Facility: Seabrook | Scenario No.: **1r2** | Op Test No.: 1

Examiners: _____ | Candidates: Palmieri - US

_____ Crosby - PSO

_____ _____

Initial Conditions: Unit at 100% power.

Turnover: Maintain 400 MVARs lagging. Load Control needs the higher MVARs for a system test.

Entered TSASs for CS-P-2B being tagged out of service for planned maintenance 2 hours ago. Return to service expected within 6 hours.

Critical Tasks:

1. MANUALLY trip the reactor from the control room when SSPS fails to automatically trip the reactor. [E-0, A]
2. MANUALLY trip the main turbine before a severe (Orange Path) challenge develops to either the Subcriticality or the Integrity CSF, or before transition to ECA-2.1, whichever happens first. [E-0 – Q]
3. MANUALLY start at least one ESW pump (SW pump or CT pump) for an operating safeguards train before transition out of E-0. [E-0 – L]

Event No.	Malf. No.	Event Type*	Event Description
1	Scenario Exam #19 RCS Pressure	I (Both)	Pressurizer (PZR) pressure channel fails. Transient causes failure of one PZR spray valve resulting in abnormal PZR pressure control.
2	N/A	R (RO) N (US)	The Load Dispatcher contacts the control room to order a power reduction to ≤ 90% power due to pending grid limitations.
3	bkED1UAT	~~M (Both)~~	~~Loss 13.8kV Bus 1 results in reactor trip demand due to loss of A & B RCPs as well as A & C CW pumps.~~
4		C (Both)	Automatic trip of the reactor and main turbine does not occur. Operators are required to manually trip the reactor **(CT)** and turbine **(CT)**.
~~4~~ 5	Trigger Exam 19 power loss	~~M (Both)~~ C N/A	Combination of abnormal PZR pressure control and failure of the main turbine to automatically trip will cause a Safety Injection to occur.
~~5~~ 6	mfSW001	C (Both)	When SI occurs SW-P-41A trips and the standby pump fails to automatically start. The crew must manually start the standby pump **(CT)**.

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

The simulator is initialized at 100% power. The crew is instructed to maintain power. Load Control is conducting a system wide test, and needs the MVAR loading to be maintained at 400 lagging.

CS-P-2B is out of service for an oil change. T.S. 3.1.2.2, 3.1.2.4 and 3.5.2 were entered 2 hours ago. The pump is expected back in 6 hours.

RC-P-455 fails high causing PZR spray valves to open and requiring operators to take action to restore RCS pressure control. Pressurizer spray valve PCV-455B fails partially open at the same time due to a valve positioner problem. This results in abnormal PZR pressure control when PZR pressure control is restored to automatic.

The Load Dispatcher contacts the control room to order a power reduction to $\leq$ 90% power due to pending grid limitations. The crew will utilize major plant evolution procedure OS1000.06, POWER DECREASE and ODI 56 to perform the power reduction.

The 13.8 kV Bus 1 UAT breaker trips and the associated RAT breaker fails to fast transfer. Loss of power to Bus 1 results in reactor trip demand due to loss off A & B RCPs and A & C Circulating Water pumps. The crew enters E-0, REACTOR TRIP OR SAFETY INJECTION. The reactor fails to trip automatically and the operator is required to manually trip the reactor. On the reactor trip, the automatic Turbine Trip fails and all turbine stop and control valves will remain open. MSIVs will not automatically close and cannot be closed from the control room. The operator is required to manually trip the main turbine.

The combination of abnormal PZR pressure control and the failure of the main turbine to trip causes Safety Injection to actuate.

In addition, SW-P41A will trip and the remaining TRAIN A SW pump will fail to auto start causing the crew to perform the RNO for E-0, Attachment A step 7.

Expected procedure transition is E-0 $\Rightarrow$ ES-1.1 $\Rightarrow$ OS1000.11.

1. ☐ Initialize the simulator at 100% IC 300. Raise VAR loading on the Main Generator to 400MVARs LAGGING.

2. ☐ Protected train is 'A'.

3. ☐ Place the control switch for CS-P-2B in PTL
   ☐ Close CS-V-197
   ☐ Danger tag CS-P-2B and CS-V197
   ☐ Press the pushbutton control switch for CVCS TRAIN B BYP/INOP light

4. Run the following SCENARIO to rack-out the breaker for CS-P-2B, de-energize CS-V197, fail automatic trip of the turbine, fail closure of the MSIVs, failure of the Bus 1 RAT breaker to close and failure of SW-P-41C to AUTO start and activate Event Trigger Demo Exams/Exam 19 power loss:

   ☐ SELECT: **Scenario**
   ☐ SELECT: **Demo exams**
   ☐ SELECT: **Exam #19 setup**
   ☐ SELECT: **RUN**

   Verify the following inserted / activated:

   ☐ mfRPS003, AUTOMATIC TURBINE TRIP FAILURE
   ☐ mfSW014, SW PUMP 41C FAILS TO AUTO START

   ☐ svMSV86 ISO VALVE FAILS OPEN
   ☐ svMSV88 ISO VALVE FAILS OPEN
   ☐ svMSV90 ISO VALVE FAILS OPEN
   ☐ svMSV92 ISO VALVE FAILS OPEN
   ☐ bkED1RAT BREAKER FAILS OPEN

   ☐ mvCSV197, MOV BREAKER STATUS OPEN
   ☐ bkCS1P2B_52, BREAKER RACKED-OUT

   ☐ SELECT: **Event Triggers** (Top Bar)
   ☐ SELECT: **Demo Exams/Exam 19 power loss**
   ☐ VERIFY: **ACTIVATED** (Only options are to OPEN / ABORT / CLOSE)

5. Perform the following to cause failure of the reactor to trip automatically on loss of 13.8kV Bus1:

- ☐ SELECT: **MF List**
- ☐ SELECT: **REACTOR PROTECTION**
- ☐ SELECT: **mfRPS001 AUTOMATIC REACTOR TRIP FAILURE (TRAIN 'A')**
- ☐ SELECT: **INSERT**
- ☐ SELECT: **MF List**
- ☐ SELECT: **REACTOR PROTECTION**
- ☐ SELECT: **mfRPS002 AUTOMATIC REACTOR TRIP FAILURE (TRAIN 'B')**
- ☐ SELECT: **INSERT**

Verify the following malfunctions inserted:

- ☐ mfRPS001 AUTOMATIC REACTOR TRIP FAILURE (TRAIN 'A')
- ☐ mfRPS002 AUTOMATIC REACTOR TRIP FAILURE (TRAIN 'B')

6. Activate Event Trigger Demo exams\Exam 19M Delete MSIV failure:

- ☐ SELECT: **Event Triggers**
- ☐ SELECT: **Demo exams**
- ☐ SELECT: **Exam 19M Delete MSIV failure**
- ☐ **ACTIVATE**

Verify the following activated:

- ☐ SELECT: **Event Triggers** (Top Bar)
- ☐ **Demo Exams/Exam 19M Delete MSIV failure**
- ☐ **ACTIVATED** (Only options are to OPEN / ABORT / CLOSE)

Protected Train is A

Mode 1: 100% RTP, ARO = 228 steps CBD, Boron Concentration = 1293 ppm. ODI-56 rev 7 on US desk, +1 degrees = 88 gal RMW, -1 degree change = 19 gal BA; AFD target 0.60%, Current AFD 0.35%

Grid system test in progress. Reactive load on the main generator is 400MVARs lagging. Dispatch will notify us when the test is completed.

Centrifugal Charging Pump CS-P-2B is danger tagged out for oil change. Entered TSASs 3.1.2.2a, 3.1.2.4 and 3.5.2.a two hours prior to turnover. Expected return to service is 6 hours after turnover.

SCENARIO OUTLINE

EVENT	INSTRUCTION	Actions or Behaviors
Shift Turnover	Shift turnover information as stated. Provide Turnover Sheet	None

When directed by the Lead Examiner, initiate the following event:

EVENT 1

PT-455 fails high and PZR Spray Valve Fails Open.

Perform the following to initiate RC-PT-455 fails high and PZR Spray Valve RC-PCV-455B Fails Open:

- ☐ SELECT **Scenario**
- ☐ SELECT **Demo Exams**
- ☐ SELECT **Exam #19 RCS Pressure**
- ☐ SELECT **Run**

NOTE: IF the crew does nothing, the plant will trip on OTΔT. At scripted severity (0.25), the spray valve will require 3 banks of B/U heaters to return PZR pressure to program. With 3 banks of heaters ON, PZR spray will eventually be required to limit PZR pressure increase. IF the PZR Pressure control is returned to fully auto control, PZR pressure will cycle as the backup heaters are turned on and off.

PSO	Acknowledges alarm, notes failed PZR pressure channel, recommends manual control of PZR pressure control to return PZR pressure to normal.
US	Acknowledges report, directs PSO to use manual control of PZR controller to return PZR to program.
US	Refers to OS1201.06, PT 455 - 458 PZR PRESSURE INSTRUMENT FAILURE and directs operator actions.
RO	Reports CONTROLLING channel (RC-P-455) failed
RO	Manually controls pressure at program
RO	Selects alternate channel for control and backup (457/456) selects Alt. channel for recording and Alt channel for ΔT, OPΔT and OTΔT recording.

EVENT	INSTRUCTION	Actions or Behaviors
CUE:	**IF solicited by the crew, I&C suggests that the failure of RC-PT-455 could have initiated the problem with RC-PCV-455B. Further investigation will be required to confirm.**	RO Notes status of RC-PCV-455B when directed to check Spray Valves – CLOSED and reports to US. US Directs RO to manually close affected spray valve per RNO. RO Reports the spray valve does not respond to controller demand. RO As directed, controls PZR pressure using automatic or manual control. RO Verifies no redundant channel bistables tripped. US Refers to TS 3.3.1, table 3.3-1 item 7, 9 & 10. TS 3.3.2 Table 3.3-3 items 1d & 10a. TS 3.2.5. Notifies I&C to initiate troubleshooting of failed channel, failed spray valve US Coordinates using BTI to bypass the failed channel for troubleshooting or testing. Notifies Work Week Manager and plant management regarding failure.

NOTE: At the discretion of the lead Examiner, bypass the failed channel or trip the failed channel as directed by the US. IF the Lead Examiner chooses, the next event can be initiated without bypassing or placing the channel in trip condition. The scenario will not be affected either way.

NOTE: If the crew chooses to use BTI, perform the following:

☐	SELECT: **Panel Overview**	
☐	SELECT: **BTI CP-1**	
☐	SELECT: **CP-1 Door to OPEN**	D5628 7300 CABINET CAB CP-1 DOOR OPEN
☐	SELECT: **ENABLE**	D4562 7300 CABINET CP-1 BYPASSED / INOP
☐	SELECT: **PB-455A to the UP position**	High Pressure Reactor trip
☐	SELECT: **PB-455C to the UP position**	Low Pressure Reactor trip (P-7 interlocked)
☐	SELECT: **PB-455D to the UP position**	Pressurizer Low Pressure SI (P-11 interlocked)
☐	SELECT: **PB-455B to the UP position**	P-11 permissive
☐	SELECT: **TB-411C to the UP position**	OTΔT Trip
☐	SELECT: **CP-1 Door to CLOSED**	D5628 7300 CABINET CAB CP-1 DOOR OPEN - return

EVENT	INSTRUCTION	Actions or Behaviors

NOTE: If the crew chooses NOT to use BTI, perform the following to trip the bistables:

☐	SELECT: **Panel Overview**	
☐	SELECT: **Trip CP-1**	D5628 7300 CABINET CAB CP-1 DOOR OPEN
☐	SELECT: **CP-1 Door to OPEN**	
☐	SELECT: **PB-455A to the UP position**	High Pressure Reactor trip
☐	SELECT: **PB-455C to the UP position**	Low Pressure Reactor trip (P-7 interlocked)
☐	SELECT: **PB-455D to the UP position**	Pressurizer Low Pressure SI (P-11 interlocked)
☐	SELECT: **PB-455B to the UP position**	P-11 permissive
☐	SELECT: **TB-411C to the UP position**	OTΔT Trip
☐	SELECT: **CP-1 Door to CLOSED**	D5628 7300 CABINET CAB CP-1 DOOR OPEN - return

After allowing the crew to complete OS1201.06, or at the Lead Examiner's discretion, continue to the next event.

NOTE: H2 pressure control will not be restored. The bearing oil will maintain 25 psig H2 pressure on loss of MSOP/ESOP.

EVENT 2

Power decrease	Contact the control room as Load Dispatch. Direct a power decrease to ≤ 90% power within the next 15 minutes due to pending grid limitations. Maintain ≤ 90% until cleared by Load Dispatch.	US	Refers to OS1000.06, POWER DECREASE and ODI 56 for power reduction. Provides direction on rate and control bands for operators. Conducts brief for power decrease.
		SUR	Uses the LOAD SELECTOR load decrease push-button or LOAD LIMIT SET potentiometer to reduce load to maintain power and VAR loading.

NOTE: The power reduction allows the RO to satisfy the (R)eactivity control or (N)ormal control requirement and the US to satisfy the (N)ormal control requirement. Once met, the next event may be started.

EVENT	INSTRUCTION	Actions or Behaviors	
		SUR	If reducing load with the load selector, FOLLOW the load set with the load limit set potentiometer and the standby load set.
		RO	Initiates boration / inserts control rods to control RCS temperature and AFD.
			Uses ODI 56 values or DETERMINES the quantity of boric acid required to make the desired reactivity change from RS1735,"Reactivity Calculations"
			TURNS the BLENDER MODE START SWITCH to STOP
			PLACES the BORIC ACID BLENDER MODE SELECTOR SWITCH to BORATE.
			CHECKS/PLACES CS-FIC-111 in auto remote (A/R).
			CHECKS/PLACES CS-FIC-110 in auto remote (A/R).
			SETS CS-FIQ-111 controller to the desired flow rate.
			SETS CS-FIQ-111 controller to the desired quantity.
NOTE:	**Operators are required to remain at the makeup controls during the boration / dilution and makeup evolution. This will ensure proper system response is verified as well as the desired amount.**		TURNS the BLENDER MODE START SWITCH to START. When the boric acid supply counter has added its preset quantity, VERIFIES the boration stopped.
		RO	As directed by US, RETURN the makeup controls to automatic blended makeup.
			As directed by US, OPERATE pressurizer heaters to force spray to equalize boron concentration between the RCS and pressurizer.
		US	Provide oversight of power reduction. Notify plant management of plant status.

After the crew has dispatched NSO(s) to respond and initiated a power decrease, or at the lead examiner's discretion, continue with the next event.

EVENT	INSTRUCTION	Actions or Behaviors
EVENT 3		
Loss of 13.8 kV Bus 1 & Rx Trip Demand	Initiate a loss of bus 1 as follows :	
	☐ SELECT: **MF List** ☐ SELECT: **Electrical Distribution (component)** ☐ SELECT: **bkED1UAT** ☐ SELECT: **Fail Open (UAT BREAKER FAILS OPEN)** ☐ SELECT: **INSERT**	Crew must recognize demand for reactor trip and trip the reactor manually. Crew performs Immediate Actions (I/As).
		RO Trips the reactor MANUALLY **(CT)**. Verifies reactor trip and bypass breakers open, neutron flux decreasing, and rod bottom lights lit.
	A trip demand will occur when Bus 1 loses power due to loss of A & B RCPs and A & C CW pumps. On the plant trip, the pressure transient will cause the spray valve to drift open to 30%.	SUR Trips the main turbine MANUALLY **(CT)**. Verifies all turbine stop valves closed and generator breaker open. Verifies power to AC Emergency busses, verifies all emergency busses energized.
NOTE:	**Combination of increased spray flow, abnormal PZR pressure control and requirement to MANUALLY trip the main turbine, automatic SI is expected.** **IF the crew established tripping the RCPs associated with PZR spray as contingency actions after I/As to avoid depressurization to SI after a reactor trip, THEN an automatic SI may not occur. In that case the crew will exit E-0 at step 4 to ES-0.1 Step 1. Go to page 14.**	RO Checks if SI is actuated – *IF YES, crew continues in E-0 after the US reads the I/As. IF NO, crew will go to ES-0.1, REACTOR TRIP RESPONSE after the US reads the I/As.* US Enters E-0, REACTOR TRIP OR SAFETY INJECTION, Step 1 and directs operator actions to verify I/As completed.
EVENT 4	SW-P-41A will trip and SW-P-41C will not automatically start. The crew will be required to manually start SW-P-41C **(CT)** to provide cooling to the only available high head injection pump.	RO Performs ATTACHMENT A. Notes the status of TRN A SW and starts SW-P-41C per ATTACHMENT A RNO **(CT)**.

EVENT	INSTRUCTION	Actions or Behaviors	
		SUR	Performs operator actions on both sides of the MCB until RO has completed ATTACHMENT A.
		US/SUR	Checks if MSIVs should be closed - *NO*
		US/SUR	Check CNTMT pressure has remained < 18 psig - *YES*
		US/SUR	Verifies total EFW > 500 gpm - *YES*
		US/SUR	Monitors RCS temp stable at or trending to 557°F – *NO*
		SUR	As directed, opens EFW mini-flow and throttles EFW to reduce cooldown.
NOTE	It is expected, but not required that the RO will have completed ATTACHMENT A, briefed the US and returned to performing MCB manipulations by Step 10 of E-0.	US/RO	Checks RCS Isolated – *NO*
		RO	As directed, closes CS-V145 to isolate the RCS
		US/RO	Checks PORVs closed - *YES*
		US/RO	Checks PZR spray valves closed - *NO*
NOTE:	It is expected that if RCS pressure has not stabilized or begun increasing, the crew will evaluate shutting down RC-P-1C to minimize spray flow through the failed open spray valve.	RO	AS directed, checks closed / closes spray valve and shuts down RC-P-1C.
		RO	As directed (NOTE) maintains seal injection flow to all RCPs.
		US/RO	Checks whether ALL RCPs should be stopped – *NO, subcooling SAT*
		US/SUR	Checks for faulted SG - *NO*
		US/SUR	Checks for ruptured SG - *NO*
		US/RO	Checks whether RCS is intact - *YES*
		CREW	Checks if ECCS flow should be reduced:
		US/RO	Checks RCS subcooling > 40°F - *YES*
		US/SUR	Checks secondary heat sink - *YES*

EVENT	INSTRUCTION	Actions or Behaviors	
NOTE:	IF the crew did not stop RC-P-1C at RNO step 10c 2), then RCS pressure may not be stable or increasing. IF this occurs the crew will be forced to implement E-0 steps 16 – 26, returning to step 9 and then step 10 where they will have another opportunity to stop RC-P-1C to minimize spray flow.	US/RO	Checks RCS pressure stable or increasing - *YES*
		US/RO	Check PZR level > 5% - *YES*
		RO	As directed, resets SI
			Verifies only CS-P-2A running and DOES NOT shut down CS-P-2A.
		RO	Checks RCS pressure stable or increasing – *YES*
		RO	AS directed, opens CS-V142 and 143, closes SI-V138 and 139, establishes 60 gpm charging flow while maintaining 6 – 10 gpm seal injection flow.
		US	Exits E-0 to Step 7 of ES-1.1, SI TERMINATION.
		CREW	Begins monitoring CSFs for implementation.
NOTE:	**The scenario may be terminated at the Lead Examiner's discretion or when the crew has established inventory control in ES-1.1, SI TERMINATION (step 15).**		
		US/RO	Check if SI pumps should be stopped - *YES*
		RO	As directed, places SI pumps in STBY.
			As directed, places RH pumps in STBY
		US/RO	Verifies ECCS not required – *YES (not required)*
		RO	As directed, resets T signal (P signal NA)
		CREW	Checks Instrument Air:
		US/SUR	Verifies instrument air pressure normal - *YES*
		US/RO	Verifies PCCW CNTMT isolations open - *YES*
		US/SUR	Verifies CNTMT instrument air pressure normal - *YES*
		US/RO	Checks if CBS pumps running - *NO*
		US/RO	Check if Letdown can be established - *YES*

EVENT	INSTRUCTION	Actions or Behaviors	
		RO	As directed, opens CC-V341, closes / checks closed letdown drag valves, opens CNTMT isolation valves, opens letdown valves, throttles a drag valve to establish letdown flow.
		RO	As directed, sets VCT makeup controls
Expected E-Plan classification for this event: NO CLASSIFICATION		RO	As directed, aligns CCP suction to VCT.

EVENT	INSTRUCTION	Actions or Behaviors	
	NOTE: This portion of the scenario is only applicable if the crew successfully took actions to prevent a Safety Injection actuation.		
Transition to ES-0.1		US	Enters ES-0.1, REACTOR TRIP RESPONSE and directs operator actions.
		US	Reads applicable CAUTIONS and NOTES of ES-0.1, reviews ES-0.1 OAS items with crew.
	NOTE: It is expected that upon exiting E-0, the crew will discover that SW-P-41A has tripped and TRN A components have lost service water cooling. While SI has not actuated, restoration of TRN A SW remains a critical task as CS-P-2A is the only pump available for RCS inventory control and RCP seal injection.	CREW	Takes action to restore TRN SW cooling by MANUALLY starting SW-P-41C **(CT)**.
		US/RO	Checks RCS temperature stable or trending to 557°F – *YES (trending to 557°F)*
		US/SUR	Checks RCS temperature < 557°F **OR** FWI actuated – *YES (FWI)*
		SUR	Verifies FWI by status panel.
		SUR	Verifies total EFW > 500 gpm, verifies, main FW pumps tripped and closes FW pump discharge valves.
		US/RO	Verifies all control rods fully inserted - *YES*
		US/RO	Check PZR level > 17% - *YES*
		US/RO	Check charging in service - *YES*
		US/RO	Check letdown in service - *YES*
		US/RO	Check PZR level trending to 25% - *YES*
		US/RO	Check VCT makeup controls set for required boron concentration and automatic - *YES*
		US/RO	Checks PZR pressure > 1800 PSIG - *YES*
		US/RO	Checks PZR pressure stable at or trending to 2235 PSIG - *YES*

US	Reads CAUTIONS regarding overcooling of the plant and CST makeup.
US/SUR	Verifies 5% NR level in at least one SG or 65% WR level in at least two SGs - *YES*
US/SUR	Verifies SUFP or MDEFW available – *YES (both)*
US/SUR	Checks RCS temperature stable or increasing - *YES*
SUR	If not already performed per OAS, opens EFW mini-flow valves and controls SG levels 25% to 50%.

As directed by the Lead Examiner, terminate the scenario.

E-Plan classification for this scenario – NO CLASSIFICATION

Facility: Seabrook | Scenario No.: **2r1** | Op Test No.: 1

Examiners: _____ | Candidates: Palmieri - US

_____ Crosby - BOP

_____ _____

Initial Conditions: Unit at 75% power.

Turnover: Maintain current power level until cleared for power increase by system load control.

Entered TSASs for CS-P-2B being tagged out of service for planned maintenance 2 hours ago. Return to service expected within 6 hours.

Critical Tasks:

1. Control the EFW flow rate to not less than 25 GPM per SG in order to minimize the RCS cooldown rate before a severe (orange path) challenge develops to the integrity CSF. [ECA-2.1 A]

Event No.	Malf. No.	Event Type*	Event Description
1	NA	N (~~R~~O) BOP/US	Power increase.
2	LtFWLT529	I (Both)	Steam Generator narrow range level channel L529 will fail low. As it is the controlling channel, the feedwater control system will respond to increase feed flow to the B SG. Operator action will be required to restore feed flow to normal and return B SG narrow range level to within programmed band.
3	IOR on Turbine Trip pushbutton	M (Both)	An inadvertent turbine trip causes a catastrophic rupture of the main steam bottle (down stream of MSIVs). All four MSIVs will fail to close when the MSI signal is actuated. Manual actuation of MSI in the control room will not cause the MSIVs to close. Procedure progression will be E-0 ⇒ E-2 ⇒ ECA-2.1 where the crew will be directed to reduce feed flow to all SGs to 25 gpm (CT) to avoid severe challenge to the Integrity CSF.
~~4~~ 4	?	C (Both)	
~~4~~ 5	mvFWFV4214A	C (Both)	The motor operator overloads for EFW flow control valve FW-FV-4214A will trip as soon as the valve motion is demanded. The operator will be required to utilize FW-FV-4214B to control EFW flow to A SG.

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

The simulator is initialized at approximately 75% power at EOL. The plant was ordered to reduce power from 100% to current power level due to potential for grid loading limitations / instability. After turnover the crew is cleared for power increase by system load control and expected to return to 100% at 5% / hr.

CS-P-2B is out of service for an oil change. T.S. 3.1.2.2, 3.1.2.4 and 3.5.2 were entered 2 hours ago. The pump is expected back in 6 hours.

The controlling channel for SG B level control will fail low. The feedwater control system will respond to increase feed flow to SG B. Operator action will be required to restore feed flow to normal and return B SG narrow range level to within programmed band.

An inadvertent turbine trip causes a catastrophic rupture of the main steam bottle (down stream of MSIVs). The reactor fails to trip automatically. The crew will have to trip the reactor manually (CT). All four MSIVs will fail to close when the MSI signal is actuated. Manual actuation of MSI in the control room will not cause the MSIVs to close. Procedure progression will be E-0 to E-2 to ECA-2.1 where the crew will be directed to reduce feed flow to all SGs to 25 gpm (CT) to avoid severe challenge to the Integrity CSF. A component failure will occur as the operator attempts to limit EFW flow to SG A. The motor overloads for FW-FV-4214A will actuate and require the operator to utilize FW-FV-4214B to limit EFW to SG A to 25 gpm. When feed flow has been reduced, NSO(s) dispatched to the MSIVs will successfully close MSIVs in the west pipe chase (SG A and D). The crew will exit ECA-2.1 returning to E-2. With EFW limited to 25 gpm a RED condition will exist for the HEAT SINK CSF. A note at the beginning of FR-H.1 states that the procedure should NOT be implemented if feed flow was reduced by operator action. The crew will continue to implement E-2 and transition to ES-1.1, SI TERMINATION.

Seabrook
Simulator Scenario Setup
Scenario 2

1. ☐ Initialize the simulator at 75%, IC98

2. ☐ Protected train is 'A'.

3. ☐ Verify AFD is within ± 1% of target / adjust CBD as necessary
   ☐ Place rod control in AUTOMATIC

4. ☐ Place the control switch for CS-P-2B in PTL
   ☐ Close CS-V-197
   ☐ Danger tag CS-P-2B and CS-V197
   ☐ Press the pushbutton control switch for CVCS TRAIN B BYP/INOP light

5. Run the following SCENARIO to fail AUTOMATIC reactor trip, fail closure of the MSIVs, and activate Event Triggers Demo Exams/Exam 52M FWFV4214A Fails and Demo Exams/Exam 52M Steam Break:

   ☐ SELECT: **Scenario**
   ☐ SELECT: **Demo exams**
   ☐ SELECT: **Exam #52M setup**
   ☐ SELECT: **RUN**

   Verify the following inserted / activated:

   ☐ mfRPS001, AUTOMATIC REACTOR TRIP FAILURE (TRAIN 'A')
   ☐ MfRPS002, AUTOMATIC REACTOR TRIP FAILURE (TRAIN 'B')

   ☐ svMSV86 ISO VALVE FAILS OPEN
   ☐ svMSV88 ISO VALVE FAILS OPEN
   ☐ svMSV90 ISO VALVE FAILS OPEN
   ☐ svMSV92 ISO VALVE FAILS OPEN

   ☐ mvCSV197, MOV BREAKER STATUS OPEN
   ☐ bkCS1P2B_52, BREAKER RACKED-OUT

   ☐ SELECT: **Event Triggers** (Top Bar)
   ☐ SELECT: **Demo Exams/Exam 52M FWFV4214A Fails**
   ☐ VERIFY: **ACTIVATED** (Only options are to OPEN / ABORT / CLOSE)
   ☐ SELECT: **Demo Exams/Exam 52M Steam Break**
   ☐ VERIFY: **ACTIVATED** (Only options are to OPEN / ABORT / CLOSE)

Protected Train is A

MODE 1: 75% RTP, CBD @ 165 steps (ARO = 228 steps), Boron Concentration = 149 ppm. ODI-56 rev 7 on US desk, +1 degrees = 4540 gal RMW, -1 degree change = 40 gal BA; AFD target - 0.65%, Current AFD - 0.69%

The plant was ordered to reduce power from 100% to current power level due to potential for grid loading limitations. When cleared by PSNH Load Dispatch, return to 100% power at 5%/hour. Power Aid for power increase is on US desk.

Centrifugal Charging Pump CS-P-2B is danger tagged out for oil change. Entered TSASs 3.1.2.2a, 3.1.2.4 and 3.5.2.a two hours prior to turnover. Expected return to service is 6 hours after turnover.

SCENARIO OUTLINE

EVENT	INSTRUCTION	Actions or Behaviors	
Shift Turnover	Shift turnover information as stated. Provide Turnover Sheet	US	Provides operators with turnover.

When directed by the Lead Examiner, call the crew as PSNH Load Dispatch. Clear the plant for load increase to 100%:

EVENT 1

Load Increase	US	Briefs crew on power increase. Provides guidelines for operator responsibilities and control bands. Provides Power Aid to BOP. Provides oversight on control manipulations
	SUR	Uses RE provided estimates on RMW required for power increase or DETERMINES the quantity of RMW required to make the desired reactivity change from RS1735,"Reactivity Calculations"
	SUR	As directed, aligns the controls and initiates dilution. Uses control rods for power increase and AFD control.
	BOP	Selects loading rate as directed. Adjusts the LOAD LIMIT SET potentiometer 1% to 2% above current load. Uses the load selector LOAD INCREASE push-button and verifies LOAD INCREASING lamp illuminates. Verifies expected response on turbine 1st stage pressure and control valve response. Follows the load set with the standby load set.

At Lead Examiners discretion, initiate the next event.

EVENT	INSTRUCTION	Actions or Behaviors	
EVENT 2			
FW-L529 Fails Low	Perform the following to initiate failure of the controlling NR level channel for SG B:		
	☐ SELECT **MF List** ☐ SELECT **Feedwater (Component)** ☐ SELECT **ItFWLT529** ☐ **Double Click** ☐ SELECT **FAIL LOW** ☐ INSERT	BOP	Acknowledges alarms, notes failed SG B level channel, recommends manual control of SG B level control to return SG B level to program.
		US	Acknowledges report, directs BOP to use manual control of SG B feed regulating valve to return SG B NR level to program. May direct halt of power increase. Refers to OS1235.03, SG LEVEL INSTRUMENT FAILURE.
		US	Directs operator actions and provides oversight of control manipulations.
		BOP	Identifies failed channel as controlling channel, establishes MANUAL control of SG B feed regulating valve and restores SG B NR level 50% to 70%. Selects an alternate SG level channel for control. Restores SG B FF/SF matched and level at program, then returns SG B level control to AUTO.
		SUR	Verifies no redundant SG B NR level channels tripped on UL-1 and UL-6.
		CREW	Verifies no redundant SG B NR level channels tripped on UL-12
		US	Refers to TSs. TS 3.3.1 Table 3.3-1 Item 13 and TS 3.3.2 Table 3.3-3 Items 5.b, 6.a, 7.c, 10.c and 3.3.3.6 Table 3.3-10, Item 7 are applicable.
		US	Contacts Work Week Manager for support on troubleshooting and repair. Informs plant management of failure. Coordinates with I&C

EVENT	INSTRUCTION	Actions or Behaviors
		US/BOP Check for ATWS mitigation channel failed - *NO*

NOTE: At the discretion of the lead Examiner, bypass the failed channel or trip the failed channel as directed by the US. IF the Lead Examiner chooses, the next event can be initiated without bypassing or placing the channel in trip condition. The scenario will not be affected either way.

NOTE: If the crew chooses to use BTI, perform the following:

☐	SELECT: **Panel Overview**	
☐	SELECT: **BTI CP-1**	
☐	SELECT: **CP-1 Door to OPEN**	D5628 7300 CABINET CAB CP-1 DOOR OPEN
☐	SELECT: **ENABLE**	D4562 7300 CABINET CP-1 BYPASSED / INOP
☐	SELECT: **LB-529A to BYPASS**	
☐	SELECT: **LB-529B to BYPASS**	F4840 SG B LEVEL LO-LO - return
☐	SELECT: **CP-1 Door to CLOSED**	D5628 7300 CABINET CAB CP-1 DOOR OPEN - return

NOTE: If the crew chooses NOT to use BTI, perform the following to trip the bistables:

☐	SELECT: **Panel Overview**	
☐	SELECT: **Trip CP-1**	D5628 7300 CABINET CAB CP-1 DOOR OPEN
☐	SELECT: **CP-1 Door to OPEN**	
☐	SELECT: **LB 529A to the UP position**	D4777 SG B LEVEL HI-HI CHANNEL TRIP
☐	SELECT: **LB 529B to the UP position**	F4840 SG B LEVEL LO-LO – already in alarm
☐	SELECT: **CP-1 Door to CLOSED**	D5628 7300 CABINET CAB CP-1 DOOR OPEN - return

After allowing the crew to complete OS1235.03, or at the Lead Examiner's discretion, continue to the next event.

EVENT	INSTRUCTION	Actions or Behaviors
EVENT 3		
Turbine Trip Steam Break ECA-2.1	Initiate an inadvertent turbine trip as follows:	
	☐ SELECT: **Panel PFF14** ☐ SELECT: **Insert OR** ☐ SELECT: **Main Turbine TRIP pushbutton** ☐ SET Final Value: **TRIP** ☐ **INSERT**	Crew must recognize demand for reactor trip and trip the reactor manually. Crew performs Immediate Actions (I/As). SUR Trips the reactor MANUALLY **(CT)**. Verifies reactor trip and bypass breakers open, neutron flux decreasing, and rod bottom lights lit. BOP Verifies all turbine stop valves closed and generator breaker open. Verifies power to AC Emergency busses, verifies all emergency busses energized.
	A trip demand will occur when the main turbine trips. The catastrophic steam break will be initiated when the turbine trips. Verify that Event Trigger **Demo exams\Exam 25M Steam Break** has actuated:	SUR Checks if SI is actuated, Verifies both trains of SI actuated.
	☐ SELECT: **Malfunctions (Top Bar)** ☐ VERIFY: **mfMS051 MAIN STEAM BOTTLE BREAK – INSERTED at 1.0**	US Enters E-0, REACTOR TRIP OR SAFETY INJECTION, Step 1 and directs operator actions to verify I/As completed. SUR Performs ATTACHMENT A.
	An automatic SI/MSI is actuated but the MSIVs do not close.	BOP Performs operator actions on both sides of the MCB until SUR has completed ATTACHMENT A. US/BOP Checks if MSIVs should be closed - *YES* BOP As directed, attempts to close the MSIVs from the MCB US/BOP Check CNTMT pressure has remained < 18 psig - *YES*

EVENT	INSTRUCTION	Actions or Behaviors	
NOTE:	It is likely that EFW flow to one SG will be automatically isolated by the HIGH FLOW isolation. IF FW-FV-4214A received an isolation signal the valve will fail nearly full open due to the component failure scripted into the scenario.	US/BOP	Verifies total EFW > 500 gpm - *YES*
		US/BOP	Monitors RCS temp stable at or trending to 557°F – *NO*
EVENT 4	When the BOP begins to throttle EFW to SG A using FW-FV-4214A, Event Trigger **Demo Exams/Exam 52M FW4214A Fails** will de-energized the MOV.	BOP	As directed, opens EFW mini-flow and throttles EFW to reduce cooldown. Notes loss of FW-FV-4214A control and uses FW-FV-4214B to throttle EFW flow. Maintains total > 500 gpm.
NOTE	It is expected, but not required that the SUR will have completed ATTACHMENT A, briefed the US and returned to performing MCB manipulations by Step 10 of E-0.	US/SUR	Checks RCS Isolated – *YES*
		SUR	As directed (NOTE) maintains seal injection flow to all RCPs.
		US/SUR	Checks whether ALL RCPs should be stopped – *NO, subcooling SAT*
		US/BOP	Checks for Faulted SG - *YES*
		US	Exits E-0 to E-2, FAULTED STEAM GENERATOR ISOLATION, Step 1
		Crew	Begins monitoring CSFs for implementation.
		US	Reads applicable CAUTIONS and NOTES from E-2
		US/BOP	Check if MSIVs and Bypasses are closed - *NO*
		US/BOP	If not already dispatched, directs NSO(s) to locally close MSIVs.
		US/BOP	Checks if ANY SG pressure boundaries are intact - *NO*
		US	Exits E-2 to ECA-2.1, UNCONTROLLED DEPRESSURIZATION OF ALL STEAM GENERATORS, Step 1.
		US	Reads applicable CAUTIONS and NOTE(s) of ECA-2.1
		US/BOP	Checks if MSIVs and Bypasses are closed - *NO*
		US/BOP	Checks SG ASDVs closed - *YES*

EVENT	INSTRUCTION	Actions or Behaviors	
		US/BOP	Checks FWRV and FWRV Bypasses closed – *YES.*
		US/BOP	Checks FWIVs closed - *YES*
		US/BOP	Checks MDEFW or SUFP supplying SG(s) - *YES*
		US/BOP	Checks MS-V393 and MS-V394 closed - *NO*
		SUR	As directed, closes MS-V393 and MS-V394.
		US/BOP	Checks SGBD isolation valves closed - *YES*
		US	Reads CAUTION requiring minimum of 25 gpm EFW to each SG with NR level < 5%.
		US/BOP	Checks if RCS Cold Leg cooldown rate is < 100°F/HR - *NO*
NOTE: Control limitations associated with EFW throttle valves may challenge the operator when minimizing flow and maintaining a minimum of 25 gpm.		BOP	Throttles EFW to establish minimum flow of 25 gpm to each SG **(CT)**.
NOTE: It is expected that the crew will pursue restoring 25 gpm to any SG isolated automatically on high flow AFTER the EFW lines are walked down.			
Isolation of SG A and D	As soon as feed flow has been minimized to all SGs, DELETE the malfunctions blocking closure of SG A and D MSIVs:	US/SUR	Checks RCS Hot Leg temperatures stable or decreasing - *YES*
	☐ SELECT: **Component Malfs (Top Bar)** ☐ SELECT: **mfMSV86** ☐ SELECT: **Delete MF** ☐ SELECT: **mfMSV92** ☐ SELECT: **Delete MF**	US/SUR	Checks whether ALL RCPs should be stopped – *NO, subcooling SAT.*
		US/BOP	Checks CST inventory > 250,000 gallons – *YES*
		US/BOP	Checks secondary radiation – *NORMAL.*
CUE: As an NSO, report that the MSIVs for SG A and D have been closed from the west pipe chase.		BOP	Acknowledges NSO report, begins monitoring SG A and D pressures and informs crew when pressure in either SG A or SG D is increasing.

EVENT	INSTRUCTION	Actions or Behaviors	
NOTE:	The crew should exit ECA-2.1 to E-2 as soon as pressure in any SG increases.	US	Notes ECA-2.1 OAS item 2 and exits ECA-2.1 when any SG pressure increases.
Isolation of SG B and C	☐ SELECT: **Component Malfs (Top Bar)** ☐ SELECT: **mfMSV88** ☐ SELECT: **Delete MF** ☐ SELECT: **mfMSV90** ☐ SELECT: **Delete MF**		
NOTE:	A CAUTION prior to step 1 of FR-H.1 states that the procedure should not be performed if EFW flow is < 500 gpm due to operator action.	Crew	Notes HEAT SINK CSF – RED
		US	Notes CAUTION in FR-H.1 prior to step 1 and does NOT perform FR-H.1. Continues with E-2.
CUE:	**As an NSO, report that the MSIVs for SG A and D have been closed from the west pipe chase.**	BOP	Acknowledges NSO report, informs crew of MSIV status.
		US	Reads applicable CAUTIONS and NOTES of E-2.
		US/BOP	Checks if MSIVs and Bypasses are closed - *YES*
		US/BOP	Checks if ANY SG pressure is stable or increasing - *YES*
		US/BOP	Checks for any SG pressure decreasing in uncontrolled manner or any SG completely depressurized – *IF YES, US/BOP perform step 4 and isolate EFW flow to affected SGs. IF NO, go to step 5.*
		US/BOP	Checks CST inventory > 250,000 gallons - *YES*
		US/BOP	Checks secondary radiation - *NORMAL*
		CREW:	Checks id ECCS flow should be reduced:
		US/SUR	Check RCS subcooling > 40°F - *YES*
		US/BOP	Checks secondary heat sink - *NO*
		US	Exits E-2 to E-1, LOSS OF REACTOR OR SECONDARY COOLANT, step 1
		US	Reads NOTES of E-1

EVENT	INSTRUCTION	Actions or Behaviors	
		US/SUR	Checks if RCPs should be stopped - *NO*
		US/BOP	Checks for FAULTED SGs- *NO*
		US/BOP	Checks secondary heat sink - *NO*
		BOP	As directed, establishes a total EFW > 500 gpm until level is adequate.
		US/BOP	Checks secondary radiation - *NORMAL*
		US	Reads CAUTION regarding actuation of PORVs on PZR pressure or LTOP.
		US/SUR	Checks PORVs available - *YES*
		CREW	Checks if ECCS flow should be reduced:
		US/SUR	Checks RCS subcooling > 40°F - *YES*
		US/BOP	Checks secondary heat sink - *YES*
		US/SUR	Checks RCS pressure stable or increasing - *YES*
		US/SUR	Check PZR level > 5% - *YES*
		US	Exits E-1 to ES-1.1, SI TERMINATION.
As directed by the Lead Examiner, terminate the scenario.			
E-Plan classification for this scenario – UE 15b (Although H-RED existed, the condition was operator induced and LOSS OF HEAT SINK was not valid).			

Facility: Seabrook | Scenario No.: 3 | Op Test No.: 1

Examiners: _____ | Candidates: Palmieri - US

_____ | Crosby – PSO / BOP

_____ | _____

Initial Conditions: Unit at 100% power.

Turnover: Entered TSASs for CS-P-2B being tagged out of service for planned maintenance 2 hours ago. Return to service expected within 6 hours.

Critical Tasks:

1. MANUALLY trip the reactor from the control room when SSPS fails to automatically trip the reactor. [E-0, A]
2. Establish feed flow into at least one SG before RCS bleed and feed is required [FR-H.1, A]

Event No.	Malf. No.	Event Type*	Event Description
1	ttRCTT411	I (Both)	RCS Loop 1 NR cold leg RTD fails high. Loop 1 Tavg increases and Loop1 ΔT decreases. Loop1 becomes the auctioneered high channel and NSSS control systems respond. *Used if the RO candidate is on the primary side of the MCB.*
2	NA	N (RO)	The Load Dispatcher contacts the control room to order a power reduction to ≤ 90% power due to pending grid limitations.
3	ctMSPK3001	C (Both)	Main steam pressure controller MS-PK-3001 has an internal failure causing the setpoint to fail LOW. MS-PK-3001 controls the ASDV for SG A. The ASDV is driven full open when the setpoint fails LOW. *Used if the RO candidate is on the secondary side of the MCB.*
4	mfED025	C (Both)	Vital 120 VAC power panel 1-EDE-PP-1A loses power when the inverter supplying the power panel malfunctions. CHANNEL I RPS / SSPS is affected. Control systems using CHANNEL I inputs are affected.

5	mfED005	M (Both) C (Both)	The normal UAT feeder to 4.16kV Bus 3 inadvertently trips open. The breaker for the alternate feeder to Bus 3 (RAT) fails to close and Bus 3 de-energizes. The immediate impact is loss of power to condensate pumps CO-P-30A and 30C (STBY) as well as heater drain pump HD-P-31A. Flow to the MFPs is significantly reduced and MFP suction pressure drops rapidly. The MFPs will sequentially trip on LOW suction pressure. When the first MFP trips, a Turbine Setback will be actuated. SG levels will decrease to the SG LO-LO level reactor trip setpoint. The reactor will fail to trip automatically. The operators will be forced to trip the reactor MANUALLY **(CT)**. When the reactor trips the Main Turbine will fail to automatically trip and will not trip manually. The operators will be required to actuate MSI. As soon as the TDEFW pump steam supply valve begins to open, the TDEFW pump will trip on overspeed. After running for a short time the shaft of the MDEFW pump will shear, resulting in loss of all feed to the SGs. If the crew attempts to restore feed using the SUFP, the Bus 5 breaker will fail to close. The crew will be able to restore feed to the SGs by resetting the TDEFW **(CT)**. The procedure progression will be from E-0 ⇒ FR-H.1 ⇒ E-0 ⇒ ES-1.1.

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

NOTE: This scenario has been written as a spare. Events have been included to provide for evaluation of the RO candidate on either side of the MCB. It is assumed that only those events required to meet the evaluation requirements will be executed during the scenario.

The simulator is initialized at 100% power. The crew is instructed to maintain power. Load Control is conducting a system wide test, and needs the MVAR loading to be maintained at 400 lagging.

CS-P-2B is out of service for an oil change. T.S. 3.1.2.2, 3.1.2.4 and 3.5.2 were entered 2 hours ago. The pump is expected back in 6 hours.

IF the RO candidate is on the primary side of the MCB, RCS Loop 1 NR cold leg RTD fails high. Loop 1 indicated Tavg increases and Loop1 indicated ΔT decreases. Loop1 becomes the auctioneered high channel and NSSS control systems respond. The automatic rod control system drives rods IN at maximum speed until the operator places rods in MANUAL. The PZR level control system REFERENCE LEVEL "fails" to 100% of programmed level. As the plant is at 100% power PZR control is not adversely affected. The condenser steam dumps receive a demand signal but do not open because they not are not armed. The crew will utilize abnormal procedure OS1201.08, TAVG/DELTA T FAILURE to respond to the failure.

The Load Dispatcher contacts the control room to order a power reduction to $\leq$ 90% power due to pending grid limitations. The crew will utilize major plant evolution procedure OS1000.06, POWER DECREASE and ODI 56 to perform the power reduction.

IF the RO candidate is on the secondary side of the MCB, main steam pressure controller MS-PK-3001 will fail due to an internal fault causing the setpoint to fail LOW. MS-PK-3001 controls the ASDV for SG A. The ASDV is driven full open when the setpoint fails LOW. The crew will take action to close the ASDV using guidance from the MPCS VAS procedure.

Vital 120 VAC power panel 1-EDE-PP-1A loses power when the inverter supplying the power panel malfunctions. CHANNEL I RPS / SSPS is affected. Control systems using CHANNEL I inputs are affected. RCS letdown will be isolated when the controlling channel of PZR level fails low. The PZR pressure control system will generate a demand for all PZR heaters to be energized when the controlling channel fails low. The heaters will not energize due to the PZR level channel failing low. Automatic rod control (insertion) will occur due to the TREF signal going to NO-LOAD value when the controlling channel of main turbine 1st stage pressure fails low. SG level control for two of the SGs and MFP speed control will be affected. The crew will utilize abnormal procedure OS1247.01, LOSS OF A 120 VAC VITAL INSTRUMENT PANEL (PP1A, 1b, 1C RO 1D) to respond. Power will be restored to the power panel from its alternate source by an NSO as directed by the control room.

The normal UAT feeder to 4.16kV Bus 3 inadvertently will trip open. The breaker for the alternate feeder to Bus 3 (RAT) fails to close and Bus 3 de-energizes. The immediate impact is loss of power to condensate pumps CO-P-30A and 30C (STBY) as well as heater drain pump HD-P-31A. Flow to the MFPs is significantly reduced and MFP suction pressure drops rapidly. The MFPs will sequentially trip on LOW suction pressure. When the first MFP trips, a Turbine Setback will be actuated. SG levels will decrease to the SG LO-LO level reactor trip setpoint. The reactor will fail to trip automatically. The operators will be forced to trip the reactor MANUALLY **(CT)**. When the reactor trips, the Main Turbine will fail to automatically trip and will not trip manually. The operators will be required to actuate MSI. Automatic SI will be actuated

due to the excessive cooldown caused by the failure of the main turbine to trip. As soon as the TDEFW pump steam supply valve begins to open, the TDEFW pump will trip on overspeed. After running for a short time the shaft of the MDEFW pump will shear, resulting in loss of all feed to the SGs. If the crew attempts to restore feed using the SUFP, the Bus 5 breaker will fail to close. The crew will be able to restore feed to the SGs by resetting the TDEFW **(CT)**.

The procedure progression will be from E-0 ⇒ FR-H.1 ⇒ E-0 ⇒ ES-1.1.

1. ☐ Initialize the simulator at 100%, IC 300 C9 BOL

2. ☐ Protected train is 'A'.

3. ☐ Place the control switch for CS-P-2B in PTL
   ☐ Close CS-V-197
   ☐ Danger tag CS-P-2B and CS-V197
   ☐ Press the pushbutton control switch for CVCS TRAIN B BYP/INOP light

4. ☐ CHECK/PLACE two SG FF/SF & level input channels from CHANNEL I and two from CHANNEL II

5. Run the following SCENARIO to rack-out the breaker for CS-P-2B, de-energize CS-V197, fail automatic trip of the reactor, fail automatic and manual trip of the turbine, fail automatic MSI, fail manual actuation of TRN B MSI, fail closure of the Bus 3 RAT breaker, and activate Event Triggers Demo exams/Exam 25M TDEFW Trip and Demo exams/Exam 25M MDEFW shaft shears:

   ☐ SELECT: **Scenario**
   ☐ SELECT: **Demo exams**
   ☐ SELECT: **Exam #25M setup**
   ☐ SELECT: **RUN**

   Verify the following inserted / activated:

   ☐ mfRPS001, AUTOMATIC REACTOR TRIP FAILURE (TRAIN 'A')
   ☐ mfRPS002, AUTOMATIC REACTOR TRIP FAILURE (TRAIN 'B')
   ☐ mfRPS003, AUTOMATIC TURBINE TRIP FAILURE
   ☐ mfRPS019, MS ISOLATION FAILS TO ACTUATE (TRAIN 'A')
   ☐ mfRPS020, MS ISOLATION FAILS TO ACTUATE (TRAIN 'B')

   ☐ bkED3RAT BREAKER FAILS OPEN

   ☐ IOOZMDIEHCUC3851TVT, MAIN TURBINE TRIP overridden to RELEASE
   ☐ IOOZMDIMSCS30851, TRN B MSI ACTUATION overridden to RESET

   ☐ mvCSV197, MOV BREAKER STATUS OPEN
   ☐ bkCS1P2B_52, BREAKER RACKED-OUT

- [ ] SELECT: **Event Triggers** (Top Bar)
- [ ] SELECT: **Demo Exams/Exam 25M TDEFW Trip**
- [ ] VERIFY: **ACTIVATED** (Only options are to OPEN / ABORT / CLOSE)

- [ ] SELECT: **Event Triggers** (Top Bar)
- [ ] SELECT: **Demo Exams/Exam 25M MDEFW shaft shears**
- [ ] VERIFY: **ACTIVATED** (Only options are to OPEN / ABORT / CLOSE)

- [ ] SELECT: **Event Triggers** (Top Bar)
- [ ] SELECT: **Demo Exams/Exam 25M SUFP AF breaker fails open**
- [ ] VERIFY: **ACTIVATED** (Only options are to OPEN / ABORT / CLOSE)

Protected Train is A

Mode 1: 100% RTP, ARO = 228 steps CBD, Boron Concentration = 1293 ppm. ODI-56 rev 7 on US desk, +1 degree = 88 gal RMW, -1 degree change = 19 gal BA; AFD target - 0.65%, Current AFD - 0.69%

Centrifugal Charging Pump CS-P-2B is danger tagged out for oil change. Entered TSASs 3.1.2.2a, 3.1.2.4 and 3.5.2.a two hours prior to turnover. Expected return to service is 6 hours after turnover.

SCENARIO OUTLINE

EVENT	INSTRUCTION	Actions or Behaviors
Shift Turnover	Shift turnover information as stated. Provide Turnover Sheet	None

When directed by the Lead Examiner, initiate the following event:

EVENT 1

Loop 1 Tc Fails high

Insert Loop 1 Tc Fails high as follows:

- ☐ SELECT: **MF List**
- ☐ SELECT **REACTOR COOLANT (component)**
- ☐ DOUBLE CLICK: **ttRCTT411**
- ☐ SELECT: **Fail High**
- ☐ SELECT: **Insert**

The automatic rod control system drives rods IN at maximum speed until the operator places rods in MANUAL. Steam dumps get open demand but are not armed and do not open.

RO	Notes automatic rod insertion, checks for failed input to rod control.
US	Acknowledges report, directs BOP to check for Turbine Runback / Setback.
BOP	Verifies no Turbine Runback / Setback. Checks for failed input to rod control.
RO	Notes abnormal Loop1 indication
US	Acknowledges report of RC Loop 1 indication failure and directs RO to place rod control in MANUAL.
RO	PLACES rod control in MANUAL. Pulls up VPROs
US	Refers to OS1201.08, TAVG/DELTA T FAILURE and directs operator actions.
US/RO	Checks for ANY Tavg Channel failed high - *YES*
RO	Verifies rod control in MANUAL.
US/BOP	Checks condenser steam dump valves closed - *YES*
RO	Defeats Loop 1 ΔT inputs, defeats Loop 1 Tavg input and selects a non affected channel for recording.

EVENT	INSTRUCTION	Actions or Behaviors
		US/RO Checks Tavg within ± 1°F of Tref – *IF **YES**, US will likely delay returning rod control to AUTO until rods have been restored to ARO position. IF **NO** US will direct RO to restore Tavg within 1°F of Tref.*
		US/RO Checks PZR level trending to program - *YES*
		US/BOP Verifies steam dump interlock selector switches positioned to NA RESET or NA BYPASS INTERLOCK - *YES*
		US/RO Verifies no redundant channel bistables tripped.
		US Refers to TS 3.3.1, table 3.3-1 item 7 & 8. TR 19. Notifies I&C to initiate troubleshooting.
		US Coordinates tripping of bistables or using BTI to bypass the failed channel for troubleshooting or testing. Notifies Work Week Manager and plant management regarding failure.

NOTE: At the discretion of the Lead Examiner, bypass the failed channel or trip the failed channel as directed by the US. IF the Lead Examiner chooses, the next event can be initiated without bypassing or placing the channel in trip condition. The scenario will not be affected either way.

NOTE: If the crew chooses to use BTI, perform the following:

☐	SELECT: **Panel Overview**	
☐	SELECT: **BTI CP-1**	
☐	SELECT: **CP-1 Door to OPEN**	D5628 7300 CABINET CAB CP-1 DOOR OPEN
☐	SELECT: **ENABLE**	D4562 7300 CABINET CP-1 BYPASSED / INOP
☐	SELECT: **TB-411C to the UP position**	OTΔT Trip
☐	SELECT: **TB-411G to the UP position**	OPΔT Trip
☐	SELECT: **TB-412D to the UP position**	Low-Low Tavg P-12
☐	SELECT: **TB-412G to the UP position**	Low Tavg FWI
☐	SELECT: **CP-1 Door to CLOSED**	D5628 7300 CABINET CAB CP-1 DOOR OPEN - return

EVENT	INSTRUCTION	Actions or Behaviors

NOTE: If the crew chooses NOT to use BTI, perform the following to trip the bistables:

☐	SELECT: **Panel Overview**	
☐	SELECT: **Trip CP-1**	D5628 7300 CABINET CAB CP-1 DOOR OPEN
☐	SELECT: **CP-1 Door to OPEN**	
☐	SELECT: **TB-411C to the UP position**	OTΔT Trip
☐	SELECT: **TB-411G to the UP position**	OPΔT Trip
☐	SELECT: **TB-412D to the UP position**	Low-Low Tavg P-12
☐	SELECT: **TB-412G to the UP position**	Low Tavg FWI
☐	SELECT: **CP-1 Door to CLOSED**	D5628 7300 CABINET CAB CP-1 DOOR OPEN - return

After allowing the crew to complete OS1201.08, or at the Lead Examiner's discretion, continue to the next event.

EVENT 2

Power decrease

Contact the control room as Load Dispatch. Direct a power decrease to ≤ 90% power within the next 15 minutes due to pending grid limitations. Maintain ≤ 90% until cleared by Load Dispatch.

NOTE: The power reduction allows the RO to satisfy the (R)eactivity control or (N)ormal control requirement and the US to satisfy the (N)ormal control requirement. Once met, the next event may be started.

US	Refers to OS1000.06, POWER DECREASE and ODI 56 for power reduction. Provides direction on rate and control bands for operators. Conducts brief for power decrease.
BOP	Uses the LOAD SELECTOR load decrease push-button or LOAD LIMIT SET potentiometer to reduce load to maintain power and VAR loading. If reducing load with the load selector, FOLLOW the load set with the load limit set potentiometer and the standby load set.
RO	Initiates boration / inserts control rods to control RCS temperature and AFD. Uses ODI 56 values or DETERMINES the quantity of boric acid required to make the desired reactivity change from RS1735,"Reactivity Calculations"

EVENT	INSTRUCTION	Actions or Behaviors	
			TURNS the BLENDER MODE START SWITCH to STOP
			PLACES the BORIC ACID BLENDER MODE SELECTOR SWITCH to BORATE.
			CHECKS/PLACES CS-FIC-111 in auto remote (A/R).
			CHECKS/PLACES CS-FIC-110 in auto remote (A/R).
			SETS CS-FIQ-111 controller to the desired flow rate.
			SETS CS-FIQ-111 controller to the desired quantity.
NOTE: Operators are required to remain at the makeup controls during the boration / dilution and makeup evolution. This will ensure proper system response is verified as well as the desired amount.			TURNS the BLENDER MODE START SWITCH to START. When the boric acid supply counter has added its preset quantity, VERIFIES the boration stopped.
			As directed by US, RETURN the makeup controls to automatic blended makeup.
		RO	As directed by US, OPERATE pressurizer heaters to force spray to equalize boron concentration between the RCS and pressurizer.
At the lead examiner's discretion, continue with the next event.		US	Provide oversight of power reduction. Notify plant management of load restrictions.

EVENT 3

MS-PK-3001 Failure

Initiate failure of MS-PK-3001 as follows:

☐	SELECT: **MF list**
☐	SELECT: **Main Steam (Component)**
☐	Double Click: **ctMSPK3001**
☐	SELECT: **FAIL SETPOINT**
☐	SET VALUE: **0**
☐	**INSERT**

D5214 ASDV A NOT FULL CLOSED

BOP	Acknowledges VAS and Hardwired alarms. Informs crew that the ASDV for SG A is full open. Notes controller SETPOINT is pegged LOW. Pulls up VPRO.
US	Directs operator action per VPRO or HWAS for UA-53 A-7.
BOP	Places ASDV control switch to close, places MS-PK-3001 in MANUAL - MINIMUM

EVENT	INSTRUCTION	Actions or Behaviors	
		US	Refers to TS 3.7.1.6 and 3.6.3. *ASDV remains operable as long as it can be MANUALLY operated form the MCR*
		US	Contact Work Week manager and / or I&C for support and troubleshooting. Informs station management.
EVENT 4			
Loss of PP-1A	Initiate loss of PP-1A as follows:		
	☐ SELECT: **MF List** ☐ SELECT: **ELECTRICAL DISTRIBUTION** ☐ SELECT: **mfED025 LOSS OF UPS-I-1A** ☐ **INSERT**	CREW	Diagnoses loss of power panel based on plant response and indications from MCB.
		RO	Notes automatic control rod insertion, recommends placing rod control in MANUAL based on indications of failed power panel.
		US	Acknowledges input from RO, directs RO to place rod control in MANUAL
	Automatic rod control (insertion) will occur due to the TREF signal going to NO-LOAD value when the controlling channel of main turbine 1st stage pressure fails low.	RO	Places rod control in MANUAL.
		US	Enters abnormal procedure OS1247.01, LOSS OF A 120 VAC VITAL INSTRUMENT PANEL (PP1A, 1B, 1C RO 1D) and directs operator actions.
	SG level control for two of the SGs and MFP speed control will be affected.	US/BOP	CHECKS SG steam flow / feed flow matched - *NO*
		BOP	As directed, places affected SG FRV in MANUAL and controls NR level 50% to 70%. Places MFP speed controller in MANUAL and maintains MFP speed at program. Selects alternate control channels for affected controls.
		US/BOP	Checks steam dump valves closed - *YES*

EVENT	INSTRUCTION	Actions or Behaviors	
	The PZR pressure control system will generate a demand for all PZR heaters to be energized when the controlling channel fails low. The heaters will not energize due to the PZR level channel failing low.	US/RO	Checks PZR pressure control stable or trending to 2235 PSIG - *YES*
		US/RO	Check for affected PZR pressure instrument - *YES*
		RO	As directed, places PZR pressure control in MANUAL, selects an alternate controlling channel and recording channel.
	RCS letdown will be isolated when the controlling channel of PZR level fails low. PZR level will trend up due to continued charging.	US/RO	Check PZR level stable or trending to program - *NO*
		RO	As directed, reduces charging flow to minimize PZR level increase.
		US/RO	Check for affected PZR level instrument - *YES*
	When directed as NSO to transfer PP-1A to the maintenance supply, perform the following:	RO	As directed, places PZR level control in MANUAL, selects an alternate controlling channel and recording channel. Resets the PZR control group heaters.
	☐ SELECT: **D-Points** ☐ SELECT: **EDE** ☐ SELECT: **svo6003EDE** ☐ SELECT: **ALARM** ☐ **INSERT**	US/RO	Checks if letdown was isolated - *YES*
		US/RO	Checks if letdown can be re-established - *YES*
		RO	As directed, establishes 50 gpm charging, verifies PZR level > 17%, aligns cooling to letdown heat exchanger, closes letdown drag valves, opens letdown isolation valves, re-establishes letdown flow
	☐ SELECT: **Malfunctions (Top Bar)** ☐ SELECT: **mfED025** ☐ SELECT: **DELETE**	RO	Unless already defeated by EVENT 1, defeats CHAN I input to 7300 processes by selecting Loop 1 ΔT, Tavg and selects non affected channel for recording.
		Crew	Determines PP-1A affected.
		US	Dispatches NSO to check status of UPS and to re-energize PP-1A from its maintenance supply.
		US	Directs actions to restore normal system alignment.

EVENT	INSTRUCTION	Actions or Behaviors	
		RO	As directed, resets N41 rate trips, restores defeated Loop 1 Tavg and ΔT channels.
		RO	As directed, restores PZR pressure control to preferred alignment (455/456).
		RO	As directed, restores AUTO control of rods, PZR level and PZR pressure control.
		BOP	As directed, returns SG level control and MFP speed control to AUTO.
		US	Evaluates TS 3.8.3.1 and 3.3.3.6. Contacts Work Week manager / Electrical maintenance for support / troubleshooting. Informs plant management.

After allowing the crew to complete OS1247.01, or at the Lead Examiner's discretion, continue to the next event.

EVENT 5

Loss of Bus 3 – Loss of Heat Sink	Initiate loss of 4.16 kV Bus 3 as follows: ☐ SELECT: **MF List** ☐ SELECT: **Electrical Distribution** ☐ SELECT: **mfED005 BUS 3 UAT BREAKER TRIP (86 LOCKOUT)** ☐ **INSERT**	BOP	Notes VAS alarms associated with loss of Bus 3. Reports Turbine Setback in progress due to loss of condensate pump CO-P-30A. Reports MFP suction pressure decreasing and feed flow decreasing to all SGs.
		US	Based on time available, US may enter OS1231.03, TURBINE RUNBACK / SETBACK. Directs reactor trip based on procedure guidance that the plant cannot survive setbacks due to loss of feed from greater than 85% power.
	IF automatic reactor trip demand occurs, the reactor will not trip.	Crew must recognize demand for reactor trip and trip the reactor manually. Crew performs Immediate Actions (I/As).	

EVENT	INSTRUCTION	Actions or Behaviors	
		RO	Trips the reactor MANUALLY **(CT)**. Verifies reactor trip and bypass breakers open, neutron flux decreasing, and rod bottom lights lit.
NOTE:	Automatic and manual turbine trip is blocked. Automatic MSI is blocked. Manual TRN B MSI is blocked. All included to cause automatic SI.	BOP	Attempts to trip the main turbine MANUALLY. Notes that the turbine did not trip and actuates TRB B MSI (MCB-EF). When MSIVs fail to close, actuates TRN A MSI and verifies all MSIVs close. When generator output is zero, opens the generator breaker.
NOTE:	As soon as MS-V395 starts opening, the TDEFW pump trips.		
			Verifies power to AC Emergency busses, verifies all emergency busses energized.
		RO	Checks if SI is actuated, Verifies both trains of SI actuated.
		US	Enters E-0, REACTOR TRIP OR SAFETY INJECTION, Step 1 and directs operator actions to verify I/As completed.
		RO	Performs ATTACHMENT A.
		BOP	Performs operator actions on both sides of the MCB until RO has completed ATTACHMENT A.
		US/BOP	Checks if MSIVs should be closed – *NO, but MSIVs are closed*
		US/BOP	Check CNTMT pressure has remained < 18 psig - *YES*
NOTE:	When the crew attempts to start the SUFP, the Bus 5 breaker will fail to close.	US/BOP	Verifies total EFW > 500 gpm - *NO*
		BOP	As directed, attempts to start the SUFP. Notes that the Bus 5 breaker fails to close.
		US	Exits E-0 to FR-H.1, REPSONSE TO LOSS OF SECONDARY HEAT SINK, Step 1
		US	Reads CAUTIONS, NOTES and applicable OAS items
		CREW	Determines whether secondary heat sink is required – *YES.*

EVENT	INSTRUCTION	Actions or Behaviors
		US/RO Checks if at least one CCP is available - *YES*
		US/BOP Checks if SGBD is isolated - *YES*
		US/BOP Determines cause of loss of EFW – TDEFW tripped on overspeed; MD EFW pump shaft sheared. SUFP breaker failure.
		US/BOP Monitors RCS temp stable at or trending to 557°F – *YES, temperature is trending to 557°F.*
NOTE	It is expected, but not required that the RO will have completed ATTACHMENT A, briefed the US and returned to performing MCB manipulations by Step 10 of E-0.	US/RO Checks RCS Isolated – *NO* RO As directed, closes CS-V145 to isolate the RCS
		US/RO Checks PORVs closed - *YES*
		US/RO Checks PZR spray valves closed - *YES*
		RO As directed (NOTE) maintains seal injection flow to all RCPs.
		US/RO Checks whether ALL RCPs should be stopped – *NO, subcooling SAT*
When directed as NSO to restore EFW by resetting the TDEFW: ☐ SELECT: RF List ☐ SELECT: Main Steam (Component) ☐ SELECT: rmvMSV129 ☐ SELECT: RF: MANUAL ☐ SET RAMP to 30 sec; VALUE to 1.0		US/BOP Checks for faulted SG - *NO*
		US/BOP Checks for ruptured SG - *NO*
		US/RO Checks whether RCS is intact - *YES*
		CREW Checks if ECCS flow should be reduced:
		US/RO Checks RCS subcooling > 40°F - *YES*
		US/BOP Checks secondary heat sink – *NO, as MDEFW shaft has sheared.*
		US/BOP Determine whether SUFP is immediately available - *NO*
Contact control room to open FW-V346 and when opened: ☐ INSERT		US/BOP Directs NSO to locally restore EFW flow per OS1036.03. US Goes to step 4

EVENT	INSTRUCTION	Actions or Behaviors	
NOTE:	**Step 5 of FR-H.1 is CONTINUOUS ACTION step. As soon as EFW flow has been established, the crew should exit to procedure and step in effect (E-0, Step 8).**	RO	As directed, stops all RCPs
		US/BOP	Checks power to SUFP - NO
		US/BOP	Initiate switchover of SUFP from Bus 5 to Bus 4 breaker
CUE:	**Report as the NSO at the TDEFW pump that flow has been restored.**	BOP	Notes EFW > 500 gpm feed flow to SGs as indicated on MCB and reported by NSO **(CT)**.
		US	Determines feed and bleed is NOT in progress and exits FR-H.1 to procedure and step in effect (E-0).
		CREW	Returns to E-0 step 8 and proceeds through procedure to step 15 where they check if ECCS flow should be reduced - *YES*.
NOTE:	**The scenario may be terminated at the Lead Examiner's discretion.**		
		US/RO	Checks if RCS subcooling is > 40°F - *YES*
		US/BOP	Checks if secondary heat sink is adequate - *YES*
		US/RO	Checks RCS pressure stable or increasing - *YES*
		US/RO	Check PZR level > 5% - *YES*
		RO	As directed, resets SI
			Verifies only CS-P-2A running and DOES NOT shut down CS-P-2A.
		RO	Checks RCS pressure stable or increasing – *YES*
		RO	AS directed, opens CS-V142 and 143, closes SI-V138 and 139, establishes 60 gpm charging flow while maintaining 6 – 10 gpm seal injection flow.
		US	Exits E-0 to Step 7 of ES-1.1, SI TERMINATION.

As directed by the Lead Examiner, terminate scenario.

E-Plan classification for this scenario – SAE (H-RED)