

Simulation Facility Calvert Cliffs Scenario No.: 1 Op Test No.: 1

Examiners: _____ Operators: _____ SRO

RO

BOP

Objectives: To evaluate the applicants' ability to conduct a unit power increase, to implement the ARMs, OIs, AOPs, as appropriate, for malfunctioning systems and/or controls including failure of 11 SW Pp, the Condenser Hotwell Lvl Controller, a PRZR ref. line failure including associated instruments and small RCS leak. Once the leak is determined to be in CNMNT a loss of 1Y03 occurs. The reactor is tripped and EOP-0 entered. After EOP-0 is entered, the RCS leak grows to ≈ 300 gpm. 11 FRV will fail as is causing an overfeed of 11 SG. When the SIAS setpoint is reached it will fail to actuate and will have to be actuated manually. In EOP-5, when C/D is commenced, the ADVs will not operate from the control Room.

Initial Conditions: The plant is at $\approx 93\%$ Power, MOC

11 AFW Pp is OOS

TBV-3940 is isolated due to failing open last shift

12 Main CPU is failed for 12 SG DFWCS

11 SGFP Oil Cooler SRW flow is being controlled manually using 1-SRW-446, CV-1622 bypass valve

Turnover: Present plant conditions: $\approx 93\%$ power, MOC; Unit 2 is in MODE 5.

Power history: 100% power for previous 94 days. Reduced to $\approx 95\%$ last shift to clean waterboxes.

Equipment out of service:

- 1) 11 AFW Pp failed to develop adequate discharge head for STP. It is disassembled, expected to be returned to service in 2 days.
- 2) TBV-3940 failed open last shift. Valve is currently isolated and E & C is investigating.
- 3) 12 Main CPU is failed for 12 SG DFWCS. System engineer is investigating.
- 4) 11 SGFP Oil Cooler SRW flow is being controlled manually using 1-SRW-446, CV-1622 bypass valve.

Surveillances due: None

Instructions for shift:

- 1) Waterbox cleaning is complete, waterbox is back in service. The crew is to return power to 100%.

Event No.	Malf. No.	Event Type*		Event Description
Preload	AFW001_01 FW001_03 ESFA001_01 ESFA001_02 MS009_01			11 AFW Pp OOS. 12 Main CPU on 12 SG DFWCS OOS. SIAS fails to actuate automatically. TBV-3940 failed open(use RF to shut TBV-3940 local isolation, 1-MS-120).
1	N/A	R N	RO BOP	The Crew commences a power increase to 100% per OP-3.
2	SW002_01	C	CRO	After power has been raised $\approx 5\%$, 11 SW Pp trips. The CRO should acknowledge the alarms, determine 11 SW Pp has tripped, refer to the ARM and inform the CRS. The CRS will implement AOP-7A. 13 SW Pp will be aligned to 11 header (may also be electrically aligned). If not electrically aligned the CRS should recognize they are in a T.S. action. The CRS should contact the OWC or the electricians for assistance.
3	CD002 (high)	I	CRO	Several minutes after the SW Pp failure, the Hotwell level Cont. (4405) fails high, dumping fully to the CST. The CRO will receive the Hotwell level low alarm, will inform the CRS and refer to the ARM. The CRO should determine 4405 has failed high, take manual control and restore hotwell level. The OWC should be contacted for assistance.
4	RCS026_01 (high)	I	RO	About 3 minutes after the crew has taken manual control of hotwell level, PRZR level contr. (110X) fails high. The RO should acknowledge the alarms, inform the CRS and refer to the ARM. Level control should be shifted to channel Y and the OWC notified.
5	RCS024_02 (low) RCS023_01 (low) RCS002 (5-50 gpm over 5 min)	C	RO	About 2 minutes after 110X fails, 100X and 102B pressure channels fail low and an RCS leak begins to ramp in. The crew should refer to the ARM, select channel Y for control and bypass TM/LP and hi pressure trip units for RPS channel B. The CRS should recognize entrance into T.S. 3.3.1 and 3.3.4. The crew should also bypass SIAS, Block and DSS on ESFAS for 102B. The crew should recognize an RCS leak is taking place and implement AOP-2A.
6	120v003_03 RCS002 (300 gpm) FW006_01 (as is)	M	ALL	After the leak is determined to be in CNMNT, a loss of 1Y03 will occur. If 102B has not been bypassed a reactor trip will result. If bypassed the crew should diagnose a loss of 1Y03. The CRS should direct a reactor trip due to RCS leakage. The crew should implement EOP-0, recognize when a SIAS is necessary, that it has not occurred and manually initiate SIAS.
7	Panel Override ADV Controller to Auto	M	ALL	On the reactor trip 11 FRV fails as is ($\approx 80\%$) causing an over feed of 11 S/G. The crew should recognize the overfeed condition, trip the SGFPs and shift to AFW. The crew should complete EOP-0 and implement EOP-5. AOP-7J may be implemented concurrently with the EOPs for loss of 1Y03. The crew should commence RCS cooldown and depressurization IAW EOP-5. When C/D is commenced, the ADVs will not operate from the control Room. The scenario can be terminated when cooldown and depressurization are commenced and Safety injection flow is throttled.

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

SCENARIO 1 OVERVIEW

The candidates will take the shift at $\approx 93\%$ power with instructions to raise power to 100%.

The Crew begins to raise power to 100%. The crew will use OP-3 and conduct a normal power increase per the OP.

After power has been raised $\approx 5\%$, 11 SW Pp trips. The CRO should acknowledge the alarms, determine 11 SW Pp has tripped, refer to the ARM and inform the CRS. The CRS will implement AOP-7A. 13 SW Pp will be aligned to 11 header (may also be electrically aligned). If not electrically aligned the CRS should recognize they are in a T.S. action. The CRS should contact the OWC or the electricians for assistance.

Several minutes after the SW Pp failure, the Hotwell level Cont. (4405) fails high, dumping fully to the CST. The CRO will receive the Hotwell level low alarm, inform the CRS and refer to the ARM. The CRO should determine 4405 has failed high, take manual control and restore hotwell level. The OWC should be contacted for assistance.

About 3 minutes after the crew has taken manual control of hotwell level, PRZR level contr. (110X) fails high. The RO should acknowledge the alarm, inform the CRS and refer to the ARM. Level control should be shifted to channel Y and the OWC notified.

About 2 minutes after 110X fails, 100X and 102B pressure channels fail low and a small RCS leak begins to ramp in over 5 minutes. The crew should refer to the ARM, select channel Y for the control channel and bypass the TM/LP and hi pressure trip units for RPS channel B. The CRS should recognize entrance into T.S. 3.3.1 and 3.3.4. The crew should also bypass SIAS low pressure and block and DSS on ESFAS for 102B. The crew should recognize an RCS leak is taking place and implement AOP-2A.

After the leak is determined to be in CNMNT a loss of 1Y03 occurs. If 102B has not been bypassed a reactor trip will result. If bypassed the crew should diagnose a loss of 1Y03. The CRS should direct a reactor trip due to the RCS leakage. The crew should implement EOP-0, recognize when a SIAS is necessary, that it has not occurred and manually initiate SIAS.

On the reactor trip, 11 FRV fails as is ($\approx 80\%$) causing an overfeed of 11 S/G. The crew should recognize the overfeed condition, trip the SGFPs and shift to AFW. The crew should complete EOP-0 and implement EOP-5. AOP-7J may be implemented concurrently with the EOPs for loss of 1Y03. The crew should commence RCS cooldown and depressurization IAW EOP-5. When C/D is commenced, the ADVs will not operate from the control Room. The scenario can be terminated when cooldown and depressurization are commenced and safety injection flow is throttled.

Scenario No: 1		Event No. 1		Page 4 of 12
Event Description:		Power increase to 100%.		
Time	Position	Applicant's Actions or Behavior		
	CUE	Turnover directs the crew to raise power to 100%.		
	SRO	<ul style="list-style-type: none"> Performs brief of power escalation per OP-3. Notifies the System Operator power is being raised to 100%. Directs crew to begin a power escalation per OP-3. 		
	RO	<ul style="list-style-type: none"> Commences dilution Monitors reactor power, RCS temperatures during power increase Requests Peer checks for reactivity manipulations 		
	BOP	<ul style="list-style-type: none"> Raises turbine load to maintain Tc within 2°F of program Monitors feedstation to verify S/G levels are being maintained approximately 0 inches 		
	SRO	<ul style="list-style-type: none"> Coordinates power escalation between RO and BOP 		

Scenario No: 1		Event No. 2	Page 5 of 12
Event Description: 11 SW Pp Trips			
Time	Position	Applicant's Actions or Behavior	
	CUE:	Annunciator alarms 1C13 - K-06 11 SW HDR PRESS LO 1C19 - R-03 U-1 4KV ESF FDR BKR TRIP	
	CRO	<ul style="list-style-type: none"> Acknowledges alarms, identifies and reports 11 SW Pp has tripped Refers to the ARM Checks 11 and 12 SW Pp status and header pressure 	
	SRO	<ul style="list-style-type: none"> Acknowledges report and directs implementation of AOP-7A. <ul style="list-style-type: none"> • Informs operators of trip criteria • Directs OSO to align 13 SW Pp to 11 header • Directs CRO to reduce MVARs to zero • Directs RO to monitor the primary 	
	CRO	<ul style="list-style-type: none"> Contacts the System Operator Reduces MVARs to zero Directs OSO to align 13 SW Pp to 11 header Directs CCHX be placed in service 	
	RO	<ul style="list-style-type: none"> Perform actions as directed by SRO 	
	SRO	<ul style="list-style-type: none"> Recognizes in T.S. action (3.7.7) if 13 SW Pp is not aligned to 11 4KV Bus 	
	SRO	<ul style="list-style-type: none"> When 13 SW Pp is aligned to 11 SW header, directs CRO to start 13 SW Pp 	
	CRO	<ul style="list-style-type: none"> Starts 13 SW Pp, and verifies proper operation. 	
	SRO	<ul style="list-style-type: none"> Contacts OWC to investigate failure of 11 SW Pp. 	

Scenario No: 1		Event No. 3	Page 6 of 12
Event Description: Failure of Condenser Hotwell level controller (4405) high.			
Time	Position	Applicant's Actions or Behavior	
	CUE:	Annunciator alarms 1C03 - C-16 CNDSR HOTWELL LEVEL	
	CRO	<ul style="list-style-type: none"> Acknowledges alarm, identifies and reports 1-CD-4405-CV has failed high Refers to the ARM 	
	SRO	<ul style="list-style-type: none"> Acknowledges report and: <ul style="list-style-type: none"> Directs CRO to take 4405-CV to manual and shut the dump CV. Implements AOP-3G Verifies 11 CST level and hotwell level 	
	CRO	<ul style="list-style-type: none"> Perform actions as directed by SRO 	
	SRO	<ul style="list-style-type: none"> Contacts OWC/I&C to investigate failure of 1-LIC-4405. 	

Scenario No: 1		Event No. 4	Page 7 of 12
Event Description: PZR Level Transmitter 1-LT-110X Fails High.			
Time	Position	Applicant's Actions or Behavior	
	CUE:	Annunciator alarms 1C06 - E-33 PZR CH X LVL All but selected Charging Pump stop.	
	RO	<ul style="list-style-type: none"> Acknowledges alarm, identifies and reports LT-110X has failed high. Refers to the ARM 	
	SRO	<ul style="list-style-type: none"> Acknowledges report and directs RO to: <ul style="list-style-type: none"> Shift PZR level control to channel Y Shift PZR heater cutout to channel Y 	
	RO	<ul style="list-style-type: none"> Perform actions as directed by SRO 	
	SRO	<ul style="list-style-type: none"> Refers to T.S. 3.3.10 	
	SRO	<ul style="list-style-type: none"> Contacts OWC/I&C to investigate failure of 1-LT-110X. 	

Scenario No: 1		Event No. 5	Page 8 of 12
Event Description: PZR Press Transmitter 1-PT-100X, 102B fail low and RCS leak			
Time	Position	Applicant's Actions or Behavior	
	CUE:	Annunciator alarms 1C06 - E-29 PZR CH 100 PRESS E- 05 TM/LP TRIP SETPOINT	
	RO	<ul style="list-style-type: none"> Acknowledges alarm, identifies and reports LIC-100X and PT-102B have failed Refers to the ARM Reports the primary is stable 	
	SRO	<ul style="list-style-type: none"> Acknowledges report and directs RO to: <ul style="list-style-type: none"> Shift PZR press control to channel Y Ensure the spray valves are shut Investigate a possible failed instrument line 	
	RO	<ul style="list-style-type: none"> Performs actions as directed by SRO Monitors PZR level and determines it is lowering 	
	SRO	<ul style="list-style-type: none"> Refers to T.S. 3.3.1 and 3.3.4 Directs the associated trip units (6, 7) and ESFAS channels be bypassed (DSS, SIAS PP and SIAS PPB) 	
	CRO	<ul style="list-style-type: none"> Bypasses RPS trip units Reports 110X, 100X and 102B all from the same instrument tap. Reports CNMNT sump alarm and checks CNMNT parameters 	
	SRO	<ul style="list-style-type: none"> Suspects an RCS leak and implements AOP-2A. Directs the RO to: <ul style="list-style-type: none"> Isolate letdown Perform leak isolation steps (STEP E) 	
	RO	<ul style="list-style-type: none"> Performs actions as directed by the SRO. Determines the leak is in CNMNT and not isolated. 	
	SRO	<ul style="list-style-type: none"> Directs trip of the unit due to the RCS leak. (May not get to this point do to loss of 1Y03) 	

Scenario No: 1		Event No. 6	Page 9 of 12
Event Description: Loss of 1Y03.			
Time	Position	Applicant's Actions or Behavior	
	CUE:	<p>Various Annunciators associated with loss of 120V Vital AC Bus.</p> <p>Note: If channel B RPS trip units have not been bypassed a reactor trip will occur. (A low pressure SIAS signal will be generated but will not occur on the bus loss due to SIAS failure).</p>	
	RO	<ul style="list-style-type: none"> • Acknowledges alarms, monitors the primary. • Refers to the ARM 	
	CRO	<ul style="list-style-type: none"> • Determines a trip is not required and that a loss of 1Y03 has occurred • Refers to the ARM 	
	SRO	<ul style="list-style-type: none"> • Determines 1Y03 has failed, prioritizes and decides to trip the reactor due to RCS leakage rather than implement AOP-7J. • Briefs the crew, directs the reactor be tripped and EOP-0 implemented. 	

Scenario No: 1		Event No. 7	Page 10 of 12
Event Description:		Reactor Trip with LOCA	
Time	Position	Applicant's Actions or Behavior	
	CUE:	Manual Reactor Trip initiated (or auto if trip units not bypassed).	
	RO	<p>Perform Post-Trip Immediate Actions:</p> <ul style="list-style-type: none"> Depresses ONE set of Manual RX TRIP buttons Checks reactor tripped <ul style="list-style-type: none"> Prompt drop in NI power Negative SUR Checks ALL CEAs fully inserted Verifies demin water makeup to RCS is secured <ul style="list-style-type: none"> 11 & 12 RCMU pumps secured VCT M/U valve 1-CVC-512-CV is shut If RCS M/U is in DIRECT LINEUP, RWT CHG PP SUCT valve 1-CVC-504-MOV is shut (1-CVC-501-MOV must be opened first) <p>Informs SRO Reactivity Safety Function is complete.</p>	
	BOP	<ul style="list-style-type: none"> Checks reactor has tripped Ensures Turbine has tripped: <ul style="list-style-type: none"> Depresses Turbine TRIP button. Checks the Turbine MAIN STOP VALVES shut. Checks Turbine SPEED drops Verifies turbine generator output breakers open: <ul style="list-style-type: none"> 11 GEN BUS BKR, 0-CS-552-22 11 GEN TIE BKR, 0-CS-552-23 Verifies 11 GEN and EXCITER FIELD BKR's 1-CS-41 and 1-CS-41E are open. <p>Informs SRO the Turbine is Tripped.</p>	
	BOP	<ul style="list-style-type: none"> Checks 11 OR 14 4KV Vital Bus energized Checks 125 VDC and 120 VAC busses energized Verifies CCW flow to RCPs Verifies Switchgear Ventilation in service <p>Informs SRO Vital Auxiliaries Safety Function is complete but 1Y03 is deenergized.</p>	
	RO	<ul style="list-style-type: none"> Determines PZR pressure is not stable between 1850 psia and 2300 psia and is trending lower Determines PZR level is not stabilizing between 80 and 180 inches or trending to 160 inches Ensures RCS subcooling GREATER THAN 30°F Notes a SIAS should have occurred and did not. (Not required until 1725#) Manually actuates SIAS if RCS pressure is <1725. Trips 2 RCPs <p>Informs SRO RCS Pressure and Inventory Safety Function can NOT be met due to low PZR pressure and PZR level.</p>	

Scenario No: 1		Event No. 7	Page 11 of 12
Event Description:		Reactor Trip with LOCA.	
Time	Position	Applicant's Actions or Behavior	
	BOP	<ul style="list-style-type: none"> Verifies Turbine Bypass Valves or ADVs operating to maintain: <ul style="list-style-type: none"> SG pressures between 850 and 920 psia Tcold between 525° and 535°F (notes lowering RCS temp and SG pressure) Determines 11 FRV is failed partially open MSIVs may be shut if SG press decreases to 800# Shuts MFW isolations Checks at least one SG available for controlled heat removal <ul style="list-style-type: none"> SG level between -170 and +30 inches Trips SGFPs Initiates Aux Feedwater to maintain S/G level <p>Informs SRO Core and RCS Heat Removal Safety Function is met. (May be delayed due to waiting for Tc recovery from overfeed)</p>	
	CREW	<ul style="list-style-type: none"> Checks Containment pressure less than 0.7 psig Checks Containment temperature less than 120°F Checks containment radiation monitor alarms CLEAR with NO unexplained trends Checks RMS alarms CLEAR with NO unexplained trends: <ul style="list-style-type: none"> 1-RIC-5415 U-1 wide range noble gas 1-RI-1752 Condenser Offgas 1-RI-4014 Unit 1 SG Blowdown 1-RI-5415 Unit 1 Main Vent Gaseous Determines CNMNT parameters cannot be met due to rising press. and temp (negative trends). <p>Informs SRO CNMNT environment cannot be met and Rad Levels External to CNMNT is met.</p>	
	SRO	<ul style="list-style-type: none"> Conducts EOP-0 mid-brief and directs operators to reverify Safety Function 	
	SRO	<ul style="list-style-type: none"> Determines Recovery Procedure per Diagnostic Flowchart: All Safety Functions met – NO Single Event Diagnosis - EOP-5 Directs transition to EOP-5 	

Scenario No: 1		Event No. 7	Page 12 of 12
Event Description:		Reactor Trip with LOCA	
Time	Position	Applicant's Actions or Behavior	
	SRO	<ul style="list-style-type: none"> Briefs crew prior to EOP-5 implementation Directs actions per EOP-5 	
	RO	<ul style="list-style-type: none"> Monitors RCS Depressurization and RCP trip strategy <ul style="list-style-type: none"> Verifies SIAS or notes SIAS actuation failure and manually actuates (if not done in EOP-0) Trips 2 RCPs when RCP pressure is < 1725 (if not done by EOP-0) Monitors running RCPs for NPSH requirements Verifies boration 	
	CRO	<ul style="list-style-type: none"> Maintain CNMNT environment <ul style="list-style-type: none"> Verifies running in slow due to SIAS Verifies opens SRW 8" valves 	
	CRO	<ul style="list-style-type: none"> Commences RCS cooldown to < 300°F <ul style="list-style-type: none"> Uses TBVs or ADVs to commence cooldown at < 100°F. (will lose TBVs due to SIAS) Determines ADVs don't respond from controller, informs CRS Directs control of ADVs locally or from 1C43 Blocks SGIS when block permitted alarm is received. Maintains S/G level 	
	RO	<ul style="list-style-type: none"> Depressurizes the RCS to reduce subcooling and maintain PZR level. Throttles HPSI to maintain PZR level > 101". 	
		When the cooldown is controlled at < 100°F per hour and HPSI flow is throttled the scenario can be terminated.	

Simulation Facility Calvert Cliffs Scenario No.: 3 Op Test No.: 1

Examiners: _____ Operators: _____ SRO
_____ RO
_____ BOP

Objectives: To evaluate the applicants' ability to conduct a unit power reduction, to implement the ARMs, OIs, AOPs, as appropriate, for malfunctioning systems and/or controls including failure of the SRW Controller for the Main Gen H2 cooler, a PRZR level control failure (110X), a loss of 11 Charging Pp and a loss of 14B 480V bus. After the bus loss is addressed, a SG tube leak begins. The crew takes action per AOP-2A to bring the unit offline. The reactor fails to trip(ATWS), the CEDM MG sets are deenergized and EOP-0 implemented. EOP-6 will be implemented. When the SGIS block permitted alarm is received, SGIS B will not block and SGIS will actuate. When 11 SG is isolated, the safety that was wiping lifts and does not reseal. The crew should transition to EOP-8.

Initial Conditions: The plant is at 100% Power, MOC

11 AFW Pp is OOS

13 CAR is OOS

One 11 SG Safety is wiping steam

PT-102A is failed low

Turnover: Present plant conditions: 100% power, MOC; Unit 2 is in MODE 5.

Power history: 100% power for previous 94 days.

Equipment out of service:

- 1) 11 AFW Pp failed to develop adequate discharge head for STP. It is disassembled, expected to be returned to service in 2 days.
- 2) 1-RV-3993, 11 SG Safety is wiping steam, still considered operable.
- 3) 13 CAR is OOS for bearing replacement. Expected return in 6 hours.
- 4) 1-PT-102A has failed low. OOS since 0410 this morning. IAS for T.S. 3.3.1 and 3.3.4. RPS and ESFAS trip units bypassed. E&C investigating.

Surveillances due: 1B DG STP-O-8 due today. SM will bring STP to CR when ready.

Instructions for shift:

- 1) Maintain 100% power. Perform 1B DG STP-O-8 when directed by SM.

Event No.	Malf. No.	Event Type*		Event Description
Preload	AFW001_01 RCS024_01 RPS005 RPS006 PANEL OVRD – SGIS B BLK KEYSWCH			11 AFW Pp OOS. 1-PT-102A failed low. ATWS. 12 S/G SGIS Block Failure
1	RCS026_01 (low)	I	RO	About 3 minutes after the crew has taken the watch, PRZR level contr. (110X) fails low. The RO should acknowledge the alarm, inform the CRS and refer to the ARM. Level control should be shifted to channel Y and the OWC notified.
2	TG030_01 (closed)	I	CRO	After the 110X failure, the SRW controller for the Main Generator H2 cooler fails the valve shut. When the high temperature alarm is received, the CRO should acknowledge the alarm, inform the CRS and refer to the ARM. The CRO should determine TIC-1608 has failed low causing the CV to go shut and take manual control and restore H2 temperature. The OWC should be contacted for assistance.
3	CVCS023_01	C	RO	After the crew has taken manual control of 1-SRW-1608, 11 Charging Pp trips. The RO should acknowledge the alarms, diagnose the loss of pump, inform the CRS and refer to the ARM. The crew should check for common mode failure and the CRS should direct starting of a backup pump. The OWC and/or maintenance should be notified.
4	480v001_08	C	CRO	After the backup charging pump is started, a loss of 14B 480V Bus occurs. The crew should determine a reactor trip is not required, monitor the primary and diagnose a loss of 14B bus. The crew should also recognize a second charging pump is lost and ensure charging is in service. The CRS should implement AOP-7I and address T.S. for the electrical subsystem and loss of charging pumps.
5	MS001_01 (20-100 gpm over 3 minutes)	R N	RO CRO	After the crew has addressed the loss of bus, a SG tube leak begins. The crew will note the N-16 alarm and determine a tube leak is taking place. The CRS should implement AOP-2A and commence a downpower to PRZR level <101 inches or Tave <537°F. When the trip criteria are reached the CRS should direct a reactor trip. The reactor will fail to trip and the RO should take actions for an ATWS. The crew should implement EOP-0.
6	MS016_02	M	ALL	The crew will perform the actions of EOP-0 and transition to EOP-6. In EOP-6 the crew will commence a rapid cooldown to <515°F Th. When SGIS Block Permitted alarm is received, SGIS B will fail to block and SGIS will actuate. After 11 SG is isolated, the safety that was wiping steam on 11 SG lifts. The crew should then recognize two events are taking place and transition to EOP-8.
7	N/A	M	ALL	11 SG cools down and depressurizes due to the safety lifting. The crew will determine the correct success paths for EOP-8 and the hierarchy in which they should be performed. The scenario can be terminated when the success paths of EOP-8 are being performed

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

SCENARIO 3 OVERVIEW

The candidates will take the shift at 100% power.

After the crew has assumed the watch, PRZR level contr. (110X) fails low. The RO should acknowledge the alarm, inform the CRS and refer to the ARM. Level control should be shifted to channel Y. The CRS should contact the OWC for assistance.

After the 110X failure, the SRW controller for the main generator H2 cooler fails causing the CV to shut. When the high temperature alarm is received, the CRO should acknowledge the alarm, inform the CRS and refer to the ARM. The CRO should determine 1608 has failed low causing the CV to go shut, take manual control and restore H2 temperature. The OWC should be contacted for assistance.

After the crew has taken manual control of 1-SRW-1608, 11 Charging Pp trips. The RO should acknowledge the alarms, diagnose the loss of pump, inform the CRS and refer to the ARM. The crew should check for common mode failure and the CRS should direct starting of a backup pump. The OWC and/or maintenance should be notified.

After the backup charging pump is started, a loss of 14B 480V Bus occurs. The crew should determine a reactor trip is not required, monitor the primary and diagnose the loss of 14B bus. The crew should also recognize a second charging pump is lost and ensure charging is in service. The CRS should implement AOP-7I and address the T.S. for the electrical subsystem and loss of charging pumps.

After the crew has addressed the loss of bus, a SG tube leak begins. The crew will note the N-16 alarm and determine a tube leak is taking place. The CRS should implement AOP-2A and commence a downpower til PRZR level is <101 inches or Tave is <537°F. When the trip criteria are reached, the CRS should direct a reactor trip. The reactor will fail to trip and the RO should take actions for an ATWS. The crew should implement EOP-0.

The crew will perform the actions of EOP-0 and transition to EOP-6. In EOP-6, the crew will commence a rapid cooldown to <515°F Th. When SGIS Block Permitted alarm is received, SGIS B will fail to block and SGIS will actuate. After 11 SG is isolated, the safety that was wiping steam on 11 SG lifts. The crew should then recognize two events are taking place and transition to EOP-8.

11 SG cools down and depressurizes due to the safety lifting. The crew will determine the correct success paths for EOP-8 and the hierarchy in which they should be performed. The scenario can be terminated when the success paths of EOP-8 are being performed

Scenario No:	3	Event No.	1	Page 4 of 13
Event Description:	PZR level Control channel 110X fails Low.			
Time	Position	Applicant's Actions or Behavior		
	CUE	Annunciator E-33 - PZR CH. X LVL alarms. E-35 - PZR HTR CUTOUT All Charging pumps start.		
	RO	<ul style="list-style-type: none"> Acknowledges alarm, identifies and reports LT-110X has failed low. Refers to the ARM 		
	SRO	<ul style="list-style-type: none"> Acknowledges report and directs RO to: <ul style="list-style-type: none"> Shift PZR level control to channel Y Shift PZR heater cutout to channel Y 		
	RO	<ul style="list-style-type: none"> Perform actions as directed by SRO 		
	SRO	<ul style="list-style-type: none"> Refers to T.S. 3.3.10 		
	SRO	<ul style="list-style-type: none"> Contacts OWC/I&C to investigate failure of I-LT-110X. 		

Scenario No: 3		Event No. 2	Page 5 of 13
Event Description: SRW Controller to Main Generator H2 Cooler Fails shut.			
Time	Position	Applicant's Actions or Behavior	
	CUE:	Annunciator alarms 1C02 – B21 – GEN MON STATUS PANEL	
	CRO	<ul style="list-style-type: none"> • Acknowledges alarm, identifies and reports alarm is due to high generator H2 temperature. • Refers to the ARM • Determines 1-TIC-1608 has failed. 	
	SRO	<ul style="list-style-type: none"> • Acknowledges report and directs RO to: <ul style="list-style-type: none"> • Shift 1-TIC-1608 to manual and restore H2 temperature 	
	CRO	<ul style="list-style-type: none"> • Perform actions as directed by SRO 	
	SRO	<ul style="list-style-type: none"> • Contacts OWC/I&C to investigate failure of 1-TIC-1608 	

Scenario No: 3		Event No. 3	Page 6 of 13
Event Description: Trip of 11 Charging Pump.			
Time	Position	Applicant's Actions or Behavior	
	CUE:	Annunciator – F-45 - CHG HDR FLOW LO, PRESS LO. L-18 - 480V ESF MOTOR OVLD	
	RO	<ul style="list-style-type: none"> • Acknowledges alarms, Determines 11 Charging Pump has tripped, informs SRO • Refers to the ARM 	
	SRO	<ul style="list-style-type: none"> • Acknowledges report: • Directs RO to check for common mode failure. • Directs RO start 12 or 13 Charging Pump. 	
	RO	<ul style="list-style-type: none"> • Performs actions as directed by SRO: <ul style="list-style-type: none"> • Verifies suction lineup for Charging Pumps • Starts 12 or 13 Charging Pump • Checks normal charging and letdown flow 	
	SRO	Contacts OWC for support for loss of 11 Charging Pump.	

Scenario No: 3		Event No. 4	Page 7 of 13
Event Description: Loss of 14B 480V Bus			
Time	Position	Applicant's Actions or Behavior	
	CUE:	Annunciators associated with loss of 480V Bus	
	BOP	<ul style="list-style-type: none"> Verifies RPS is not calling for a trip Acknowledges Alarms, Determines 14B 480V Bus has been lost, informs SRO. 	
	SRO	<ul style="list-style-type: none"> Acknowledges report. Directs RO to monitor the primary. Implements AOP-7I, <u>LOSS OF 4KV, 480VOLT OR208/120 VOLT INSTRUMENT BUS POWER</u> <ul style="list-style-type: none"> Directs RO to start 13 Charging Pump if 12 was running. Directs BOP to verify 11 IA Compressor is running Directs BOP to verify additional loads as directed by AOP-7I 	
	RO	<ul style="list-style-type: none"> Starts 13 Charging Pump. 	
	BOP	<ul style="list-style-type: none"> Verifies loads running per AOP-7I. 	
	SRO	<ul style="list-style-type: none"> Refers to T.S. 3.8.9 and 3.5.2 and refers to TRM 15.1.2 and 15.1.3. 	
	SRO	<ul style="list-style-type: none"> Contacts OWC to investigate loss of 14B 480V bus. 	

Event Description: SG Tube Leak.

Time	Position	Applicant's Actions or Behavior
	CUE:	Annunciator alarm - 1C03 - C47- MAIN STM N-16 RAD MON 2C26
	BOP	<ul style="list-style-type: none"> Acknowledges alarm, checks N-16 monitor, determines 11 SG has rising activity. Informs SRO and refers to the ARM.
	SRO	<ul style="list-style-type: none"> Acknowledges report directs RO to assess RCS for leakage Directs the CRO to monitor SG feed and level indications for confirmation. Implements AOP-2A - EXCESSIVE REACTOR COOLANT LEAKAGE. <ul style="list-style-type: none"> Notifies Rad Con Directs chemistry to sample both SGs Determines leak exceeds the capacity of one Charging Pump Determines a SG tube leak exists
	RO	<ul style="list-style-type: none"> Performs actions as directed by SRO Isolates letdown
	CRO	<ul style="list-style-type: none"> Performs actions as directed by SRO Isolates SG B/D
	SRO	<ul style="list-style-type: none"> Directs operators to perform a rapid power reduction to Tave <537°F or PZR level <101". Informs operators of trip criteria.
	RO	<ul style="list-style-type: none"> Performs a 1 minute boration from BASTs. Shifts charging suction to the RWT. Uses CEAs as necessary. Informs SRO when trip criteria are met.
	CRO	<ul style="list-style-type: none"> Reduces turbine load to maintain SG pressure between 800 and 825 PSIA.
	SRO	<ul style="list-style-type: none"> Directs RO to trip the reactor Directs the RO and BOP to implement EOP-0, <u>POST-TRIP IMMEDIATE ACTIONS</u>
	RO	<ul style="list-style-type: none"> Depresses one set of manual reactor trip pushbuttons <ul style="list-style-type: none"> Notes reactor failed to trip Informs SRO of ATWS condition Deenergizes CEDM Motor Generator sets: <ul style="list-style-type: none"> Opens 12A 480V Bus FDR (52-1201) Opens 13A 480V Bus FDR (52-1301) Opens 12A/12B 480V Bus TIE (52-1212) Opens 13A/13B 480V Bus Tie (52-1312) Verifies the reactor is tripped Reenergizes 12A and 13A 480V Buses by closing ANY breakers opened above Checks ALL CEAs fully inserted Verifies demin water makeup to RCS is secured <ul style="list-style-type: none"> 11 & 12 RCMU pumps secured VCT M/U valve 1-CVC-512-CV is shut If RCS M/U is in DIRECT LINEUP, RWT CHG PP SUCT valve 1-CVC-504-MOV is shut <p>Reports Reactivity Control Safety Function is complete</p>

Scenario No: 3		Event No. 6	Page 9 of 13
Event Description:		EOP-0, <u>POST-TRIP IMMEDIATE ACTIONS</u>	
Time	Position	Applicant's Actions or Behavior	
		NOTE: Actions of EOP-0 continued from Event 5	
	BOP	<ul style="list-style-type: none"> Checks reactor has tripped Ensures turbine has tripped: <ul style="list-style-type: none"> Depresses U-1 MAIN TURB TRIP button Checks Turbine STOP valves shut Checks turbine speed drops Verifies turbine generator output breakers open: <ul style="list-style-type: none"> 11 GEN BUS BKR, 0-CS-552-22 11 GEN TIE BKR, 0-CS-552-23 Verifies 11 GEN FIELD BKR 1-CS-41 is open Verifies 11 GEN EXCITER FIELD BKR 1-CS-41E is open <p>Reports the turbine is tripped</p>	
	BOP	<ul style="list-style-type: none"> Checks 11 OR 14 4KV Vital Bus energized Checks 125 VDC and 120 VAC busses energized Verifies CCW flow to RCPs <p>Informs SRO Vital Auxiliaries Safety Function is complete.</p>	
	RO	<ul style="list-style-type: none"> Ensures PZR pressure stabilizes between 1850 psia and 2300 psia and is trending to 2250 psia Determines PZR level is not stabilizing between 80 and 180 inches or trending to 160 inches Ensures RCS subcooling GREATER THAN 30°F <p>Informs SRO RCS Pressure and Inventory Safety Function can NOT be met due to low PZR pressure and PZR level.</p>	
	BOP	<ul style="list-style-type: none"> Verifies Turbine Bypass Valves or ADVs operating to maintain: <ul style="list-style-type: none"> SG pressures between 850 and 920 psia Tcold between 525° and 535°F Checks at least one SG available for controlled heat removal <ul style="list-style-type: none"> SG level between -170 and +30 inches Initiates Aux Feedwater to maintain S/G level <p>Informs SRO Core and RCS Heat Removal Safety Function is met.</p>	

Scenario No: 3		Event No. 6	Page 10 of 13
Event Description:		EOP-0, <u>POST-TRIP IMMEDIATE ACTIONS</u>	
Time	Position	Applicant's Actions or Behavior	
	CREW	<ul style="list-style-type: none"> • Checks Containment pressure less than 0.7 psig • Checks Containment temperature less than 120°F • Checks containment radiation monitor alarms CLEAR with NO unexplained trends • Checks RMS alarms CLEAR with NO unexplained trends: <ul style="list-style-type: none"> • 1-RIC-5415 U-1 wide range noble gas • 1-RI-1752 Condenser Offgas • 1-RI-4014 Unit 1 SG Blowdown • 1-RI-5415 Unit 1 Main Vent Gaseous <p>Informs SRO CNMNT environment is met and Rad Levels External to CNMNT can NOT be met due SG Blowdown and Condenser offgas in alarm.</p>	
	SRO	<ul style="list-style-type: none"> • Conducts EOP-0 mid-brief and directs operators to reverify Safety Functions 	
	SRO	<ul style="list-style-type: none"> • Determines Recovery Procedure per Diagnostic Flowchart: • All Safety Functions met – NO • Single Event Diagnosis - EOP-6 • Directs transition to EOP-6 	

Scenario No: 3		Event No. 7	Page 11 of 13
Event Description:		EOP-6 SG TUBE RUPTURE/EOP-8.	
Time	Position	Applicant's Actions or Behavior	
	SRO	<ul style="list-style-type: none"> Briefs crew prior to EOP-6 implementation Directs actions per EOP-6 	
	CREW	<ul style="list-style-type: none"> If PZR pressure LESS THAN OR EQUAL TO 1725 psia verify SIAS actuation 	
	RO	<ul style="list-style-type: none"> Monitors RCS depressurization If SIAS has not actuated, performs injection lineup and blocks SIAS. Performs RCP Trip Strategy: <ul style="list-style-type: none"> When pressure drops to 1725 psia, trips either (if pressure decrease is a result of the event) <ul style="list-style-type: none"> 11A and 12B RCPs OR 11B and 12A RCPs Monitors RCS temp and pressure limits per ATTACHMENT 1 for minimum pump operating pressure for running RCPs Commences RCS Boration. 	
	BOP	<ul style="list-style-type: none"> Commences RCS Cooldown <ul style="list-style-type: none"> Commences a rapid cooldown to <515°F Th <ul style="list-style-type: none"> Uses TBVs until loss of vacuum (if SIAS actuates) Uses ADVs and records time ADVs open When SGIS Block permitted alarms are received, attempts to block SGIS, <ul style="list-style-type: none"> Notes SGIS A did not block Informs SRO May slow cooldown and direct PWS to attempt to block SGIS B at ESFAS cabinet Reports ESFAS cabinet door open alarm as excepted alarm When SGIS actuates resumes C/D using the ADVs Establishes AFW flow using 13 AFW pump to both S/Gs 	
	RO	<ul style="list-style-type: none"> Evaluates the need to throttle HPSI flow <ul style="list-style-type: none"> When the following conditions are met: <ul style="list-style-type: none"> At least 25°F subcooling based on CETs PZR level > 101 inches At least one S/G available for heat removal RVLMS indicates level is above the top of the hot leg Throttles HPSI flow by throttling HPSI HDR valves and/or stopping 13 HPSI PP to: <ul style="list-style-type: none"> Maintain subcooling between 25 and 140°F based on CETs PZR level between 101 and 180 inches With PZR pressure >200 PSIA and constant stops both LPSI pumps If the HPSI throttle criteria can not be maintained, reinitiates full flow 	

Scenario No: 3		Event No. 7	Page 12 of 13
Event Description:		EOP-6 SG TUBE RUPTURE/EOP-8.	
Time	Position	Applicant's Actions or Behavior	
	RO	<ul style="list-style-type: none"> Depressurizes the RCS to reduce subcooling and maintain PZR level Uses Aux. Spray to depressurize the RCS to maintain the following: <ul style="list-style-type: none"> Reduce RCS pressure to approximately affected S/G pressure at least 25°F RCS pressure as close to NPSH limit of Attachment 1 as possible Aux. Spray use: <ul style="list-style-type: none"> Records PZR water temp and charging outlet temperature Opens Aux Spray valve Operates charging loop stop valves as necessary to adjust Aux. Spray flow Shifts PZR Spray control to manual Shuts normal PZR Spray valves Maintains PZR cooldown <200°F per hour Controls RCS subcooling by the following methods: <ul style="list-style-type: none"> Controlling Aux Spray flow Operating PZR heaters Raising or lowering RCS cooldown rate Throttling or raising HPSI flow Use of PZR vent valves When backflow is anticipated and HPSI throttle criteria are met and a bubble exists in the PZR maintains PZR level between 101 and 120 inches until backflow is initiated 	
	BOP	<ul style="list-style-type: none"> Identify, Isolate and Confirm the Affected S/G Identifies affected S/G (11) by: <ul style="list-style-type: none"> Mismatch in feed flow prior to trip Unexplained S/G level rise pre or post trip Main Steam Line and N-16 RMS S/G chemistry samples When Th is less than 515°F, isolates the affected S/G by: <ul style="list-style-type: none"> Verifies 11 MSIV shut Verifying the MSIV bypass is shut Shifting 11 ADV to 1C43 and verifying shut Shutting 11 S/G FW Isolation valve Shutting 11 AFW Block valves Verifying 11 S/G B/D valves shut Shutting the Main Steam Upstream Drain valves Dispatches a plant operator to observe locally from the Aux. Bldg. Roof the S/G Safeties are shut Verifies the correct S/G is isolated 	
	CREW	<ul style="list-style-type: none"> Notes sound of open MSSV, lowering RCS temp, pressure and PZR level. Monitors SG parameters and determines 11 SG is affected. 	

Scenario No: 3		Event No. 7	Page 13 of 13
Event Description:		EOP-6 SG TUBE RUPTURE/EOP-8.	
Time	Position	Applicant's Actions or Behavior	
	SRO	<ul style="list-style-type: none"> • Determines EOP-6 is no longer the correct EOP and directs transition to EOP-8 <ul style="list-style-type: none"> • Directs operators to determine success paths for all safety functions <ul style="list-style-type: none"> • RC-1, VA-1, PIC-4, HR-2, CE-1, RLEC-2 • Addresses safety functions not being met in EOP-8, (RLEC-2) then • Addresses safety functions that were out in EOP-0 (PIC-4). • Priorities are RLEC-2, PIC-4, RC-1, VA-1, HR-2, CE-1. 	
		When success paths have been selected and hierarchy of performance determined the scenario can be terminated.	

Simulation Facility Calvert Cliffs Scenario No.: 4 Op Test No.: 1

Examiners: _____ Operators: _____ SRO

_____ RO
_____ BOP

Objectives: To evaluate the applicants' ability to conduct a unit power reduction, to implement the ARMs, OIs, AOPs, as appropriate, for malfunctioning systems and/or controls including a rapid downpower as requested by ESO due to transformer problems, failure of a SG FRV controller and failure of the VCT level transmitter. PORV-402 starts to leak, and will be isolated. 12 SRW Pp trips and AOP-7B is implemented. When 13 SRW Pp is started, a SRW leak begins in the Aux. Bldg. on the supply line to 1B DG. After 1B DG is isolated, a CEA drops. AOP-1B is implemented. When the CEA is being recovered a second CEA drops. The CRS should direct the reactor be tripped and EOP-0 implemented. In EOP-0, offsite power will be lost. The 1A DG will fail to start and 12 AFW Pp will seize. The crew should recognize a loss of feed exists along with a station blackout and go to EOP-8.

Initial Conditions: The plant is at 100% Power, MOC

11 AFW Pp is OOS

11 CBP is OOS

0C DG is OOS

PRZR level Ch. 110X is OOS

Turnover: Present plant conditions: 100% power, MOC; Unit 2 is in MODE 3, just entered from Mode 4.

Power history: 100% power for previous 94 days.

Equipment out of service:

- 1) 11 AFW Pp failed to develop adequate discharge head for STP. It is disassembled, expected to be returned to service in 2 days.
- 2) 0C DG is OOS for lube oil pressure switch replacement, expected back in 4 hours.
- 3) 11 CBP is OOS for bearing replacement. Expected return in 6 hours.
- 4) 1-LT-110X has failed high. OOS since 0625 this morning. E&C investigating.

Surveillances due: None.

Instructions for shift:

- 1) Maintain 100% power. PE on 0C DG when returned to service.

Event No.	Malf. No.	Event Type*		Event Description
Preload	AFW001_01 RCS026_01 DG002_01 DG002_02 CD005_01			11 AFW Pp OOS. 1-LT-110X failed high. 0C DG OOS. 1A DG Start failure. 11 CBP OOS.
1	N/A	R N	RO CRO	After the crew has assumed the watch, the ESO calls and requests Unit 1 load be reduced to 650 MWe within the next 15 minutes due to a transformer fire at Waugh Chapel. The crew will commence a rapid downpower per OP-3 and stabilize the unit at 650 MWe.
2	FW018_02 (LO)	I	CRO	After the unit is stabilized, 12 SG FRV Controller fails. The CRO should acknowledge the alarm and inform the CRS. The CRS should direct the CRO to maintain SG level and implement AOP-3G. The CRS should direct the CRO to place the controller switch in the Main PDI Fail position. The CRS should direct the OWC to contact the System Engineer for assistance.
3	CVCS009 (LO)	I	RO	After AOP-3G actions have been taken, VCT Level transmitter LT-227 fails low. This causes Ch. Pp suction to shift to the RWT. The RO should inform the CRS. The CRS should direct the RO to shift Ch. Pp suction back to the VCT. The OWC should be contacted for assistance.
4	RCS021 (5% over 2 min)	C	RO	Next PORV-402 starts to leak. The RO should acknowledge the Quench Tank alarm and note on the acoustic monitor the indicated leakage. The ARM will be referenced and the CRS will direct the PORV Block valve, RC-403 to be closed. The CRS will refer to T. S. 3.4.11. The OWC will be conducted for assistance.
5	SRW003_02 SRW001_02 (5% to 3% over 2 min)	C	CRO	Approximately 3 minutes after the block valve is ordered closed, 12 SRW Pump trips. The ARM is referenced and a check is made for common mode failure. 13 SRW Pump will be started and AOP-7B implemented. When 13 SRW Pp is started, the transient causes a leak on the supply line to 1B DG. The leak will be located and isolated and starting air isolated to 1B DG per AOP-7B. The OWC should be contacted for assistance.
6	CEDS012_29 CEDS012_31	M,R	ALL	After 1B DG starting air is isolated, CEA 29 drops. The RO should acknowledge the alarms, inform the CRS and refer to the ARM. The CRS should implement AOP-1B and address T.S. 3.1.4. The primary will be stabilized and realignment time determined. After notifying maintenance and correcting the cause, realignment will be commenced. When CEA 29 withdrawal is begun, CEA 31 drops. The CRS should direct a reactor trip. The crew should implement EOP-0.
7	SWYD002 AFW001_02	M	ALL	After VA is complete, a loss of offsite power occurs. 1A DG does not start and after HR is complete, 12 AFW Pp trips. The crew will recognize a station blackout exists along with a loss of feed. The crew will implement EOP-8 and restore power via the 1A DG which will also restore AFW. The crew can then transition to EOP-2. The scenario can be terminated once power and AFW are restored.

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

SCENARIO 4 OVERVIEW

The candidates will take the shift at 100% power.

After the crew has assumed the watch, the ESO calls and requests Unit 1 load be reduced to 650 MWe within the next 15 minutes due to a transformer fire at Waugh Chapel. The crew will commence a rapid downpower per OP-3 and stabilize the unit at 650 MWe.

After the unit is stabilized, 12 SG FRV Controller fails. The CRO should acknowledge the alarm and inform the CRS. The CRS should direct the CRO to maintain SG level and implement AOP-3G. The CRS should direct the CRO to place the controller in the Main PDI Fail position. The CRS should direct the OWC to contact the System Engineer for assistance.

After AOP-3G actions have been taken, VCT Level transmitter LT-227 fails low. This causes Ch. Pp suction to shift to the RWT. The RO should inform the CRS. The CRS should direct the RO to shift Ch. Pp suction back to the VCT. The OWC should be contacted for assistance.

Next PORV-402 starts to leak. The RO should acknowledge the Quench Tank alarm and note on the acoustic monitor the indicated leakage. The ARM will be referenced and the CRS will direct the PORV Block valve, RC-403 to be closed. The CRS will refer to T. S. 3.4.11. The OWC will be conducted for assistance.

Next, 12 SRW pump trips off. The CRO acknowledges the alarm, informs the CRS and refers to the ARM. The CRS should direct starting of 13 SRW Pp after checking for common mode failure. AOP-7B is implemented. When 13 SRW Pp is started, the transient causes a leak on the supply line to 1B DG. The CRS should evaluate T.S. 3.8.1 for the DG being OOS. The leak will be located and isolated and starting air isolated to 1B DG. The OWC should be contacted for assistance.

After 1B DG starting air is isolated, CEA 29 drops. The RO should acknowledge the alarms, inform the CRS and refer to the ARM. The CRS should implement AOP-1B and address T.S. 3.1.4. The primary will be stabilized and realignment time determined. After notifying maintenance and correcting the cause, realignment will be commenced. When CEA 29 withdrawal is begun, CEA 31 drops. The CRS should direct a reactor trip. The crew should implement EOP-0.

After VA is complete, a loss of offsite power occurs. 1A DG does not start and after HR is complete, 12 AFW Pp trips. The crew will recognize a station blackout exists along with a loss of feed. The crew will implement EOP-8 and restore power via the 1A DG which will also restore AFW. The crew can then transition to EOP-2. The scenario can be terminated once power and AFW are restored.

Scenario No: 4		Event No. 1	Page 4 of 12
Event Description:		Power reduction to 650 MWe.	
Time	Position	Applicant's Actions or Behavior	
	CUE	The System Operator informs the Control Room of a cooling problem on one of the two inservice transformers at Waugh Chapel and requests the Unit reduce to 650 MWe gross within the next 15 minutes.	
	SRO	<ul style="list-style-type: none"> Directs crew to begin a rapid power reduction per OP-3 Appendix B. Instructs crew on reactor trip criteria: (may have been covered previously in a brief) <ul style="list-style-type: none"> Any valid low S/G pressure pre-trip Any valid high PZR pressure pre-trip Any valid TM/LP pre-trip S/G level approaching +50 or -45 inches Informs chemistry if power reduction is greater than 15% in one hour 	
	RO	<ul style="list-style-type: none"> Initiates PZR spray flow to equalize RCS Boron: <ul style="list-style-type: none"> Energize all PZR backup heater banks Adjust PZR Pressure Controller setpoint to maintain 2250 psia Commences boration from the BASTs followed by shifting suction to the RWT: <ul style="list-style-type: none"> Opens BA direct makeup valve Verifies two charging pumps running Runs a BA pump for 30 seconds After BA Pump is secured, shuts BA direct makeup valve Opens RWT outlet valve Shuts VCT outlet Inserts CEAs if necessary and maintains ASI within the limits of the COLR Requests Peer checks for reactivity manipulations 	
	BOP	<ul style="list-style-type: none"> Lowers TBV controller setpoint to 885 PSIA and requests peer check If power is reduced below 70%, opens the LP FW heater HI LVL Dumps Reduces turbine load to maintain Tc within 5°F of program (Maintains Main Steam header pressure 850-880 psia) Monitors turbine parameters not to exceed <ul style="list-style-type: none"> 150°F/hr rate of change of 1st stage shell inner metal temperature (Point 6 on TR-4404) 75°F 1st stage shell metal temperature differential (Diff between Points 6 & 7 on TR-4404) Unloading rate of 10% step change or 5%/min 	
	SRO	<ul style="list-style-type: none"> Coordinates power reduction between RO and BOP 	
	BOP	<ul style="list-style-type: none"> Monitors feedstation to verify S/G levels are being maintained approximately 0 inches 	

Scenario No: 4		Event No. 2	Page 5 of 12
Event Description: 12 SG FRV Controller Fails.			
Time	Position	Applicant's Actions or Behavior	
	CUE:	SG 12 FW SYSTEM TROUBLE on alarm display FIC-1121 indicates "F"	
	BOP	<ul style="list-style-type: none"> Identifies and reports failure of FIC-1121 to the SRO 	
	SRO	<ul style="list-style-type: none"> Acknowledges report and concurs with the BOP diagnosis Directs implementation of AOP-3G, <u>MALFUNCTION OF MAIN FEEDWATER SYSTEM</u> <ul style="list-style-type: none"> Directs the BOP to place the HS for the PDI in the "Main Fail" position Directs BOP to adjust the affected PDI Controller to maintain SG level approximately zero inches 	
	BOP	<ul style="list-style-type: none"> Performs actions directed by SRO Restores/maintains SG level approximately zero inches 	
	SRO	<ul style="list-style-type: none"> Contacts OWC investigate failure of 1-FIC-1121 	

Scenario No: 4		Event No. 3	Page 6 of 12
Event Description: VCT Level Transmitter, 1-LT-227 fails low.			
Time	Position	Applicant's Actions or Behavior	
	CUE:	Annunciator – F-46 CHG PP SUCT FROM RWT Charging Pump suction swaps to the VCT.	
	RO	<ul style="list-style-type: none"> Acknowledges alarm, notes Charging Pump suction shifted to the RWT, and informs the SRO. Checks VCT level (LT-226) and other parameters/lineup and determines suction shift is invalid. 	
	SRO	<ul style="list-style-type: none"> Acknowledges report: Directs RO to shift Charging suction back to the VCT Directs RO to monitor primary parameters Directs CRO to reduce turbine load as necessary to maintain Tc on program. 	
	RO	<ul style="list-style-type: none"> Shifts Charging suction back to the VCT. Monitors primary parameters. 	
	CRO	<ul style="list-style-type: none"> Maintains Tc on program. 	
	SRO	<ul style="list-style-type: none"> Contacts OWC for support for failure of 1-LT-227. 	

Scenario No:	4	Event No.	4	Page 7 of 12
Event Description:	PORV 402 Leakage.			
Time	Position	Applicant's Actions or Behavior		
	CUE:	Annunciator Alarm - E-1, Quench TK TEMP LVL PRESS Acoustic Monitor indication of leakage		
	RO	<ul style="list-style-type: none"> Notes alarms on IC06 and informs SRO Refers to ARM Determines, based on acoustic monitor indications that PORV 402 or Safety RV-200 is leaking 		
	SRO	<ul style="list-style-type: none"> Acknowledges report and concurs with the ROs diagnosis. Directs RO to close PORV 402 block valve, 1-RC-403 (may direct RO to take PORV 402 to Override Close) 		
	RO	<ul style="list-style-type: none"> Performs action as directed by the SRO When Block valve 403 is closed informs the SRO PORV leakage to the Quench Tank has stopped 		
	SRO	<ul style="list-style-type: none"> Directs RO to return Quench Tank parameters to normal per OI-1B, <u>Quench Tank Operations</u> Refers to T.S. 3.4.11 		
	RO	<ul style="list-style-type: none"> Performs actions directed by SRO 		

Scenario No: 4		Event No. 5	Page 8 of 12
Event Description: 12 SRW Pump Trips/SRW leak in the Aux. Bldg.			
Time	Position	Applicant's Actions or Behavior	
	CUE	Annunciator alarm - 12 SRW HDR PRESS LO U-1 4KV ESF MOTOR OVERLOAD Loss of 12 SRW header pressure	
	BOP	<ul style="list-style-type: none"> Identifies and reports loss of 12 SRW Pp Refers to ARM 	
	SRO	<ul style="list-style-type: none"> Acknowledges report and directs BOP to check for common mode failure 	
	BOP	<ul style="list-style-type: none"> Checks for Motor overload alarm, 12 SRW Head tank level and 11 SRW header parameters Reports no common mode failure cause exists to SRO 	
	SRO	<ul style="list-style-type: none"> Directs 12 SRW Pump be placed in P-T-L Directs BOP to start 13 SRW Pump Implements AOP-7B, <u>LOSS OF SERVICE WATER</u> <ul style="list-style-type: none"> Directs monitoring of Turbine/Generator parameters Directs Main Generator MVARs be reduced to zero (may not since 13 SRW Pump is started) 	
	CREW	<ul style="list-style-type: none"> Perform actions directed by the SRO <ul style="list-style-type: none"> Verifies normal parameters on the 12 SRW header Verifies component temperatures return to normal 	
	SRO	<ul style="list-style-type: none"> Contacts OWC to investigate trip of 12 SRW Pump 	
	BOP	Notes Annunciator alarm - 1C13 - K23 - 12 SRW HEAD TK LVL 12 SRW Head Tank level lowering	
	BOP	<ul style="list-style-type: none"> Acknowledges alarm, reports lowering level in 12 SRW Head tank and refers to ARM Dispatches a plant operator to check SRW Head Tank Makeup CV is open 	
	SRO	<ul style="list-style-type: none"> Acknowledges report and refers to AOP-7B Directs the crew to: <ul style="list-style-type: none"> Monitor turbine/generator temperatures Reduce MVARs to zero Determine if SRW head tank level is lowering slowly or rapidly Dispatch operators to locate the leak 	
	CREW	<ul style="list-style-type: none"> Perform actions as directed by SRO Determines SRW Head Tank level is lowering slowly Determines leak is in Aux. Bldg. due to raising MWRT level 	
	SRO	<ul style="list-style-type: none"> After report of leak in Aux. Bldg., directs crew to: <ul style="list-style-type: none"> Isolate SRW to the Aux. Bldg or 1B DG (close 1-SRW-170 and 172) Isolate starting air to 1B DG Shift SFP cooling lineup to 12 SFP HX (if Aux. Bldg is isolated) Verify ZA train equipment 	
	BOP	<ul style="list-style-type: none"> Performs actions directed by the SRO 	

Event Description: Dropped CEAs

Time	Position	Applicant's Actions or Behavior
	CUE:	Annunciator alarms 1C05 - D- D-31 SECONDARY CEA POSITION DEVIATION +/- 4" D-32 CEA MOTION INHIBIT Dropping Rx power, RCS temp. and press.
	RO	<ul style="list-style-type: none"> Acknowledges alarms, identifies CEA #29 has dropped and informs SRO Refers to the ARM
	SRO	<ul style="list-style-type: none"> Acknowledges report Directs CRO to reduce turbine load to restore Tc to program Implements AOP-1B
	CRO	<ul style="list-style-type: none"> Coordinates with RO and reduces turbine load to restore Tc to program
	SRO	<ul style="list-style-type: none"> Determines CEA realignment time Contacts OWC to obtain support Directs RO to attempt CEA realignment Directs RO and CRO to NOT allow reactor power to rise above the power the unit was stabilized at while the CEA is being aligned.
	RO	<ul style="list-style-type: none"> Attempts CEA realignment using 5.25 inch pull and 15 second wait Monitors reactor power, SUR, temp. etc.
	SRO	<ul style="list-style-type: none"> Refers to T.S. 3.1.4.
	RO	<ul style="list-style-type: none"> During CEA withdrawal, CEA 31 drops, Notes second dropped CEA and informs SRO
	SRO	<ul style="list-style-type: none"> Verifies second CEA drop Directs RO to trip the reactor Directs implementation of EOP-0

Scenario No: 4		Event No. 6	Page 10 of 12
Event Description:		Reactor Trip with Station Blackout	
Time	Position	Applicant's Actions or Behavior	
	CUE:	Manual Reactor Trip initiated.	
	RO	<p>Perform Post-Trip Immediate Actions:</p> <ul style="list-style-type: none"> Depresses ONE set of Manual RX TRIP buttons Checks reactor tripped <ul style="list-style-type: none"> Prompt drop in NI power Negative SUR Checks ALL CEAs fully inserted Verifies demin water makeup to RCS is secured <ul style="list-style-type: none"> 11 & 12 RCMU pumps secured VCT M/U valve 1-CVC-512-CV is shut <p>Informs SRO Reactivity Safety Function is complete.</p>	
	BOP	<ul style="list-style-type: none"> Checks reactor has tripped Ensures Turbine has tripped: <ul style="list-style-type: none"> Depresses Turbine TRIP button. Checks the Turbine MAIN STOP VALVES shut. Checks Turbine SPEED drops. Verifies turbine generator output breakers open: <ul style="list-style-type: none"> 11 GEN BUS BKR, 0-CS-552-22 11 GEN TIE BKR, 0-CS-552-23 Verifies 11 GEN and EXCITER FIELD BKR's 1-CS-41 and 1-CS-41E are open. <p>Informs SRO the Turbine is Tripped.</p>	
	ALL	<ul style="list-style-type: none"> Notes Offsite power has been lost CRS directs BOP to reverify Vital Auxiliaries 	
	BOP	<ul style="list-style-type: none"> Notes 11 are 14 4KV Vital Buses deenergized Checks 125 VDC and 120 VAC busses energized Determines 1Y09 and 1Y10 are deenergized <p>Informs SRO Vital Auxiliaries cannot be met due to no vital 4KV Buses and no 120 Volt instrument buses.</p>	
	RO	<ul style="list-style-type: none"> Ensures PZR pressure stabilizes between 1850 psia and 2300 psia and is trending to 2250 psia Determines PZR level is not stabilizing between 80 and 180 inches or trending to 160 inches Ensures RCS subcooling GREATER THAN 30°F <p>Informs SRO RCS Pressure and Inventory Safety Function can NOT be met due to low PZR pressure and PZR level.</p>	

Scenario No:	4	Event No.	6	Page 11 of 12
Event Description:	Reactor Trip with Station Blackout.			
Time	Position	Applicant's Actions or Behavior		
	BOP	<ul style="list-style-type: none"> Verifies Turbine Bypass Valves or ADVs operating to maintain: (only ADVs are available locally) <ul style="list-style-type: none"> SG pressures between 850 and 920 psia Tcold between 525° and 535°F Directs ABO to locally open ADVs several turns Checks at least one SG available for controlled heat removal <ul style="list-style-type: none"> SG level between -170 and +30 inches Initiates Aux Feedwater to maintain S/G level Notes loss of 12 AFW Pp <p>Informs SRO Core and RCS Heat Removal Safety Function cannot be met due to no feed and no RCPs.</p>		
	SRO	<ul style="list-style-type: none"> Directs PWS/PPO/TBO investigate loss of 12 AFW Pump and to attempt to return it to service. Directs PWS/PPO/OSO investigate start failure of 1A DG and to attempt to return to service 		
	CREW	<ul style="list-style-type: none"> Checks Containment pressure less than 0.7 psig Checks Containment temperature less than 120°F Checks containment radiation monitor alarms CLEAR with NO unexplained trends Checks RMS alarms CLEAR with NO unexplained trends: <ul style="list-style-type: none"> 1-RIC-5415 U-1 wide range noble gas 1-RI-1752 Condenser Offgas 1-RI-4014 Unit 1 SG Blowdown 1-RI-5415 Unit 1 Main Vent Gaseous <p>Informs SRO CNMNT environment cannot be met and Rad Levels External to CNMNT can not be met due loss of power.</p>		
	SRO	<ul style="list-style-type: none"> Conducts EOP-0 mid-brief and directs operators to reverify Safety Function 		
	SRO	<ul style="list-style-type: none"> Determines Recovery Procedure per Diagnostic Flowchart: All Safety Functions met - NO Single Event Diagnosis – NO- EOP-8 Directs transition to EOP-8 		

Scenario No: 4		Event No. 7	Page 12 of 12
Event Description:		EOP-8, Station Blackout/Loss of All Feedwater	
Time	Position	Applicant's Actions or Behavior	
	SRO	<ul style="list-style-type: none"> Briefs crew prior to EOP-8 implementation Directs actions per EOP-8 	
	SRO	<ul style="list-style-type: none"> Contacts System Operator to determine status of offsite power. 	
	SRO	<ul style="list-style-type: none"> Directs operators to select success paths for all safety functions. Verifies selected success paths Determines sequence of success path performance (VA-3, HR-4, PIC-3, RC-1, CE-1, RLEC-1) Directs operators to implement success paths (VA and HR first) 	
	BOP	<ul style="list-style-type: none"> Implements VA-2 (or 3) success path. <ul style="list-style-type: none"> Aligns electrical system for power restoration <ul style="list-style-type: none"> Aligns 13KV and 4KV breakers Places 4KV Bus LOCI Sequencer keyswitches to ON Shuts CC CNMNT supply valve Upon receiving report of 1A DG availability, at SROs direction, places the 1A DG on 11 4KV Bus. When the 1A DG is on the 11 4KV, verifies shutdown sequencer loads are operating. 	
	RO	<ul style="list-style-type: none"> Implements HR-4 success path. <ul style="list-style-type: none"> Isolates SG B/D. Checks to see if OTCC initiation criteria are met. (both S/Gs <350 inches or Tc rises uncontrollably by at least 5°F). Attempts to restore feed <ul style="list-style-type: none"> Opens AFW block valves Aligns feed from unit 2 using 23 AFW Pump OR If 1A DG is now powering 11 4KV Bus then uses 13 AFW to establish feed 	
		When power is restored to 11 4KV Bus and feed is established using either 13 or 23 AFW Pump, the scenario can be terminated.	