

Facility: Seabrook Scenario No.: 2r2 Op Test No.: 1
 Examiners: T. Fish Candidates: Palmieri - US

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	Power increase.
2	LtFWLT529	I	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	An inadvertent turbine trip causes a catastrophic rupture of the main steam bottle (down stream of MSIVs).
4	svMSV86 svMSV88 svMSV90 svMSV92	C	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.
5	mvFWFV4214A	C	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

Scenario Event Description
Seabrook Simulator Scenario **2r2**

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). 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 2r2

1. Initialize the simulator at 75%, IC98
2. Protected train is 'A'.
3. Verify AFD is within $\pm 1\%$ 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:

-
- 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)

Seabrook
Simulator Scenario Turnover Information
Scenario **2r2**

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

<u>EVENT</u>	<u>INSTRUCTION</u>	<u>Actions or Behaviors</u>	
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 1 st 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:

- | | |
|--------------------------|-------------------------------------|
| <input type="checkbox"/> | SELECT MF List |
| <input type="checkbox"/> | SELECT Feedwater (Component) |
| <input type="checkbox"/> | SELECT ItFWLT529 |
| <input type="checkbox"/> | Double Click |
| <input type="checkbox"/> | SELECT FAIL LOW |
| <input type="checkbox"/> | 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 |

<u>EVENT</u>	<u>INSTRUCTION</u>	<u>Actions or Behaviors</u>
		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:

<input type="checkbox"/>	SELECT: Panel Overview	
<input type="checkbox"/>	SELECT: BTI CP-1	
<input type="checkbox"/>	SELECT: CP-1 Door to OPEN	D5628 7300 CABINET CAB CP-1 DOOR OPEN
<input type="checkbox"/>	SELECT: ENABLE	D4562 7300 CABINET CP-1 BYPASSED / INOP
<input type="checkbox"/>	SELECT: LB-529A to BYPASS	
<input type="checkbox"/>	SELECT: LB-529B to BYPASS	F4840 SG B LEVEL LO-LO - return
<input type="checkbox"/>	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:

<input type="checkbox"/>	SELECT: Panel Overview	
<input type="checkbox"/>	SELECT: Trip CP-1	D5628 7300 CABINET CAB CP-1 DOOR OPEN
<input type="checkbox"/>	SELECT: CP-1 Door to OPEN	
<input type="checkbox"/>	SELECT: LB 529A to the UP position	D4777 SG B LEVEL HI-HI CHANNEL TRIP
<input type="checkbox"/>	SELECT: LB 529B to the UP position	F4840 SG B LEVEL LO-LO – already in alarm
<input type="checkbox"/>	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.

<u>EVENT</u>	<u>INSTRUCTION</u>	<u>Actions or Behaviors</u>
<u>EVENT 3</u>		
Turbine Trip	Initiate an inadvertent turbine trip as follows:	
	<input type="checkbox"/> SELECT: Panel PFF14 <input type="checkbox"/> SELECT: Insert OR <input type="checkbox"/> SELECT: Main Turbine TRIP pushbutton <input type="checkbox"/> SET Final Value: TRIP <input type="checkbox"/> INSERT	<p>Crew performs Immediate Actions (I/As).</p> <p>SUR Verifies reactor trip and bypass breakers open, neutron flux decreasing, and rod bottom lights lit.</p>
	<p>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:</p>	<p>BOP Verifies all turbine stop valves closed and generator breaker open.</p> <p>SUR Verifies power to AC Emergency busses, verifies all emergency busses energized.</p> <p>SUR Checks if SI is actuated, Verifies both trains of SI actuated.</p>
	<input type="checkbox"/> SELECT: Malfunctions (Top Bar) <input type="checkbox"/> VERIFY: mfMS051 MAIN STEAM BOTTLE BREAK – INSERTED at 1.0	<p>US Enters E-0, REACTOR TRIP OR SAFETY INJECTION, Step 1 and directs operator actions to verify I/As completed.</p>
<u>EVENT 4</u>		
Steam Break ECA-2.1	An automatic SI/MSI is actuated but the MSIVs do not close.	<p>SUR Performs ATTACHMENT A.</p> <p>BOP Performs operator actions on both sides of the MCB until SUR has completed ATTACHMENT A.</p> <p>US/BOP Checks if MSIVs should be closed - YES</p> <p>BOP As directed, attempts to close the MSIVs from the MCB</p> <p>US/BOP Check CNTMT pressure has remained < 18 psig - YES</p> <p>US/BOP Verifies total EFW > 500 gpm - YES</p>
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.	

<u>EVENT</u>	<u>INSTRUCTION</u>	<u>Actions or Behaviors</u>
		US/BOP Monitors RCS temp stable at or trending to 557°F – <i>NO</i>
<u>EVENT 5</u>	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 – <i>YES</i> SUR As directed (NOTE) maintains seal injection flow to all RCPs. US/SUR Checks whether ALL RCPs should be stopped – <i>NO, subcooling SAT</i> US/BOP Checks for Faulted SG - <i>YES</i> 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 - <i>NO</i> US/BOP If not already dispatched, directs NSO(s) to locally close MSIVs. US/BOP Checks if ANY SG pressure boundaries are intact - <i>NO</i> 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 - <i>NO</i> US/BOP Checks SG ASDVs closed - <i>YES</i> US/BOP Checks FWRV and FWRV Bypasses closed – <i>YES</i> . US/BOP Checks FWIVs closed - <i>YES</i> US/BOP Checks MDEFW or SUIFP supplying SG(s) - <i>YES</i> US/BOP Checks MS-V393 and MS-V394 closed - <i>NO</i>

<u>EVENT</u>	<u>INSTRUCTION</u>	<u>Actions or Behaviors</u>
<p>NOTE: Control limitations associated with EFW throttle valves may challenge the operator when minimizing flow and maintaining a minimum of 25 gpm.</p> <p>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.</p>	<p>As soon as feed flow has been minimized to all SGs, DELETE the malfunctions blocking closure of SG A and D MSIVs:</p>	<p>SUR As directed, closes MS-V393 and MS-V394.</p> <p>US/BOP Checks SGBD isolation valves closed - YES</p> <p>US Reads CAUTION requiring minimum of 25 gpm EFW to each SG with NR level < 5%.</p> <p>US/BOP Checks if RCS Cold Leg cooldown rate is < 100°F/HR - NO</p> <p>BOP Throttles EFW to establish minimum flow of 25 gpm to each SG (CT).</p>
<p>Isolation of SG A and D</p>	<div style="border: 1px solid black; padding: 5px;"> <input type="checkbox"/> SELECT: Component Malfs (Top Bar) <input type="checkbox"/> SELECT: mfMSV86 <input type="checkbox"/> SELECT: Delete MF <input type="checkbox"/> SELECT: mfMSV92 <input type="checkbox"/> SELECT: Delete MF </div>	<p>US/SUR Checks RCS Hot Leg temperatures stable or decreasing - YES</p> <p>US/SUR Checks whether ALL RCPs should be stopped – NO, <i>subcooling SAT.</i></p> <p>US/BOP Checks CST inventory > 250,000 gallons – YES</p> <p>US/BOP Checks secondary radiation – <i>NORMAL.</i></p>
<p>CUE: As an NSO, report that the MSIVs for SG A and D have been closed from the west pipe chase.</p>		<p>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.</p>
<p>NOTE: The crew should exit ECA-2.1 to E-2 as soon as pressure in any SG increases.</p>		<p>US Notes ECA-2.1 OAS item 2 and exits ECA-2.1 when any SG pressure increases.</p>

<u>EVENT</u>	<u>INSTRUCTION</u>	<u>Actions or Behaviors</u>
Isolation of SG B and C	<input type="checkbox"/> SELECT: Component Malfs (Top Bar) <input type="checkbox"/> SELECT: mfMSV88 <input type="checkbox"/> SELECT: Delete MF <input type="checkbox"/> SELECT: mfMSV90 <input type="checkbox"/> 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 US/SUR Checks if RCPs should be stopped - NO US/BOP Checks for FAULTED SGs- NO

<u>EVENT</u>	<u>INSTRUCTION</u>	<u>Actions or Behaviors</u>
		US/BOP Checks secondary heat sink - <i>NO</i>
		BOP As directed, establishes a total EFW > 500 gpm until level is adequate.
		US/BOP Checks secondary radiation - <i>NORMAL</i>
		US Reads CAUTION regarding actuation of PORVs on PZR pressure or LTOP.
		US/SUR Checks PORVs available - <i>YES</i>
		CREW Checks if ECCS flow should be reduced:
		US/SUR Checks RCS subcooling > 40°F - <i>YES</i>
		US/BOP Checks secondary heat sink - <i>YES</i>
		US/SUR Checks RCS pressure stable or increasing - <i>YES</i>
		US/SUR Check PZR level > 5% - <i>YES</i>
		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).