharge header pressure 4130202(26081) decreasing CCW Pump "B" C/S GREEN light lit with CC discharge pressure < 35 psig
	RO/CRS	Identify/report trip of CC Pump "A"
	CRS	Implement Alarm Response Sheet and A-CC-31A "Abnormal Conditions in the Component Cooling System" and direct operator action.
	RO **[CT]** **E-CC A**	(Immediate Action)Verify standby Pump operating (AUTO start at low pressure ≤ 35 psig) Manually start CC Pump "B" Verify pump discharge pressure ≥ 95 psig [PI-628] Monitor temperature and flow to components in operation [RXCP Thermal Barrier Return temps TI-614/610, Letdown Hx outlet TI-130, CC Return flow FI-619]
	CRS	Review Technical Specification 3.3.d and determine 3.3.d.2 is applicable Determine Neither Component Cooling Pump is OPERABLE and apply the Standard Shutdown Sequence Contact Maintenance/Electrical to initiate repairs and investigate auto start failure

Comments: _____

Scenario No: 1		Event No. 5, 6, 7, and 8
Event Description:		(5) Steamline break on S/G A downstream of the flow restriction nozzle with approximately 350,000 lbm/hr flow (@ 1000 psig). (6) Reactor Trip Breakers Fail to open on trip signal requiring manual action. (7) RHR Pump A fails to auto start, leaving NO RHR Pump running and requiring manual start of the pump. (8) Przr steam space LOCA occurs at approximately 500,000 lbm/hr flow.
Time	Position	Applicant's Actions or Behavior
	CUE	Steamline Break: Annunciators: 47061-B S/G A SF > FF 47062-I STEAM HEADER A ISOLATION ALERT Steam flow indication on S/Gs (and just on S/G A after MSIV MS-1A closes) S/G A pressure continually decreasing RCS temperature falling Przr level lowering Przr pressure lowering Containment pressure (4151202), temperature (41507-41511) and humidity (41517) rising (or high) RHR Pump With SI actuated and sequencer loading complete, GREEN (NO RED light) light still lit for RHR Pump A C/S. SI Active Status Panel light 23 RHR PUMP A ON dark Przr steam space leak Increase rate of RCS pressure drop Higher than expected Przr level Containment radiation level increasing
	CREW	Identify/report conditions indicating a steamline break inside containment
	CRS	Direct reactor trip due to steamline break
	RO	Manually trip reactor by depressing reactor trip pushbutton [46285] Report failure of reactor to trip
	CRS	Direct actions of FR-S.1 "Response to Nuclear Power Generation/ATWS" **(NOTE: E-0 immediate action for verification of reactor trip is not listed here since it is inherent in the actions performed by the crew.)**

Comments: _____

Scenario No: 1		Event No. 5, 6, 7, and 8
Event Description:		(5) Steamline break on S/G A downstream of the flow restriction nozzle with approximately 350,000 lbm hr flow (@ 1000 psig). (6) Reactor Trip Breakers Fail to open on trip signal requiring manual action. (7) RHR Pump A fails to auto start, leaving NO RHR Pump running and requiring manual start of the pump. (8) Przr steam space LOCA occurs at approximately 500,000 lbm/hr flow.
Time	Position	Applicant's Actions or Behavior
	RO RO (cont.) **[CT]** **FR-S.1** **— C**	Perform immediate operator actions of FR-S.1 Verify reactor trip: • Reactor trip & bypass breakers open • Rod Position Indicators read ZERO • Rod bottom lights LIT • Neutron flux decreasing Attempt to manually trip reactor by depressing reactor trip pushbutton Report failure of reactor to trip • Manually insert Control Rods
	BOP **[CT]** **FR-S.1** **— C**	Perform immediate operator actions of FR-S.1 • Open Bus 33 and Bus 43 supply breakers [13301, 14301]
	CREW	Perform immediate operator actions of FR-S.1 • Dispatch operator to locally - Open Reactor Trip Breakers - Position Rod Drive MG Set motor and generator Circuit Breaker C/Ss to TRIP • When Reactor trip breakers and MG set breakers have been opened, re-energize buses 33 and 43
	BOP	Perform immediate operator actions of FR-S.1 Verify Turbine Trip: • HP turbine impulse pressure PI-486 trending toward ZERO • All turbine STOP VALVES closed Verify Feedwater Isolation: • FW-7A and FW-7B Main FW Flow Control Valves closed • FW-10A and FW-10B Main FW Bypass Flow Control Valves closed **(NOTE: Immediate Actions of FR-S.1 complete)**
	BOP	Check AFW Pumps running • Both MD AFW Pumps running • T/D AFW Pump running (if necessary)

Comments: _____

Scenario No: 1		Event No. 5, 6, 7, and 8
Event Description:		(5) Steamline break on S/G A downstream of the flow restriction nozzle with approximately 350,000 lbm/hr flow (@ 1000 psig). (6) Reactor Trip Breakers Fail to open on trip signal requiring manual action. (7) RHR Pump A fails to auto start, leaving NO RHR Pump running and requiring manual start of the pump. (8) Przr steam space LOCA occurs at approximately 500,000 lbm/hr flow.
Time	Position	Applicant's Actions or Behavior
	CREW	Check ATWS Actions completed: • ATWS actions in progress • Reactor tripped (Control Rods inserted) • Turbine tripped **(NOTE: The local operator will trip the Reactor Trip Breakers and MG Set breakers and contact Control Room about actions.)**
	BOP	Perform immediate operator actions of E-0 Verify power to Emergency AC Busses Bus 5 energized Bus 6 energized
	CREW	Perform immediate operator actions of E-0 Determine SI needed/actuated needed If actuated: 47021-A SI TRAIN A ACTUATED lit 47021-B SI TRAIN B ACTUATED lit
	CREW (cont)	If NOT actuated Check **Przr pressure <1815 psig** **Przr level CANNOT be maintained > 5%** RCS Subcooling (CETs) < 30°F **S/G pressures < 500 psig** **CNMT pressure > 4 psig** Determine that SI is required (or soon will be required) on either Przr level, S/G pressure and/or Przr pressure If required, Manually actuate SI [Safety Injection Train A(B) – START pushbuttons 4647201, 4647501] Make plant announcement for Safety Injection

Comments: _____

Scenario No: 1		Event No. 5, 6, 7, and 8
Event Description:		(5) Steamline break on S/G A downstream of the flow restriction nozzle with approximately 350,000 lbm/hr flow (@ 1000 psig). (6) Reactor Trip Breakers Fail to open on trip signal requiring manual action. (7) RHR Pump A fails to auto start, leaving NO RHR Pump running and requiring manual start of the pump. (8) Przr steam space LOCA occurs at approximately 500,000 lbm/hr flow.
Time	Position	Applicant's Actions or Behavior
	BOP	Check Main Steamline Isolation • Check high-high steam flow (> 4.45×10^6 lb/hr) for S/G A(B) • Check high steam flow (> 0.7×10^6 lb/hr) AND Tavg < 540°F for S/G A(B) • Check Containment pressure > 17 psig Identify/report steam flow indicated for S/G A (but not at high steam flow value) (if not reported before) and Containment pressure increasing **(NOTE: With identified higher than expected steam flow and rising containment pressure, the crew may perform actions at this time to isolate the steam lines)**
	RO/BOP	Verified Containment Spray NOT required: • CNMT pressure remained below 23 psig Determine/report CNMT Spray NOT required
	BOP	Verify Containment Cooling • Fan Coil Units running • Verify SW-903A-D CFCU SW Return Isolation valves open • Check Containment pressure remained below 4 psig Determine Containment pressure > 4psig • Check RBV-150A-D CFCU Emergency Dampers open Verify Aux Bldg Special Vent running: • Annunciator 47052-G ZONE SV BNDRY DAMPER NOT CLOSED not lit • Verify Zone SV fans [ASV-91A(B)/CD-34014(34015) ASV Exhaust Fan A(B) and Damper] running Verify Service Water Pumps (A1, A2, B1) running Report SW Pump B2 not running due to OOS condition Verify Feedwater Isolation: • FW-7A and FW-7B Main FW Flow Control Valves closed • FW-10A and FW-10B Main FW Bypass Flow Control Valves closed • BOTH Feedwater Pumps off Verify AFW Pumps running: • Check both MD AFW Pumps running • Stop T/D AFW Pump and place C/S [MS-102/MV-32040] in PULLOUT

Comments: _____

Scenario No: 1		Event No. 5, 6, 7, and 8
Event Description:		(5) Steamline break on S/G A downstream of the flow restriction nozzle with approximately 350,000 lbm/hr flow (@ 1000 psig). (6) Reactor Trip Breakers Fail to open on trip signal requiring manual action. (7) RHR Pump A fails to auto start, leaving NO RHR Pump running and requiring manual start of the pump. (8) Przr steam space LOCA occurs at approximately 500,000 lbm/hr flow.
Time	Position	Applicant's Actions or Behavior
	CREW	Identify/report indications of changes in Containment conditions: • Increase in pressurization • Increase in radiation levels indicated on R-2, R-7 and recorders RE-29064, 29065. **(NOTE: This will occur sometime after entry of the Przr steam space leak and may be noted later.)**
	CREW	Identify/report need to use ADVERSE CONTAINMENT values when Containment pressure exceeds 4 psig
	RO	Verify the CI Active Status Panel [11] lights lit Verify ECCS pumps running: • SI pumps • RHR pumps • CC Pumps Report RHR Pump A failed to start/NO RHR Pumps running Manually start RHR Pump A (if not already performed)
	RO (cont)	Verify SI flow: • With RCS pressure < 2100 psig [1900 psig ADVERSE]: • SI flow indicated on FI-925 • Check RCS pressure < 150 psig and determine it is not
	BOP	Verify total AFW flow > 200 gpm [4104102, 4104202]
	RO	Check RXCP Seal Cooling: • CC Supply for Thermal Barrier Isolation Valves CC-600, CC-601A(B), CC-610A(B) and CC-612A(B) open • Thermal Barrier temperatures TI-610 and TI-614 normal • RXCP Bearing Temperatures TI-125 and TI-132 normal

Comments: _____

Scenario No: 1		Event No. 5, 6, 7, and 8
Event Description:		(5) Steamline break on S/G A downstream of the flow restriction nozzle with approximately 350,000 lbm hr flow (@ 1000 psig). (6) Reactor Trip Breakers Fail to open on trip signal requiring manual action. (7) RHR Pump A fails to auto start, leaving NO RHR Pump running and requiring manual start of the pump. (8) Przr steam space LOCA occurs at approximately 500,000 lbm/hr flow.
Time	Position	Applicant's Actions or Behavior

	RO/BOP	Check RCS temperatures:
		• RCS Average Temperature [TI-401-404, recorder 42554, computer trend] stable at or trending to 547°F (or RCS Cold Leg Temps [Recorder 42555 or computer trend] at or trending to 547°F if NO RXCP running)
		
		• With temperature < 547°F:
		  • Stop dumping steam
		  • Verify T/D AFW is in PULLOUT
		  • Control feed flow to > 200 gpm until one S/G NR level > 4% [15% ADVERSE]
		  • Verify MS-1A & 1B and MS-2A & 2B, MSIV and MSIV Bypass valves are closed

	RO	Check Przr PORVs and Spray Valves closed: • PORVs closed • Normal Spray valves closed [PS-1A(B) indicating lights] • CVC-15 Aux Spray Valve closed Check if RXCPs should be tripped: • SI flow indicated on FI-925 • RCS subcooling based on CETs < 15°F [45°F ADVERSE] • If both conditions exist stop both RXCPs and place in PULLOUT **(NOTE: Above action to trip RXCPs may have occurred earlier or may occur later, as directed by E-0 QRF, depending on conditions.)**
	BOP	Check if S/G are faulted. • Check S/G pressures decreasing in uncontrolled manner Identify/report S/G A pressure decreasing
	CREW	Diagnose faulted S/G A
	CRS	Transition to E-2 "Faulted Steam Generator Isolation" Evaluate Critical Safety Function Status Trees Direct operator actions of E-2.

Comments: _____

Scenario No: 1		Event No. 5, 6, 7, and 8
Event Description:		(5) Steamline break on S/G A downstream of the flow restriction nozzle with approximately 350,000 lbm/hr flow (@ 1000 psig). (6) Reactor Trip Breakers Fail to open on trip signal requiring manual action. (7) RHR Pump A fails to auto start, leaving NO RHR Pump running and requiring manual start of the pump. (8) Przr steam space LOCA occurs at approximately 500,000 lbm/hr flow.
Time	Position	Applicant's Actions or Behavior
	BOP	Verify Main Steamline Isolation for S/G A: • Verify closed MS-1A MSIV and MS-2A MSIV Bypass Valve for S/G A Check any S/G not faulted • Check pressure in S/G B stable or increasing Identify faulted SG • SG A identified faulted • Lowering pressure
	BOP (cont)	Isolate S/G A • Verify S/G A blowdown isol valves BT-2A and BT-3A closed • Verify S/G PORV SD-3A closed • Verify/Close AFW Pump 2A flow control valve AFW-2A • Close S/G A Supply to TDAFW Pump MS-100A • Verify S/G A Sample Isolation Valves BT-31A and BT-32A closed • Close S/G A FW Isolation valve FW-12A • Close AFW Train A Crossover Valve AFW-10A Check CST level > 4% [412901, 4102902]

	CREW	Check Secondary Radiation:
		• Request period activity samples and radiation surveys of both S/Gs
		
		• Check unisolated secondary radiation monitors:
		  • R-31 and R-33 (Main Steamline)
		  • R-15 (CAE)
		  • R-19 (S/G Blowdown)
		
		Determine Secondary Radiation Trends normal

	BOP	Set Steam Dumps to minimize RCS heatup:
		  • Check Condenser available
		  • Determine Both S/G MSIV Closed
		  • Verify intact SG PORV controller in Auto
		  • Set intact SG PORV controller to the maximum SAT PRESS FOR RCLA(B) C/L, P8025G and/or P8024G from PPCS Group Output 8

Comments: _____

Scenario No: 1		Event No. 5, 6, 7, and 8
Event Description:		(5) Steamline break on S/G A downstream of the flow restriction nozzle with approximately 350,000 lbm/hr flow (@ 1000 psig). (6) Reactor Trip Breakers Fail to open on trip signal requiring manual action. (7) RHR Pump A fails to auto start, leaving NO RHR Pump running and requiring manual start of the pump. (8) Przr steam space LOCA occurs at approximately 500,000 lbm/hr flow.
Time	Position	Applicant's Actions or Behavior
	CRS	Transition to E-1 "LOSS OF REACTOR OR SECONDARY COOLANT" Direct operator actions of E-1
	RO	If RXCPs not already stopped, check if RXCPs should be tripped: • SI flow indicated on FI-925 OR • RHR Pump flow > 375 gpm for F928 or F626 AND • RCS subcooling based on CETs < 15°F [45°F ADVERSE] • If both conditions exist stop both RXCPs and place in PULLOUT Check RWST level > 37% [4131101 LI-920, 4131102 LI-921]
	BOP	Check if S/Gs are faulted: • Check S/G pressures decreasing in uncontrolled manner OR • Check any S/G completely depressurized • Verify steamlines and feedlines to S/G A isolated
	BOP (cont)	Check intact S/G levels: • S/G B narrow range (NR) level > 4% [15% ADVERSE] • If not, maintain total feed flow to S/G B > 200 gpm until NR level > 4% [15% ADVERSE] • Control feed flow to maintain NR level between 4% [15% ADVERSE] and 50%
	CREW	Check Main Steamline Radiation Channels R-31 and R-33 on SPDS normal

Comments: _____

Scenario No: 1		Event No. 5, 6, 7, and 8
Event Description:		(5) Steamline break on S/G A downstream of the flow restriction nozzle with approximately 350,000 lbm/hr flow (@ 1000 psig). (6) Reactor Trip Breakers Fail to open on trip signal requiring manual action. (7) RHR Pump A fails to auto start, leaving NO RHR Pump running and requiring manual start of the pump. (8) Przr steam space LOCA occurs at approximately 500,000 lbm/hr flow.
Time	Position	Applicant's Actions or Behavior

	RO	Check Przr PORVs and Block Valves:
		• Power to PR-1A and PR-1B available
		• PORVs closed
		  • PR-2A
		  • PR-2B
		• At least ONE PORV Block valve OPEN
		  • PR-1A
		  • PR-1B
		
		Isolate letdown by closing LD-4A, 4B and 4C Letdown Orifice Isol
		
		Reset SI by depressing both SI RESET pushbuttons [4647202, 4647502] (If not done previously)
		
		Reset Containment Isolation by depressing both CNTMT ISOL RESET pushbuttons [4647302, 4647602]

	BOP	Verify Instrument Air to Containment established • At least one Air Compressor running • Air header pressure >60 psig [4150101/4150103] • Instrument Air to Containment Isol IA-101 open

	RO	Establish Charging flow:
		• Verify at least one Charging Pump running
		  • If NOT:
		  • Verify CCW flow to RXCP Thermal Barriers has not been lost
		  • CC Supply for Thermal Barrier Isolation Valves CC-600, CC-601A(B), CC-610A(B) and CC-612A(B) open
		  • Thermal Barrier temperatures TI-610 and TI-614 normal

	RO (cont)	• Start Charging Pumps as necessary • Establish charging flow to maintain Przr level > 5% [30% ADVERSE]

Comments: _____

Scenario No: 1		Event No. 5, 6, 7, and 8
Event Description:		(5) Steamline break on S/G A downstream of the flow restriction nozzle with approximately 350,000 lbm/hr flow (@ 1000 psig). (6) Reactor Trip Breakers Fail to open on trip signal requiring manual action. (7) RHR Pump A fails to auto start, leaving NO RHR Pump running and requiring manual start of the pump. (8) Przr steam space LOCA occurs at approximately 500,000 lbm/hr flow.
Time	Position	Applicant's Actions or Behavior

	CREW	Check if SI should be terminated:
		• **RCS subcooling based on CETs > 30°F [65°F ADVERSE]**
		• **RCS pressure > 2100 psig [1900 ADVERSE] AND stable or rising**
		• **Przr level > 5% [30% ADVERSE]**
		• Secondary Heat Sink:
		  • Total feed flow to S/G B > 200 gpm
		  OR
		  • NR level in S/G B > 4% [15% ADVERSE]
		
		Determine SI should not be terminated (based on one or more of the above highlighted conditions)

	RO	Check if Containment Spray should be stopped: • Check ICS Pump any running [GREEN light lit] Determine ICS Pump A not running Check if RHR Pumps should be stopped: • RCS pressure >150 psig AND • Stable or increasing • Combined RHR Flow ZERO on FI-626 and FI- 928 • Verify RHR Pumps NOT supplying Containment Sump Recirculation flow • Reset SI if necessary [4647202, 4647502 pushbuttons] • If above are satisfied, stop RHR pumps and place in C/Ss in AUTO
	CREW	Check RCS and S/G pressures: • Pressure in both S/Gs stable or increasing • RCS pressure stable or decreasing If neither condition met, return to step 1 of E-1 **(NOTE: The crew may return to step 1 and reperform actions until S/G A has completed blowing down (S/G A pressure decreasing).)**
	BOP	Check if Diesel Generators (DGs) should be stopped • Verify Bus 5 and Bus 6 energized from offsite power (Breakers 1-501 and 1-601 closed) • Stop DG A and DG B 30 seconds apart (by taking C/S to STOP/PULLOUT position) and place in AUTO

Comments: _____

Scenario No: 1		Event No. 5, 6, 7, and 8
Event Description:		(5) Steamline break on S/G A downstream of the flow restriction nozzle with approximately 350,000 lbm/hr flow (@ 1000 psig). (6) Reactor Trip Breakers Fail to open on trip signal requiring manual action. (7) RHR Pump A fails to auto start, leaving NO RHR Pump running and requiring manual start of the pump. (8) Przr steam space LOCA occurs at approximately 500,000 lbm/hr flow.
Time	Position	Applicant's Actions or Behavior

	CREW	Evaluate Plant status:
		• Verify recirculation capability
		  • Both RHR Pumps operable
		Report RHR Pump B is not operable
		  • Determine at least one train recirculation capability
		
		  • Open CC-400A Component Cooling to RHR HX A
		  • Verify operable CC-400B Component Cooling to RHR HX B [GREEN light lit]
		  • Verify operable SI-300A and B, RWST Supply to RHR Pump A(B) [RED light lit]
		  • Verify operable SI-350A and B, CNTMT Sump B Supply to RHR Pump A(B) [GREEN light lit]
		  • Verify operable SI-351A and B, CNTMT Sump B Supply to RHR Pump A(B) [GREEN light lit]
		
		  • Direct local operator(s) to unlock and set to on breakers for recirculation MOVs
		
		• Check Aux Building radiation monitors R-13, R-14 and R-22 normal
		
		• Consult Tech Support Staff to see if E-MDS-30 should be implemented
		• Notify Chemistry to start Containment Hydrogen Monitoring System
		• Direct chemistry to obtain primary and secondary samples per EPIPs
		• Evaluate starting additional plant equipment
		
		Check if RCS cooldown and depressurization is required:
		• Check RCS pressure > 150 psig

	CRS	Transition to ES-1.2 "POST LOCA COOLDOWN AND DEPRESSURIZATION " Direct operator actions of ES-1.2
		NOTE: Scenario can be terminated at this point with transition to ES-1.2.

Comments: _____

Simulation Facility	Kewaunee	Scenario No.: 2	
Examiners:	_____	Operators: _____	SRO
	_____	_____	RO
	_____	_____	BOP

Initial Conditions: IC-12 100% power, middle of cycle (MOC)

Turnover: The plant is at 100% power.
Directions are to decrease power to 80% per Energy Supply and Control due to 345KV line problems.
Diesel Generator "A" has been tested 6 hours ago (Following SW Pump B2 failure)
All ESF features for Train A have been verified OPERABLE

Equipment Out of Service: SW Pump "B2"
Internal Containment Spray Pump "B"
S/G "B" Feedwater flow Yellow channel (FI-477)

Event No.	Malf. No.	Event Type*	Event Description
Preload	RD11		Reactor Trip Breakers Fail to open on trip signal
1	—	N BOP SRO	Decrease turbine load to 80% at the normal rate of 0.25%/min.
		R RO	Decrease reactor power using rods and/or boration
2	NI06B, 100%	I RO SRO	Nuclear Power Range N-42 fails high
3	RD03, 100%	C RO SRO	Continuous rod motion (during N-42 failure) requiring operation of Rod Control in manual
4	SO3 – 2 200 psig (RX213)	I BOP SRO	S/G A Steam Pressure Channel PT- 468 fails mid-scale (200 psig)
5	RD08A	C RO SRO	RPI power supply breaker trips open
6	FW01, 50%,,15 min	C BOP RO SRO	Loss of condenser vacuum at 500 cfm over 15 minutes
7	(RD11)	M RO BOP SRO	Reactor Trip Breakers Fail to open on trip signal
8	RC04A, 100%	M BOP RO SRO	Large Break LOCA

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

SCENARIO 2

NOTES TO SIMULATOR OPERATOR:

1. PULL-OUT SW Pump B2 C/S, 46527 and TAG

2. PULL-OUT ICS Pump B C/S, 46306 and TAG

3. S/G "A" Feedwater flow Yellow channel (FI-477):
   - Ensure FW Flow Channel Selector switch 46550/HFC-476 is selected to 476/BLUE (Channel III)
   - If desired place Steam Flow Channel Selector switch 46549/HFC-475 to 474/BLUE (Channel III)
   - Enter the following Remote Functions
     1. RP 7 (RP204) 477B – FWF < SF
     2. RP 7 (RP203) 477A – FWF > SF

Enter System Override RX210, FT-477, 4.45E6 #/Hr

4. Events 2 and 3 are entered at the same time.

5. In Event 2 (NI N42 failure), trip bistables when directed with following Remote Functions:
   - RP3-6 (RP135) 406A – OVER POWER TRIP
   - RP3-7 (RP136) 406B – ROD STOP
   - RP3-8 (RP137) 406C – OVER TEMP TRIP
   - RP3-9 (RP138) 406D – ROD STOP

6. In Event 4 (S/G A pressure PT-468 failure), trip bistables when directed with following Remote Functions:
   - RP 6 (RP185) 468A – LO/LO S.A.L.
   - RP 6 (RP186) 468B – LO PRESS
   - RP 6 (RP182) 466C – FWF < SF
   - RP 6 (RP181) 466B – FWF > SF

7. In Event 5, if directed to investigate BRB-127 VAC Distr. Cabinet, report breaker 22 is tripped open. If sent to check IRPI rack RR-149, report NO AC power available but no failure noted. IF directed to close BRB-127 brk 22, report breaker trips open again.

8. In Event 6, when directed by Control Room to check:
   - Normal water level in Condensate Drain Tank, report level normal
   - Steam supply to air ejectors pressure, report PI-11052 reads 120 psig
   - Suction pressure on each air ejector jet, report all pressures normal for given conditions (1st & 2nd stages)

9. In event 6, if directed by Control Room to place Hogging Jet in service, acknowledge request but take no action.

10. For Event 7 when directed by the Control Room to manually trip the trip breakers and open the MG Drive breakers, after approximately ONE minute:
    - Remove MALF RD11
    - Toggle REMOTE FUNCTION RD2 - 2 (RD102) MG Set 1A STOP
    - Toggle REMOTE FUNCTION RD2 - 3 (RD103) MG Set 1B STOP

11. Enter Event 8 at step 4 of ES-0.1 after Emergency Boration is started.

12. In event 8, when the crew as cycled through E-1 step 19 and returned to step 17 to shutdown unnecessary equipment. **AT THE DIRECTION OF THE NRC CHIEF EXAMINER,** the crew will be informed of time compression to a later time with RWST inventory reduced.
    Reduce RWST level to just above 37% (37.5%) by entering Remote Function SI2-1 (SI101), 37.5%
    The crew will be directed to continue with actions of step 17 of E-1 with all other conditions as expected for the given time interval.

SCENARIO 2 OVERVIEW

Event 1 - The plant is at 100% power. Directions are to decrease load to 80% power at the normal rate of 0.25%/min per Energy Supply and Control due to 345KV line problems.

Events 2&3 - Following clearly observable plant response from the reactivity changes, NI Channel N-42 upper detector fails high resulting in N42 Power Range channel indication increase. Control Rods will insert in AUTO. Power Range Overpower Rod Stop (Annunciator 47043-I) will prevent withdrawal of control rods in AUTO or MAN. Coincident with the N42 failure, Control Rod will be demanded to move in at the maximum rate (72 spm) due to a failure in the summing unit providing a +10°F difference output (Tave-Tref). This failure may be noted immediately with the N42 failure or may not since rods are placed in MAN (stopping the rod motion), but will be evident following removal of N42 from service and any attempt to restore AUTO rod control. The operator will be required to operate rod control in MAN. N42 is removed from service. The SRO will review Technical Specification 3.5 for applicability of N42 failure.

Events 4 - Following removal of N42 from service and stabilization of plant, steam pressure channel PT-468 for S/G A fails to mid-scale position. This channel also affects the output of the controlling steam flow channel FT-474 since it provides for density compensation for this steam flow channel. Indicated steam flow will derease, resulting in closing of FW-7A to derease feedwater flow to S/G A. The operator will be required to take manual control of FW-7A and restore level to normal. The alternate available steam flow channel (and possibly feedwater flow channel) will be selected, and when level is restored, feedwater control may be returned to automatic. The SRO will review Technical Specification 3.5 for applicability of PT-468 failure.

Event 5 - Following restoration of automatic level control for S/G A and stabilization of level, an AC power failure to the rod position indicator cabinet results in failure of all indicators. Annunciator 47041-P ROD BOTTOM ROD DROP will alarm, and all rods Rod Bottom Lights on the IRPIs will light. Actions are taken per E-CRD-49C and verify the rod is not dropped. Actions will then be directed in abnormal procedures A-CRD-49D and A-CRD-49B. The operator will note requirements for limitations on control motion, and hourly actions to record QPTR and step counter positions. The SRO will apply Technical Specification 3.10.f., TS 3.0.c and direct a Plant shutdown.

Event 6 - After the requirements for shutdown are addressed (per Technical Specifications) for the IRPI power failure, a loss of condenser vacuum will occur. Initially the leak will be such that adequate vacuum may be maintained by the load backdown, but will increase to the point were a plant trip is required (turbine trip & reactor trip). The operator is alerted by decreasing condenser vacuum indication, computer alarm and finally annunciator 47051-W CONDENSER LOW VACUUM. Operator actions are performed per E-AR-09. The operator should verify operation within limits of E-AR-09 Figure 1. Also the RO and SRO must address the limitations on control rod motion with the IRPI power failure per A-CRD-49D (12 steps > 85% power OR 24 steps between 50% and 85% power). The turbine will trip at 8-12" Hg abs. Pressure (Manual trip required at 5.5 Hg. Abs per E-AR-09 and N-TB-54). The operators may choose to trip the turbine and reactor before this value if vacuum continues to drop OR may choose to trip the reactor based on condenser vacuum decrease and inability to adjust reactivity adequately within the control rod motion limits.

Event 7 & 8 - The reactor will fail to trip. The operators will recognize the failure of the reactor to trip and FR-S.1 entered at step 1 Contingency Action of E-0. The operators will open the feeder breakers to the buses supplying the Rod Drive MG Sets (Bus 33 & 43) and direct the local operators to open the Rod Drive MG Sets Breakers and the reactor trip breakers. The reactor trip breakers will be opened ONE-minute following contact to open the breakers. Transition to E-0 will occur at step 5.d.

The operators will complete the immediate actions and transition from E-0 to ES-0.1 at step 4, when SI is determined NOT to be required. The operator will stabilize the plant and the operator may initiate an Emergency Boration (E-CVC-35) when he is unable to determine control rod status from RPI due to loss of power. Following the verification of emergency boration flow, a large break LOCA occurs on the RCS. Transition should be made to E-0, and later a transition from E-0 is made to E-1 at step 23. The RXCPs should be secured during the performance of E-0. At step 19 of E-1, the crew will identify the need to initiate containment sump recirculation when RWST falls to < 37%, and will re-perform the previous two steps if RWST is > 37%.

NOTE: After the initial return to step 17 of E-1 occurs, the crew will be informed of time compression to a later time with RWST inventory reduced. The crew will be directed to continue with actions of step 17 of E-1 with all other conditions as expected for the given time interval.

Event 8 (cont.)
When RWST level falls to 37% (as indicated by alarm 47023-B RWST LEVEL LOW), transition should be made to ES-1.3 to transfer to cold leg recirculation. The operator will stop Train A SI, RHR and ICS Pumps, align the RHR Pump to take suction from the Containment sump, restart the RHR "A" Pump and establish recirculation flow. The scenario is terminated following completion of this action.

Critical Tasks

1. FR-S.1 — C: Insert negative reactivity into the core by at least one of the following methods before completing immediate action steps of FR-S.1: • Open the Bus 33 and Bus 43 supply breakers to de-energize the rod drive MG sets; • Manually insert control rods.

2. ES-1.3 — A: Transfer to cold leg recirculation and establish ECCS recirculation flow that at least meets the assumptions of the plant-specific LOCA analysis.

Scenario No: 2		Event No.	1
Event Description:	Decrease turbine load to 80% at the normal rate of 0.25%/min.		
Time	Position	Applicant's Actions or Behavior	
	CUE:	Turnover direction to decrease load to 80% power	
	CRS	Implement actions of N-0-03:	
	CRS	Direct decrease to 80% power at ¼ %/min.	
	CREW	Review applicable Precautions, and Limitations and Actions.	
	RO	Perform reactivity estimate based on planned load decrease.	
	BOP	Decrease load per N-TB-54: • Review applicable Precautions & Limitations • Determine maximum unloading rate per Figures 2 & 3 • Set setter to desired load (80%) • Verify/set loading rate to appropriate rate for required backdown (.25 %/min.) • Inform GenCo of rate and amount of load reduction • Depress GO • Verify load decreases • Maintain Reactive load within limits of Figure 5	
	RO	Perform reactivity adjustments: Rod Control (inward motion at 1.5°F difference Tave-Tref) AND/OR Boron Concentration Control (initiate boration) per N-CV-35A • Review applicable Precautions & Limitations • Verify at least one RXCP in operation. • Determine rate and magnitude of boration. • Position Reactor Makeup Mode Selector to BORATE • Adjust CVC-403/CV-31092, Blender Control BA Flow, to required flow rate. • Set Boric Acid Totalizer to required quantity. • Position Reactor Makeup Control switch to START. Verify required change has been achieved by monitoring: • Rod Position • Boron Concentration • Tave	

Comments: _____

Scenario No: 2		Event No.	1
Event Description:	Decrease turbine load to 80% at the normal rate of 0.25%/min.		
Time	Position	Applicant's Actions or Behavior	

	RO (cont.)	When boration is complete:
		• Close CVC-406/CV-31904 BA Blender to VCT.
		• Perform 20 gallon Alternate Dilute
		• Position CVC-406 to AUTO
		
		Alternate Dilution actions (to flush lines):
		• *Position Reactor Makeup Mode Selector to ALT DIL.*
		• *Adjust MU-1022/CV-31095, Blender Control Rx Mu Flow, to desired flow rate.*
		• *Set Rx Make-up Totalizer to 20 gal.*
		• *Position Reactor Makeup Control switch to START.*
		• *When dilution is complete:*
		  • *Position Reactor Makeup Mode Selector to AUTO.*
		  • *Position Reactor Makeup Control switch to START.*
		  • *Adjust CVC-403/CV-31092, Blender Control BA Flow, to current RCS boron concentration.*
		
		If RCS boron concentration has been changed by >50 ppm, operate Przr heaters as necessary to equalize RCS and Przr boron.	

	BOP	Adjust Heater Drain Pump speed as required to maintain equal loading on pumps	
		NOTE: Following the required plant response, Event 2 may be started.	

Comments: _____

Scenario No: 2		Event No. 2 & 3
Event Description:		Nuclear power range channel N42 upper detector fails high (200%). Detector "A" indication will fail upscale. Channel total output will rise above 100%. Control rods will begin to step in due to the rate of change of nuclear power (compared to turbine power that does not change). Either the operator will determine rod motion is not required and placed in MAN; OR, inward rod motion will unexpectedly continue due to failed summing circuit. If rod control is taken to AUTO after N42 channel has been removed from service then rods will begin stepping in again. The operator would then be required to take control to MAN once the need for rod motion is verified not to exist.
Time	Position	Applicant's Actions or Behavior
	CUE:	N42 failure: Annunciator alarms: 47031-L POWER RANGE OVERPOWER ROD STOP 47031-M POWER RANGE HIGH FLUX 47033-K POWER RANGE CHANNEL DEVIATION 47032-K POWER RANGE POSITIVE RATE CHANNEL ALERT 47032-L UPPER QUADRANT POWER TILT RATIO HIGH Control board indication 4122602 NI-42B high N42 channel B drawer indication NI-42 high N42 channel A Drawer 42A Upper detector indication high Rod Control Summer failure 47042-G AUCTIONEERED TAVG – TREF DEVIATION (if rod movement excessive) Rod inward motion (when left in AUTO or taken to AUTO) Rod Control Tave-Tref meter 41213 indicates high (+10)
	RO/CRS	Identify/report failure of Power Range NI channel 42 high Determine rod motion not required: • Turbine load stable • RCS Tave stable for turbine load (≤ Tref)
	RO	Secure dilution, if in progress Place Rod Control Bank Selector to MAN
	CRS	Implement Alarm Response Sheet and A-NI-48 "Abnormal Nuclear Instrumentation" and direct operator action. Direct stopping load decrease
	RO	Verify Control Rod Bank Selector in MAN

Comments: _____

Scenario No: 2		Event No. 2 & 3
Event Description:		Nuclear power range channel N42 upper detector fails high (200%). Detector "A" indication will fail upscale. Channel total output will rise above 100%. Control rods will begin to step in due to the rate of change of nuclear power (compared to turbine power that does not change). Either the operator will determine rod motion is not required and placed in MAN; OR, inward rod motion will unexpectedly continue due to failed summing circuit. If rod control is taken to AUTO after N42 channel has been removed from service then rods will begin stepping in again. The operator would then be required to take control to MAN once the need for rod motion is verified not to exist.
Time	Position	Applicant's Actions or Behavior
	CRS	Implement A-MI-87 "Bistable Tripping for Failed Reactor Protection or Safeguards Inst.", Attachment I "N42 NUCLEAR POWER RANGE RR114" – "REMOVAL FROM SERVICE", and direct operator action.
	RO	Perform prerequisite alignments: • Place Upper Section switch on Detector Current Comparator to PR N42 • Place Lower Section switch on Detector Current Comparator to PR N42 • Place Rod Stop Bypass switch on Miscellaneous Control and Indication Panel to BYPASS PR N42 • Place Power Mismatch Bypass switch on Miscellaneous Control and Indication Panel to BYPASS PR N42 • Place Comparator Channel Defeat switch on Comparator and Rate drawer to N42 • Place N42A drawer Control Power breaker to OFF
	RO/CRS	Direct actions to trip bistables associated with PR N42: • Perform partial SP 47-316B to check redundant channel bistable contacts • Direct I&C to enter Relay Rack RR-114
	RO	When conditions permit, position Control Rod Bank Selector to AUTO Identify/report Tavg-Tref mismatch AND/OR Identify/report unwarranted rod insertion (if rods placed in AUTO) Verify Control Rod Bank Selector in MAN Verify rod motion stopped (if Rod Control placed in AUTO previously)
	CRS	Implement E-CRD-49A "Continuous Rod Insertion", and direct operator action. (if rod inward motion noted) **(NOTE: Crew may refer to E-CRD-49A for guidance on actions even if rod motion does not occur.)**
	RO	Withdraw Control Bank and restore Tavg-Tref program (RD 11.3.4)

Comments: _____

Scenario No: 2		Event No. 2 & 3
Event Description:		Nuclear power range channel N42 upper detector fails high (200%). Detector "A" indication will fail upscale. Channel total output will rise above 100%. Control rods will begin to step in due to the rate of change of nuclear power (compared to turbine power that does not change). Either the operator will determine rod motion is not required and placed in MAN; OR, inward rod motion will unexpectedly continue due to failed summing circuit. If rod control is taken to AUTO after N42 channel has been removed from service then rods will begin stepping in again. The operator would then be required to take control to MAN once the need for rod motion is verified not to exist.
Time	Position	Applicant's Actions or Behavior
	RO	Verify the following (per A-MI-87): • Annunciator 47033-D OPΔT HIGH in alarm • Annunciator 47033-C OTΔT HIGH in alarm • Annunciator 47041-Q OPΔT CHANNEL RNBACK/RDSTP ALERT in alarm • Annunciator 47041-R OTΔT CHANNEL RNBACK/RDSTP ALERT in alarm • Annunciator 47032-K POWER RANGE POSITIVE RATE CHANNEL ALERT in alarm • Annunciator 47032-J POWER RANGE NEGATIVE RATE CHANNEL ALERT in alarm • Annunciator 47033-J POWER RANGE DETECTOR VOLTAGE LOW in alarm • 44907-0402 PR N42 P8 Status Light lit • 44907-0502 PR N42 P10 Status Light lit • 44907-0602 PR N42 Low Range Hi Flux Status Light lit • 44907-0702 PR N42 Hi Range Hi Flux Status Light lit • 44907-0506 Loop A OTΔT Status Light lit • 44907-0606 Loop A OPΔT Status Light lit • 44907-0802 PR 42 Hi Flux Rate Status Light lit • 44906-0502 N42 Rod Stop Bypassed Status Light lit • 44904-0101 Loop A Chan 2 OTΔT Status Light lit • 44904-0401 Loop A Chan 2 OPΔT Status Light lit
	RO	• Verify Quadrant Tilt Monitor operable • Verify 4 thermocouples per quadrant operable (> 85% power) Plant Computer OR ICC Monitoring System
	CRS	Review Technical Specification 3.5.b & c: • Table 3.5-2: • No. 2 Nuclear Flux Power Range • No. 5 Overtemperature ΔT • No. 6 Overpower ΔT Determine continued operation acceptable (3 channels required OPERABLE)

Comments: _____

Scenario No: 2		Event No. 2 & 3
Event Description:		Nuclear power range channel N42 upper detector fails high (200%). Detector "A" indication will fail upscale. Channel total output will rise above 100%. Control rods will begin to step in due to the rate of change of nuclear power (compared to turbine power that does not change). Either the operator will determine rod motion is not required and placed in MAN; OR, inward rod motion will unexpectedly continue due to failed summing circuit. If rod control is taken to AUTO after N42 channel has been removed from service then rods will begin stepping in again. The operator would then be required to take control to MAN once the need for rod motion is verified not to exist.
Time	Position	Applicant's Actions or Behavior
	CRS	Contact I&C/Maintenance to investigate N42 failure

Comments: _____

Scenario No: 2		Event No. 4
Event Description:		S/G A steam pressure channel, PI-468, fails to midscale (from ~ 790 to 200 psig). This channel provides pressure compensation to the controlling steam flow channel, causing the steam flow indication FI-464 to decrease. Feedwater flow and S/G level will initially decrease in response to sensed steam demand. FW-7A will throttle close. The operator is required to take manual control of FW-7A and restore level to reference value.
Time	Position	Applicant's Actions or Behavior
	CUE:	Annunciator alarms: 47061-I STEAM GEN A LO-LO PRESS SI CHANNEL ALERT 47064-I STEAM GEN A PRESSURE LOW 47061-C S/G A FEED FLOW EXCESSIVE (due to non-failed channels) S/G A pressure PI-468 reading 200 psig while other channels PI-469 and PI-482A read ~790 psig Steam flow FI-464 reading LOWER than other channels for S/G A and S/G B: FI-465 reads approx. same as S/G B steam flow channels FI-474 and FI-475 Unexpected decrease in S/G A level (LI-471/472/473) Stable turbine load
	BOP/CRS	Identify/report unusual response of FW-7A/failure of steam flow channel FT-464 Identify/report failure of S/G A steam pressure channel PT-468 midscale
	BOP	Take MAN control of FW-7A Restore S/G A level to program
	CRS	Implement Alarm Response Sheet, A-MI-87 "Bistable Tripping for Failed Reactor Protection or Safeguards Inst.", Attachment I "PT-468 STEAM GENERATOR PRESSURE RR-109" – "REMOVAL FROM SERVICE", and direct operator action.
	BOP	Perform prerequisite alignments: • Place Steam Flow Channel Selector switch for S/G A 46547/HFC-465 to 465/YELOW (Ch II) • Place SD-3A/CV-4301302/HC-478, S/G A PORV Auto/Manual selector, to MANUAL
	BOP/CRS	Direct actions to remove PT-468 from service: • Perform partial SP 47-316A to check redundant channel bistable contacts for PT-468 removal from service. • Direct I&C to enter Relay Rack RR-109 to trip associated bistables for PT468.

Comments: _____

Scenario No: 2		Event No. 4
Event Description:		S/G A steam pressure channel, PI-468, fails to midscale (from ~ 790 to 200 psig). This channel provides pressure compensation to the controlling steam flow channel, causing the steam flow indication FI-464 to decrease. Feedwater flow and S/G level will initially decrease in response to sensed steam demand. FW-7A will throttle close. The operator is required to take manual control of FW-7A and restore level to reference value.
Time	Position	Applicant's Actions or Behavior
	BOP	When conditions permit, position balance S/G level, steam flow and feed flow and restore FW-7A to AUTO per A-FW-05A. Verify the following: • Annunciator 47064-I STEAM GEN A PRESSURE LOW in alarm • Annunciator 47061-I STEAM GEN A LO-LO PRESS SI CHANNEL ALERT in alarm • Annunciator 47061-C S/G A FEED FLOW EXCESSIVE in alarm • Annunciator 47061-B S/G A SF > FF in alarm • 44908-0701 MS Hdr A Low-Low Press Status Light lit • 44907-0901 S/G A SF > FF Status Light lit

	CRS	Review Technical Specification 3.5.b & c:
		• Table TS 3.5-2:
		  • No. 16 Steam Flow/Feedwater Flow Mismatch
		Determine continued operation acceptable (1 channel required OPERABLE)
		
		• Table TS 3.5-3
		  • No. 1.c Low Steam Pressure/Line Safety Injection
		Determine continued operation acceptable (2 channels required OPERABLE)
		
		• Table TS 3.5-4:
		• No. 1.a (as above)
		• No. 2.a. Hi-Hi Steam Flow with Safety Injection Steamline Isolation
		• No. 2.b. Hi Steam Flow and 2 of 4 Lo-Lo T_{avg} with Safety Injection Steamline Isolation
		Determine continued operation acceptable (One channel required OPERABLE)

	CRS	Inform I&C/Maintenance of S/G A pressure channel PT-468 failure/status

Comments: _____

Scenario No: 2		Event No. 5
Event Description:		Loss of AC power to Individual Rod Position Indication rack RR-149. This will cause the Control Room indication for all the IRPIs to fail to ZERO, and the associated ROD BOTTOM lights will light. Technical Specifications (and operating procedures) require a plant shutdown if more than one IRPR in a group or if more than two IRPI per bank are inoperable. Control rod motion is limited to no more than 12 steps if reactor power is ≥ 85% OR no more than 24 steps if reactor power is < 85%. If these limits are exceeded, the reactor must be tripped. If IRPI failures are caused by an electrical power problem (power supply) then 36 hours are allowed to repair the problem however the rod motion criteria is a continuous action item.
Time	Position	Applicant's Actions or Behavior
	CUE:	Annunciator alarms: 47041-P ROD BOTTOM ROD DROP 47033-11 TLA-1 ROD SUPERVISION ALARM All IRPI indication at bottom of scale All IRPI ROD BOTTOM lights lit No change in plant parameters (RCS temperature, NI power or flux tilts, Rod motion)
	RO/CRS	Identify/report loss of power to IRPIs Verify reactor trip has not occurred [Reactor trip breakers closed] Check for dropped rods: • Check PR Delta Flux within Target Band [4122701-4122704] • Check Power Range NIs for quadrant tilts [4122601-04 OR N41-N44 drawers] Determine NO dropped rod indicated
	CRS	Implement Alarm Response Sheet and E-CRD-49C "Dropped Rod" and direct operator action
	CREW	Stabilize the plant: • Stop turbine unloading • Place Control Rod Control Bank Selector to MAN (if desired)
	RO	Check PR Delta Flux within Target Band [4122701-4122704] Check Power Range NIs for quadrant tilts [4122601-04 OR N41-N44 drawers]
	CREW	Determine NO dropped rod
	CRS	Implement A-CRD-49D "Malfunctioning Rod Position Indicator", A-CRD-49B "Full Length Rod Misalignment" and direct operator action **(NOTE: First action step of A-CRD-49D has operator determine rods not misaligned.)**

Comments: _____

Scenario No: 2		Event No. 5
Event Description:		Loss of AC power to Individual Rod Position Indication rack RR-149. This will cause the Control Room indication for all the IRPIs to fail to ZERO, and the associated ROD BOTTOM lights will light. Technical Specifications (and operating procedures) require a plant shutdown if more than one IRPR in a group or if more than two IRPI per bank are inoperable. Control rod motion is limited to no more than 12 steps if reactor power is ≥ 85% OR no more than 24 steps if reactor power is < 85%. If these limits are exceeded, the reactor must be tripped. If IRPI failures are caused by an electrical power problem (power supply) then 36 hours are allowed to repair the problem however the rod motion criteria is a continuous action item.
Time	Position	Applicant's Actions or Behavior
	RO/CRS	Determine a loss of AC power to all IRPIs is indicated If AC power is lost to all IRPIs AND • If rod motion occurs that causes Group Step Counters to indicate movement > 12 steps ≤85% thermal power OR • If rod motion occurs that causes Group Step Counters to indicate movement > 24 steps between ≥50% and < 85% thermal power THEN TRIP the Reactor
	RO	Maintain Tave on program Position Control Rod Bank Selector to MAN (if not already performed) Check following parameters: • Power Range NIs [4122601-04 OR N41-N44 drawers] • PR Delta Flux Monitors [4122701-4122704] • Core Exit Thermocouple Map on PPCS Report all parameters normal except N-42 which is failed. Compare Rod Position Indications to affected Bank Step position: • Individual Rod Position Indications • Individual Rod Position from PPCS • Individual Rod Position DC voltage readings for conditioning module
	CREW	Determine rod misalignment is NOT indicated **(NOTE: At this point A-CRD-49B directs the operator to return to A-CRD-49D for a malfunctioning IRPI.)**
	RO	Maintain power level by boration or dilution

Comments: _____

Scenario No: 2		Event No. 5
Event Description:		Loss of AC power to Individual Rod Position Indication rack RR-149. This will cause the Control Room indication for all the IRPIs to fail to ZERO, and the associated ROD BOTTOM lights will light. Technical Specifications (and operating procedures) require a plant shutdown if more than one IRPR in a group or if more than two IRPI per bank are inoperable. Control rod motion is limited to no more than 12 steps if reactor power is ≥ 85% OR no more than 24 steps if reactor power is < 85%. If these limits are exceeded, the reactor must be tripped. If IRPI failures are caused by an electrical power problem (power supply) then 36 hours are allowed to repair the problem however the rod motion criteria is a continuous action item.
Time	Position	Applicant's Actions or Behavior
	CREW	Contact operator to check power to IRPI panel (RR149, Regulator Harmonic filter BRB-121, 120V 208V cabinet BRB-127) Each hour record: • QPTR (PPCS) • Individual Rod and Bank Step Counter positions (A-CP-46, Data Sheet 2) Following reactor shutdown, Emergency Borate for each Control Rod with an inoperable IRPI
	CRS	Review Technical Specification 3.10 Direct Electrical Maintenance to investigate power supply to RR149/BRB-127 breaker 22
		NOTE: When it is determined 36 hours to repair are available, Event 6 can be entered.

Comments: _____

Scenario No: 2		Event No. 6
Event Description:		A loss of condenser vacuum occurs over a 15 minute period. Once the crew is alerted to the reduction in condenser vacuum (increase in backpressure), attempts may be made to reduce load to stabilize condenser vacuum. The RO will have to control Tavg with boration, applying the rod motion limits associated with the IRPI power failure. Condenser vacuum does not recover and the crew should initiate a manual trip based on either condition: 1) Inability to maintain condenser vacuum within the limits of Figure 1 of E-AR-09 OR 2) Required Rod motion of > 12 steps.
Time	Position	Applicant's Actions or Behavior
	CUE:	Annunciator alarms: Computer alarm P0300A 47051W CONDENSER VACUUM LOW Condenser vacuum indicator 4101001 decreasing
	BOP/CRS	Identify/report a reduction in condenser vacuum (increasing backpressure)
	CRS	Implement Alarm Response Sheet, and/or E-AR-09 "Loss of Condenser Vacuum", and direct operator action.
	CREW	Announce "Losing Condenser Vacuum" on Gaitronics
	BOP	Monitor turbine operation within limits of Figure 1 of E-AR-09. Verify normal Circulating Water System operation: • Both Circ Pump running • Circ Pump Discharge Check Valves open [CW-1A, CW-1B] • Condenser Inlet Valves open [CW-2A1, 2A2, 2B1, 2B2] • Waterbox Priming Ejector operating.
	CREW	Determine loss of vacuum NOT due to loss of Circulating Water
	BOP	Verify Gland Steam Supply Pressure [4101002] at 2.5-4.0 psig Direct operator to locally verify normal water level in Condensate Drain Tank Direct operator to locally verify steam supply to air ejectors at 118-125 psig If condenser pressure increases to 5" HgA, direct operator to place hogging jet in service Reduce turbine load as directed Recognize/Report inability to maintain condenser vacuum within limits of Figure 4 of N-TB-54 (5.5 in. HgA @ > 300 MW)

Comments: _____

Scenario No: 2		Event No. 6
Event Description:		A loss of condenser vacuum occurs over a 15 minute period. Once the crew is alerted to the reduction in condenser vacuum (increase in backpressure), attempts may be made to reduce load to stabilize condenser vacuum. The RO will have to control Tavg with boration, applying the rod motion limits associated with the IRPI power failure. Condenser vacuum does not recover and the crew should initiate a manual trip based on either condition: 1) Inability to maintain condenser vacuum within the limits of Figure 1 of E-AR-09 OR 2) Required Rod motion of > 12 steps.
Time	Position	Applicant's Actions or Behavior
	RO	Perform reactivity adjustments as necessary to maintain Tavg-Tref matched and stabilize plant: Rod Control insertion AND/OR Boron Concentration Control Recognize/Report control rod motion at limits specified in A-CRD-49D (no more than 12 steps if reactor power is ≥ 85% OR no more than 24 steps if reactor power is < 85%).
	CRS	Direct reactor trip on: • Inability to maintain condenser pressure (below limits of Figure 1 of E-AR-09) AND/OR • Control Bank movement exceeds limits for operation without IRPI available
	RO	Manually trip reactor by depressing reactor trip pushbutton [46285] Report failure of reactor to trip
		NOTE: Actions continued under next Event.

Comments: _____

Scenario No: 2		Event No. 7
Event Description:		When a trip is generated, the reactor trip breakers fail to open. This requires both Control Room operator action to manually insert control rods and remove power to the Control Rod Drive system, and local actions to open the reactor trip breakers and Rod Drive MG Breakers. The RO will have to deal with inability to determine control rod positions following the trip.
Time	Position	Applicant's Actions or Behavior
	CUE	Manual trip attempted Reactor Trip Breakers A & B RED close indication lit Reactor power remains > 5% Turbine tripped
	CRS	Direct actions of FR-S.1 "Response to Nuclear Power Generation/ATWS" **(NOTE: E-0 immediate action for verification of reactor trip is not listed here since it is inherent in the actions performed by the crew.)**
	RO **[CT]** **FR-S.1** **— C**	Perform immediate operator actions of FR-S.1 Verify reactor trip: • Reactor trip & bypass breakers open • Rod Position Indicators read ZERO • Rod bottom lights LIT • Neutron flux decreasing Attempt to manually trip reactor by depressing reactor trip pushbutton Report failure of reactor to trip • Manually insert Control Rods
	BOP **[CT]** **FR-S.1** **— C**	Perform immediate operator actions of FR-S.1 • Open Bus 33 and Bus 43 supply breakers [13301, 14301]
	CREW	Perform immediate operator actions of FR-S.1 • Dispatch operator to locally • Open Reactor Trip Breakers • Position Rod Drive MG Set motor and generator Circuit Breaker C/Ss to TRIP • When Reactor trip breakers and MG set breakers have been opened, re-energize buses 33 and 43

Comments: _____

Scenario No: 2		Event No. 7
Event Description:		When a trip is generated, the reactor trip breakers fail to open. This requires both Control Room operator action to manually insert control rods and remove power to the Control Rod Drive system, and local actions to open the reactor trip breakers and Rod Drive MG Breakers. The RO will have to deal with inability to determine control rod positions following the trip.
Time	Position	Applicant's Actions or Behavior
	BOP	Perform immediate operator actions of FR-S.1 Verify Turbine Trip: • HP turbine impulse pressure PI-486 trending toward ZERO • All turbine STOP VALVES closed Verify Feedwater Isolation: • FW-7A and FW-7B Main FW Flow Control Valves closed • FW-10A and FW-10B Main FW Bypass Flow Control Valves closed **(NOTE: Immediate Actions of FR-S.1 complete)**
	BOP	Check AFW Pumps running • Both MD AFW Pumps running • T/D AFW Pump running (if necessary)
	CREW	Check ATWS Actions completed: • ATWS actions in progress • Reactor tripped • Turbine tripped **(NOTE: The local operator will trip the Reactor Trip Breakers and MG Set breakers and contact Control Room about actions.)**
	CRS	Transition to E-0 step 3 Evaluate Critical Safety Function Status Trees Direct Operator actions of E-0
	BOP	Perform immediate operator actions of E-0 Verify power to Emergency AC Busses • Bus 5 energized OR • Bus 6 energized

Comments: _____

Scenario No: 2		Event No. 7
Event Description:		When a trip is generated, the reactor trip breakers fail to open. This requires both Control Room operator action to manually insert control rods and remove power to the Control Rod Drive system, and local actions to open the reactor trip breakers and Rod Drive MG Breakers. The RO will have to deal with inability to determine control rod positions following the trip.
Time	Position	Applicant's Actions or Behavior

	CREW	Perform immediate operator actions of E-0
		Determine SI needed/actuated needed
		• If actuated:
		  • 47021-A SI TRAIN A ACTUATED lit
		  • 47021-B SI TRAIN B ACTUATED lit
		
		• If NOT actuated
		  • Check
		  • Przr pressure <1815 psig
		  • Przr level CANNOT be maintained > 5%
		  • RCS Subcooling (CETs) < 30°F
		  • S/G pressures < 500 psig
		  • CNMT pressure > 4 psig
		
		Determine that SI is NOT required
		• Announce Reactor Trip

	SRO	Transition to ES-0.1 "REACTOR TRIP RESPONSE" Evaluate Critical Safety Function Status Trees Direct operator actions of ES-0.1

	CREW	Check RCS temperatures:
		• RCS average temperatures stable at or trending to 547°F
		
		• If temperature < 547°F and decreasing:
		  • Stop dumping steam
		  • If at least one Motor-Driven AFW pump running then place T/D AFW control switch in PULLOUT
		  • If cooldown continues, control feed flow to > 200 gpm until one S/G NR level > 4% [15% ADVERSE]
		  • If cooldown continues, then close MS-1A & 1B and MS-2A & 2B, MSIV and MSIV Bypass valves.

	BOP	Check Feedwater Status: • Check RCS temperature < 554°F • FW-7A and FW-7B Main FW Flow Control Valves closed • Verify AFW flow to S/G s > 200 gpm [41404202] • Stop both Feedwater Pumps and place C/S to PULLOUT

Comments: _____

Scenario No: 2		Event No. 7
Event Description:		When a trip is generated, the reactor trip breakers fail to open. This requires both Control Room operator action to manually insert control rods and remove power to the Control Rod Drive system, and local actions to open the reactor trip breakers and Rod Drive MG Breakers. The RO will have to deal with inability to determine control rod positions following the trip.
Time	Position	Applicant's Actions or Behavior
	RO	Verify all Control Rods fully inserted: • All ROD BOTTOM lights lit • Rod Position Indicators read ZERO NOTE: Power is not available for Rod Bottom Lights and Rod Position Indicators. Emergency Borate per E-CVC-35 • Open CVC-440/MV-32127 Emergency Boration to Charging Pumps • Start Boric Acid Transfer Pump A and B in FAST • Establish at least 80 gpm Charging flow [FI-128] • Establish 80 GPM letdown flow by opening an additional Letdown Orifice Isol valve (LD-4A or 4B, or opening LD-4C and closing the other orifice isol valves) **(NOTE: The Emergency Boration may have been initiated anytime following the completion of the Immediate Operator actions of E-0, as directed by A-CRD-49D)**
		NOTE: Next Event is entered when adequate boration flow verified.

Comments: _____

Scenario No: 2		Event No. 8
Event Description:		A large break LOCA occurs. The crew will return to E-0 to perform the actions required for a Safety Injection. The crew will continue to perform actions of the IPEOPs directed toward LOCA response. When all required actions have been performed prior to the requirement for transfer to recirculation mode for ECCS, the scenario will be **halted momentarily** and **time compression** used to reduce RWST level to the point requiring transfer to recirculation The crew will determine conditions require initiation of recirculation and establish recirculation flow with one train of ECCS.
Time	Position	Applicant's Actions or Behavior
	CUE	LOCA: Numerous annunciators Rapid reduction in Przr pressure Loss of Przr level Rising Containment pressure 4151202, 4150501-4150506 and temperature 41507-41511 indication Rising Containment Sump levels 4131703, 4131704, 41337 Increasing radiation levels on Containment radiation monitors R-2, R-7, also RE-29064 and RE-29065 Transfer to recirculation: Annunciator: 47023-B RWST LEVEL LOW RWST level indications LI-920, LI-921 at or below 37%
	CREW	Identify/report inability to maintain Przr level and/or RCS pressure Report Safety Injection actuation
	CRS	Implement E-0 "REACTOR TRIP OR SI"
	RO	Perform immediate operator actions of E-0 Verify reactor trip: • Reactor trip & bypass breakers open • Rod Position Indicators read ZERO • Rod bottom lights LIT • Neutron flux decreasing
	BOP	Perform immediate operator actions of E-0 Verify Turbine Trip: • HP turbine impulse pressure PI-485/486 trending toward ZERO • All turbine STOP VALVES closed Verify power to Emergency AC Busses • Bus 5 energized • Bus 6 energized

Comments: _____

Scenario No: 2		Event No. 8
Event Description:		A large break LOCA occurs. The crew will return to E-0 to perform the actions required for a Safety Injection. The crew will continue to perform actions of the IPEOPs directed toward LOCA response. When all required actions have been performed prior to the requirement for transfer to recirculation mode for ECCS, the scenario will be **halted momentarily** and **time compression** used to reduce RWST level to the point requiring transfer to recirculation The crew will determine conditions require initiation of recirculation and establish recirculation flow with one train of ECCS.
Time	Position	Applicant's Actions or Behavior

	CREW	Perform immediate operator actions of E-0
		Determine SI needed/actuated
		• If actuated:
		  • 47021-A SI TRAIN A ACTUATED lit
		  • 47021-B SI TRAIN B ACTUATED lit
		
		  • If NOT actuated
		  • Check
		  • **Przr pressure <1815 psig**
		  • **Przr level CANNOT be maintained > 5%**
		  • **RCS Subcooling (CETs) < 30°F**
		  • S/G pressures < 500 psig
		  • **CNMT pressure > 4 psig**
		
		Determine that SI is required (or soon will be required) on any of the highlighted parameters
		
		• If required, Manually actuate SI [Safety Injection Train A(B) – START pushbuttons[4647201, 4647501]
		
		Make plant announcement for Safety Injection

	BOP	Check Main Steamline Isolation
		• Check high-high steam flow (> 4.45×10^6 lb/hr) for S/G A(B)
		• Check high steam flow (> 0.7×10^6 lb/hr) AND Tavg < 540°F for S/G A(B)
		• Check Containment pressure > 17 psig
		
		• If any of the above conditions exist , verify closed:
		  • MS-1A and MS-1B S/G A(B) MSIV
		  • MS-2A and MS-2B S/G A(B) MSIV Bypass Valve

	RO/BOP	Verified Containment Spray NOT required: • CNMT pressure remained below 23 psig [PI-945-950] • If Containment pressure > 23 psig, verify Containment Spray initiated: • ICS Pump A running

Comments: _____

Scenario No: 2		Event No. 8
Event Description:		A large break LOCA occurs. The crew will return to E-0 to perform the actions required for a Safety Injection. The crew will continue to perform actions of the IPEOPs directed toward LOCA response. When all required actions have been performed prior to the requirement for transfer to recirculation mode for ECCS, the scenario will be **halted momentarily** and **time compression** used to reduce RWST level to the point requiring transfer to recirculation The crew will determine conditions require initiation of recirculation and establish recirculation flow with one train of ECCS.
Time	Position	Applicant's Actions or Behavior
	RO (cont)	• IC-2A Cntmt Spray Pump 1A Suct from RWST open • ICS-5A Containment Spray Pump 1A Discharge open • ICS-6A Containment Spray Pump 1A Discharge open • ICS-201 and ICS-202 ICS Recirculation to RWTS closed
	BOP	Verify Containment Cooling • Fan Coil Units running • Verify SW-903A-D CFCU SW Return Isolation valves open • Check Containment pressure remained below 4 psig • May check RBV-150A-D CFCU Emergency Dampers remain shut Verify Aux Bldg Special Vent running: • Annunciator 47052-G ZONE SV BNDRY DAMPER NOT CLOSED not lit • Verify Zone SV fans [ASV-91A(B)/CD-34014(34015) ASV Exhaust Fan A(B) and Damper] running Verify Service Water Pumps (A1, A2, B1) running Verify Feedwater Isolation: • FW-7A and FW-7B Main FW Flow Control Valves closed • FW-10A and FW-10B Main FW Bypass Flow Control Valves closed • BOTH Feedwater Pumps off Verify both MD AFW Pumps running • Place T/D AFW Pump control in PULLOUT
	CREW	Identify/report need to use ADVERSE CONTAINMENT values when Containment pressure exceeds 4 psig
	RO	Verify the CI Active Status Panel [11] lights lit

Comments: _____

Scenario No: 2		Event No. 8
Event Description:		A large break LOCA occurs. The crew will return to E-0 to perform the actions required for a Safety Injection. The crew will continue to perform actions of the IPEOPs directed toward LOCA response. When all required actions have been performed prior to the requirement for transfer to recirculation mode for ECCS, the scenario will be **halted momentarily** and **time compression** used to reduce RWST level to the point requiring transfer to recirculation The crew will determine conditions require initiation of recirculation and establish recirculation flow with one train of ECCS.
Time	Position	Applicant's Actions or Behavior
		Verify ECCS pumps running: • SI pumps • RHR pumps • CC Pumps • SI Active Status Panel [10] lights lit Report all SI Active Status Panel lights lit with exception of SW Pump "B2" [0406] (expected) (and ICS Pump "B" [1105] if Containment Spray actuated) Verify SI flow: • With RCS pressure < 2100 psig [1900 psig ADVERSE]: • SI flow indicated on FI-925 • Check RCS pressure < 150 • RHR flow indicated on F928 and F626
	BOP	Verify total AFW flow > 200 gpm [4104102, 4104202]
	RO	Check RXCP Seal Cooling: • CC Supply for Thermal Barrier Isolation Valves CC-600, CC-601A(B), CC-610A(B) and CC-612A(B) open • Thermal Barrier temperatures TI-610 and TI-614 normal • RXCP Bearing Temperatures TI-125 and TI-132 normal Check RCS temperatures: • RCS Average Temperature [TI-401-404, recorder 42554, computer trend] stable at or trending to 547°F (or RCS Cold Leg Temps [Recorder 42555 or computer trend] at or trending to 547°F is NO RXCP running)
	BOP	• With temperature < 547°F: • Stop dumping steam • Verify T/D AFW is in PULLOUT (not available) • Control feed flow to > 200 gpm until one S/G NR level > 4% [15% ADVERSE]

Comments: _____

Scenario No: 2		Event No. 8
Event Description:		A large break LOCA occurs. The crew will return to E-0 to perform the actions required for a Safety Injection. The crew will continue to perform actions of the IPEOPs directed toward LOCA response. When all required actions have been performed prior to the requirement for transfer to recirculation mode for ECCS, the scenario will be **halted momentarily** and **time compression** used to reduce RWST level to the point requiring transfer to recirculation The crew will determine conditions require initiation of recirculation and establish recirculation flow with one train of ECCS.
Time	Position	Applicant's Actions or Behavior
	RO	Check Przr PORVs and Spray Valves closed: • PORVs closed • Normal Spray valves closed [PS-1A(B) indicating lights] • CVC-15 Aux Spray Valve closed Check if RXCPs should be tripped: • SI flow indicated on FI-925 AND • RCS subcooling based on CETs < 15°F [45°F ADVERSE] • If both conditions exist stop both RXCPs and place in PULLOUT **(NOTE: Above action to trip RXCPs may have occurred earlier as directed by E-0 QRF.)**
	BOP	Check if S/G secondary boundary: • Check S/G pressures decreasing in uncontrolled manner Identify/report both S/G pressures stable (or increasing)
	CREW	Check S/G tubes are NOT ruptured: • R-15 (Condenser Air Ejector radiation monitor) indication normal • R-19 (S/G Blowdown monitor) indication normal • R-31 and R-33 (Main Steamline monitors) indication normal Identify/report all secondary radiation monitors normal

	CREW	Check if RCS is intact, check:
		• Containment pressure [PI-945-450 (4150501-4150506)]
		• Containment Sump A level [41337]
		• Wide Range Containment level [LI-41317-03, 04 (4131703, 04); Computer points L8001A, L8002A]
		• Containment Radiation monitors:
		  • R2 Containment vessel area
		  • R7 Incore Instr Seal Table area

Comments: _____

Scenario No: 2		Event No. 8
Event Description:		A large break LOCA occurs. The crew will return to E-0 to perform the actions required for a Safety Injection. The crew will continue to perform actions of the IPEOPs directed toward LOCA response. When all required actions have been performed prior to the requirement for transfer to recirculation mode for ECCS, the scenario will be **halted momentarily** and **time compression** used to reduce RWST level to the point requiring transfer to recirculation The crew will determine conditions require initiation of recirculation and establish recirculation flow with one train of ECCS.
Time	Position	Applicant's Actions or Behavior
	CREW (cont)	• RE-29064, RE 29065 (WR Recorder) Containment Hi Level Rad 1B & 1A Determine all parameters are off-normal with rising indications Identify/report LOCA
	CRS	Transition to E-1 "LOSS OF REACTOR OR SECONDARY COOLANT" Evaluate Critical Safety Function Status Trees Transition to FR-P.1 "Response to Imminent Pressurized Thermal Shock Condition" Direct actions of FR-P.1 Direct operator actions of E-1
	RO	Check if FR-P.1 implementation is required: • RCS pressure > 150 psig • Determine RHR injection flow, FI-626 and FI-928, greater than 375 gpm
	CRS	Return to Procedure and step in effect. Transition to E-1 "LOSS OF REACTOR OR SECONDARY COOLANT" Direct operator actions of E-1

	RO	If RXCPs not already stopped, check if RXCPs should be tripped:
		• Verify RCS injection flow:
		  • SI flow indicated on FI-925
		  OR
		  • RHR Pump flow > 375 gpm for F928 or F626
		
		• RCS subcooling based on CETs < 15°F [45°F ADVERSE]
		
		• If both conditions exist stop both RXCPs and place in PULLOUT
		
		Check RWST level > 37% [4131101 LI-920, 4131102 LI-921]

Comments: _____

Scenario No: 2		Event No. 8
Event Description:		A large break LOCA occurs. The crew will return to E-0 to perform the actions required for a Safety Injection. The crew will continue to perform actions of the IPEOPs directed toward LOCA response. When all required actions have been performed prior to the requirement for transfer to recirculation mode for ECCS, the scenario will be **halted momentarily** and **time compression** used to reduce RWST level to the point requiring transfer to recirculation The crew will determine conditions require initiation of recirculation and establish recirculation flow with one train of ECCS.
Time	Position	Applicant's Actions or Behavior
	BOP	Check if S/Gs are faulted: • Check S/G pressures decreasing in uncontrolled manner OR • Check any S/G completely depressurized
	BOP (cont)	Check intact S/G levels: • S/G B narrow range (NR) level > 4% [15% ADVERSE] • If not, maintain total feed flow to S/G B > 200 gpm until NR level > 4% [15% ADVERSE] • Control feed flow to maintain NR level between 4% [15% ADVERSE] and 50%
	CREW	Check Main Steamline Radiation Channels R-31 and R-33 on SPDS normal

	RO	Check Przr PORVs and Block Valves:
		• Power to PR-1A and PR-1B available
		• PORVs closed
		  • PR-2A
		  • PR-2B
		• At least ONE PORV Block valve OPEN
		  • PR-1A
		  • PR-2A
		Isolate letdown by closing LD-4A, 4B and 4C Letdown Orifice Isol (If not done previously)
		Reset SI by depressing both SI RESET pushbuttons [4647202, 4647502]
		Reset Containment Isolation by depressing both CNTMT ISOL RESET pushbuttons [4647302, 4647602]

	BOP	Verify Instrument Air to Containment established • At least one Air Compressor running • Air header pressure >60 psig [4150101/4150103] • Instrument Air to Containment Isol IA-101 open

Comments: _____

Scenario No: 2		Event No. 8
Event Description:		A large break LOCA occurs. The crew will return to E-0 to perform the actions required for a Safety Injection. The crew will continue to perform actions of the IPEOPs directed toward LOCA response. When all required actions have been performed prior to the requirement for transfer to recirculation mode for ECCS, the scenario will be **halted momentarily** and **time compression** used to reduce RWST level to the point requiring transfer to recirculation The crew will determine conditions require initiation of recirculation and establish recirculation flow with one train of ECCS.
Time	Position	Applicant's Actions or Behavior
	RO	Establish Charging flow: • Verify at least one Charging Pump running • If NOT: • Verify CCW flow to RXCP Thermal Barriers has not been lost • CC Supply for Thermal Barrier Isolation Valves CC-600, CC-601A(B), CC-610A(B) and CC-612A(B) open • Thermal Barrier temperatures TI-610 and TI-614 normal • Start Charging Pumps as necessary • Establish charging flow to maintain Przr level > 5% [30% ADVERSE]
	CREW	Check if SI should be terminated: • **RCS subcooling based on CETs > 30°F [65°F ADVERSE]** • **RCS pressure > 2100 psig {1900 ADVERSE] AND stable or rising** • **Przr level > 5% [30% ADVERSE]** • Secondary Heat Sink: • Total feed flow to S/G B > 200 gpm OR • NR level in S/G B > 4% [15% ADVERSE] Determine SI should not be terminated (based on one or more of the above highlighted conditions)
	RO	Check if Containment Spray should be stopped: • Check ICS Pump any running [GREEN lights lit] • If running: - Check run time > 50 minutes • If not, check containment radiation < 2 R/hr - If containment radiation < 2 R/hr - Check containment pressure < 4 psig • If so, - Reset Containment Spray [4647102, 4647402] - Stop ICS Pump A and close ICS valves ICS-5A , 5B, CI-1001A and B

Comments: _____

Scenario No: 2		Event No. 8
Event Description:		A large break LOCA occurs. The crew will return to E-0 to perform the actions required for a Safety Injection. The crew will continue to perform actions of the IPEOPs directed toward LOCA response. When all required actions have been performed prior to the requirement for transfer to recirculation mode for ECCS, the scenario will be **halted momentarily** and **time compression** used to reduce RWST level to the point requiring transfer to recirculation The crew will determine conditions require initiation of recirculation and establish recirculation flow with one train of ECCS.
Time	Position	Applicant's Actions or Behavior
	RO (cont)	Check if RHR Pumps should be stopped: • RCS pressure >150 psig AND • Stable or increasing • Combined RHR Flow ZERO on FI-626 and FI- 928 • Verify RHR Pumps NOT supplying Containment Sump Recirculation flow • Reset SI if necessary [4647202, 4647502 pushbuttons] • If above are satisfied, stop RHR pumps and place in C/Ss in AUTO
	CREW	Check RCS and S/G pressures: • Pressure in both S/Gs stable or increasing • RCS pressure stable or decreasing If neither condition met, return to step 1 of E-1
	BOP	Check if Diesel Generators (DGs) should be stopped • Verify Bus 5 and Bus 6 energized from offsite power (Breakers 1-501 and 1-601 closed) • Stop DG A and DG B 30 seconds apart (by taking C/S to STOP/PULLOUT position) and place in AUTO
	CREW	Evaluate Plant status: • Verify recirculation capability • Both RHR Pumps operable Report RHR Pump B is not operable • Determine at least one train recirculation capability • Open CC-400A Component Cooling to RHR HX A • Verify operable CC-400B Component Cooling to RHR HX B [GREEN light lit] • Verify operable SI300A and B, RWST Supply to RHR Pump A(B) [RED light lit] • Verify operable SI-350A and B, CNTMT Sump B Supply to RHR Pump A(B) [GREEN light lit] • Verify operable SI-351A and B, CNTMT Sump B Supply to RHR Pump A(B) [GREEN light lit] • Direct local operator(s) to unlock and set to on breakers for recirculation MOVs

Comments: _____

Scenario No: 2		Event No. 8
Event Description:		A large break LOCA occurs. The crew will return to E-0 to perform the actions required for a Safety Injection. The crew will continue to perform actions of the IPEOPs directed toward LOCA response. When all required actions have been performed prior to the requirement for transfer to recirculation mode for ECCS, the scenario will be **halted momentarily** and **time compression** used to reduce RWST level to the point requiring transfer to recirculation The crew will determine conditions require initiation of recirculation and establish recirculation flow with one train of ECCS.
Time	Position	Applicant's Actions or Behavior

	CREW (cont)	• Check Aux Building radiation monitors R-13, R-14 and R-22 normal
		
		• Consult Tech Support Staff to see if E-MDS-30 should be implemented
		• Notify Chemistry to start Containment Hydrogen Monitoring System
		• Direct chemistry to obtain primary and secondary samples per EPIPs
		• Evaluate starting additional plant equipment
		
		Check if RCS cooldown and depressurization is required:
		• Check RCS pressure > 150 psig
		  • If not, check RHR loop flow > 375 gpm
		
		Check if Transfer to Containment Sump Recirculation is required:
		• RWST level < 37%
		  • If not return to step 17 (Evaluate Plant Status)
		
		(NOTE: At this point the scenario will be halted and the Crew informed of time compression of approximately 20 minutes to current plant status. All equipment status is as before with only those parameters changing as affected by the time passing.)

	CREW	Check if Transfer to Containment Sump Recirculation is required: • RWST level < 37% Identify/report RWST level < 37%
	CRS	Transition to ES-1.3 "TRANSFER TO CONTAINMENT SUMP RECIRCULATION" Direct operator actions of ES-1.3
	RO	Perform the following: • Reset SI by depressing both SI RESET pushbuttons [4647202, 4647502] • Reset Containment Spray by depressing both CNTMT SPRAY RESET [4647102, 4647402] Establish Component Cooling flow to RHR Heat Exchangers: • Verify both Component Cooling Pumps running • Open SW-1300A and SW-1300B • Open CC-400A and 400B Component Cooling to RHR HX A and B

Comments: _____

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Time	Position	Applicant's Actions or Behavior

	RO (cont)	Verify LD-6 Letdown Line Isolation closed
		
		Check Charging Pump status:
		• Any Charging Pump running
		  • If so,
		  - Check Charging Pump suction aligned to RWST [CVC-301 open]
		  • If not:
		  - Establish VCT Makeup control
		  - Set Makeup Boric Acid Controller to 11.0
		  - Ensure Makeup Mode Selector in AUTO
		
		  • Establish VCT Makeup Control:
		  - Set Makeup Boric Acid Controller to 11.0
		  - Ensure Makeup Mode Selector in AUTO
		  - Check VCT level between 17% and 28%
		  • Align Charging Pump suction to VCT
		  - Open CVC-1
		  - Close CVC-301
		
		Align SI System for Recirculation:
		• Check both trains SI and RHR capable of recirculation flow
		
		• Check Train B ECCS/ICS
		  - RHR Pump B running and F928 indicates flow
		  - SI Pump B running and Pump amps indicate flow
		  - ICS Pump B Instr 41341 indicates flow (Pump is NOT available)
		
		• Stop Train A SI Pump, RHR Pump and ICS Pump
		
		• Close SI-208 and SI-209 SI Recirculation to RWST
		
		• Open SI-350A CNTMT Sump B Supply to RHR Pump A
		
		• Close SI-300A RWST Supply to RHR Pump A

Comments: _____

Scenario No: 2		Event No. 8
Event Description:		A large break LOCA occurs. The crew will return to E-0 to perform the actions required for a Safety Injection. The crew will continue to perform actions of the IPEOPs directed toward LOCA response. When all required actions have been performed prior to the requirement for transfer to recirculation mode for ECCS, the scenario will be **halted momentarily** and **time compression** used to reduce RWST level to the point requiring transfer to recirculation The crew will determine conditions require initiation of recirculation and establish recirculation flow with one train of ECCS.
Time	Position	Applicant's Actions or Behavior

	RO (cont)
	
	[CT] ES-1.3 — A
		• Open SI-351A CNTMT Sump B Supply to RHR Pump A
		• Close RHR-8A RHR Heat Exchanger A Flow CV
		
		Establish Containment Sump Recirculation flow:
		• Start RHR Pump A
		• Check RCS pressure < 150 psig
		• Establish 1500 gpm recirculation flow:
		  • Throttle open RHR 8A
		  • Maintain flow at 1500 gpm [F626]

	CRS	Direct stopping of all pumps taking suction for RWST when RWST level reaches the Lo-Lo level alarm at 4% Return to E-1 "LOSS OF REACTOR OR SECONDARY COOLANT" (Step 17)
		NOTE: Scenario can be terminated at this point when recirculation flow has been established for Train A RHR.

Comments: _____