

Facility: Davis-Besse NPS Scenario No.: 1 Op-Test No.: 1, 2, and 3

Examiners: \_\_\_\_\_ Operators: \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_

Initial Conditions: 28% Reactor Power, Emergency Diesel Generator 1 Out of Service  
 \_\_\_\_\_  
 \_\_\_\_\_

Turnover: Plant Shutdown in progress due to Tech Spec 3.8.1.1  
 \_\_\_\_\_  
 \_\_\_\_\_

Event No.	Malf. No.	Event Type*	Event Description
1	-----	R (RO)	Lower Reactor power using the Reactor Demand Station
2	KEP2E	C (BOP)	Inadvertent Service Water Pump 1 trip
3	R3N5	I (RO)	Power Range Nuclear Instrument 5 fails high (Tech Spec)
4	UKRF	C (BOP)	Main Turbine Quill Shaft failure
5	SFEG	C (BOP)	Isolable Main Steam Line leak (Tech. Spec.)
6	P8RFC	M (All)	Loss of Offsite Power
7	GF32B	C (RO)	Emergency Diesel Generator 2 fails to automatically start
8	B2M2I	C (RO)	Makeup Pump 2 fails to start

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

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Event Description: Following crew turnover, the crew will continue the plant shutdown and cooldown. During the power reduction Service Water Pump (SWP) 1 will trip. The Circulating Water System will provide cooling to secondary loads until Service Water can be restored.

Time	Position	Applicant's Actions or Behavior
	SRO	Direct RO/BOP actions per DB-OP-06903, Plant Shutdown and Cooldown <ul style="list-style-type: none"> <li>- Verify prerequisites are complete</li> <li>- Place the Reactor Demand Hand/Auto station in HAND and begin reducing power towards 15%</li> <li>- Lower Prz setpoint as Tave is reduced</li> </ul>
	RO/BOP	Execute procedure actions per SRO directions
	SRO/RO/BOP	Recognize indications of SWP 1 tripping <ul style="list-style-type: none"> <li>- Computer Alarm P945, SW HDR 1 PRESS</li> <li>- Computer Alarm Z997, SW ISO VLV TO CLNG WTR, 1399</li> <li>- Computer Alarm Y001, SW PUMP 1</li> <li>- SWP 1 not running</li> <li>- Report from the A High Voltage Switchgear Room</li> </ul>
	SRO	Direct RO/BOP actions per DB-OP-02511, Loss of Service Water Pumps/Systems <ul style="list-style-type: none"> <li>- Announce the loss of SWP 1, Request the Shift Manager and Shift Engineer report to the Control Room</li> <li>- Verify Containment Air Cooler (CAC)1 is off</li> <li>- Close SW 1366</li> <li>- Verify CAC 3 is not running as CAC1</li> <li>- Direct an Equipment Operator to check AC107, SWP 1 Breaker, for targets</li> <li>- Attempt to restart SWP 1</li> <li>- Direct an Equipment Operator to verify the in-service Turbine Plant Cooling Water (TPCW) Heat Exchanger Outlet Vales are throttled</li> <li>- Open SW 1399, SW Hdr 1 to TPCW HX, while simultaneously closing CT 2955, TPCW HX Supply from Circ Water</li> <li>- Return CAC 1 to service per DB-OP-06016, Containment Air Cooler Operating Procedure</li> </ul>
	RO/BOP	Execute abnormal procedure actions per SRO directions

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Event Description: After SWP 1 is restarted, fail the upper chamber of Power Range Nuclear Instrument 5. NI5 failing high causes control rods to begin to automatically insert, Reactor Protection System (RPS) channel 2 to trip and RCS temperature to lower until the Integrated Control System (ICS) stations are placed in manual control.

Time	Position	Applicant's Actions or Behavior
	RO/SRO/BOP	Recognize indications of NI 5 failing high - Annunciator Alarm 5-3-I, RPS FLUX-DFLUX-FLOW TRIP - Annunciator Alarm 5-1-H, RPS CH 2 TRIP - NI NI 5, POWER RANGE PWR indicator failed high - NDI NI 5, POWER RANGE IMB indicator failed high
	SRO	Direct RO/BOP actions per DB-OP-02505, Nuclear Instrumentation Failures - Verify the FW Loop Demands are in HAND - Place the Rod Control Panel in Manual - Verify the Reactor Demand Station is in Hand - Place RPS Channel 2 in Manual Bypass per DB-OP-06403, RPS and NI Operating Procedure - Place the RPS Channel 2 Power Range Test Module in the Test Operate position - Return the Rod Control Panel to automatic, if desired
	RO/BOP	Execute abnormal procedure actions per SRO directions
	SRO	Refer to Tech Spec 3.3.1.1, RPS Instrumentation and 3.3.2.3, Anticipatory Trip System (ARTS)

Note: During the scenario validation the reduction in power due to the failed NI caused generated megawatts to lower to less than 110 MWE. The turbine is limited to 1 hour of operation below 110 MWE. The crew chose to trip the turbine manually. This action would negate the quill shaft failure, but the operator response would be the same as the actions contained in Event 4.

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Event Description: After RPS Channel 1 is bypassed a Main Turbine Quill Shaft failure will lead to a Main Turbine-Generator trip.

Time	Position	Applicant's Actions or Behavior
	RO/SRO/BOP	Recognize indications of the Main Turbine Quill Shaft failure - Annunciator Alarm 15-6-E, T-G QUILL SHAFT FAIL - Turbine Generator Main Oil Pump loses discharge pressure
	SRO	Direct the BOP per DB-OP-02015, Turbine Alarm Panel 15 Annunciators - Verify the Turning Gear Oil Pump has automatically started
	BOP	Execute alarm procedure actions per SRO directions
	RO/SRO/BOP	Recognize indications of a Main Turbine-Generator trip - Annunciator Alarm 8-1-B, T-G MASTER TURB TRIP - Annunciator Alarm 15-1-E, TURBINE TRIP - EHC Panel Trip lights on - Turbine Stop Valves Closed
	SRO	Direct the RO/BOP per DB-OP-02500, Turbine Trip - Announce the Turbine Trip - Verify Steam Generator low level limit control is proper - Verify Steam pressures are at 835 to 935 psig - Verify Air Circuit Breaker (ACB) 34560 is open - Verify ACB 34561 is open - Verify Megawatts and Megavars are zero - Verify turbine speed is decreasing below 1800 RPM - Verify MS 199, Second Stage Source Valve MSR 2, is closed - Verify MS 314, Second Stage Source Valve MSR 1, is closed - Verify RCS pressure is 2055 to 2255 psig - Verify RCS temperature is in accordance with curve CC 2.1 - Verify Pressurizer level is in accordance with curve CC 4.3 - Verify the Motor Suction Pump started - Verify the Turning Gear Oil Pump started - Reset the List Oil Pump Low Suction Pressure Trip - Verify one Condensate Pump in operation - Direct an Equipment Operator to control lube oil temperature - Perform Attachments 1, 2 and 3 in DB-OP-02500

Op-Test No.: 1,2,3 Scenario No.: 3 Event No.: 4Page 2 of 3Event Description: Event 3 Continued

Time	Position	Applicant's Actions or Behavior
	RO/BOP	Execute abnormal procedure actions per SRO directions
	SRO	Make required notifications to on-site personnel
	BOP	Perform Attachment 1 - Verify closed: <ul style="list-style-type: none"> <li>• AS 958, FLASH TANK VENT TO HTRS 1-2 &amp; 2-2</li> <li>• GS 346, STEAM SEAL DUMP VALVE TO LP HTR 1-1</li> <li>• GS 957, STEAM SEAL DUMP VALVE TO LP HTR 2-1</li> </ul> - Verify open: <ul style="list-style-type: none"> <li>• ES 308, HTRS 1-5 &amp; 2-5 EXT LINE DRN TO HP CNDSR</li> <li>• GS 2167, STEAM SEAL DUMP VALVES BYPASS TO HP CNDSR</li> </ul> - Depress OPEN: <ul style="list-style-type: none"> <li>• MS 209, MAIN STEAM NON-RETURN VALVES LINE 2</li> <li>• MS 210, MAIN STEAM NON-RETURN VALVES LINE 1</li> </ul> - Verify open: <ul style="list-style-type: none"> <li>• TD 2382, CONTROL VALVE DRAINS STEAM LEADS 1</li> <li>• TD 2383, CONTROL VALVE DRAINS STEAM LEADS 2</li> <li>• TD 2381, CONTROL VALVE DRAINS COMBINED ABOVE SEAT</li> <li>• MS 138, MSL STEAM TRAP BYP LINE 2</li> <li>• MS 266, MSL STEAM TRAP BYP LINE 1</li> <li>• ES 249, FEEDWATER HEATERS - EXT STEAM LINE DRAINS, LP HEATERS 1-2</li> <li>• ES 415, FEEDWATER HEATERS - EXT STEAM LINE DRAINS, LP HEATERS 1-3</li> <li>• ES 341, FEEDWATER HEATERS - EXT STEAM LINE DRAINS, LP HEATER 2-2</li> <li>• ES 411, FEEDWATER HEATERS - EXT STEAM LINE DRAINS, LP HEATER 2-3</li> <li>• ES 417, FEEDWATER HEATERS - EXT STEAM LINE DRAINS, HP HEATERS 1-4</li> <li>• ES 252, FEEDWATER - EXT STEAM LINE DRAINS, HP HEATERS 1-6</li> </ul>



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Event Description: A steam leak develops on the steam supply to Auxiliary Feedwater Pump Turbine (AFPT) 2. By isolating the steam leak the AFPT 2 is rendered inoperable and requires a Tech Spec entry.

Time	Position	Applicant's Actions or Behavior
	RO/SRO/BOP	Recognize indications of a steam leak in AFP Room 2 - Fire alarms in AFP Room 2 - Annunciator Alarm 12-2-A, SG 1 TO AFPT 2 MN STM PRESS LO - Computer Alarm P012, AFPT 2 STM IN LOW PRESS
	SRO	Direct RO/BOP actions per DB-OP-02525, Steam Leaks - Announce the steam leak and location - *Close MS 107A - Verify MS 107 is closed - Verify MS 106 is closed - Contact Radiation Protection
	RO/BOP	Execute abnormal procedure actions per SRO direction
	SRO	Refer to: - Tech Spec for 3.7.1.2 for AFP operability - DB-OP-02000 for PTS criteria

## \* Critical Task

Note: During the scenario validation the crew chose to trip the reactor and initiate SFRCS due to the potential that the steam leak was a personnel hazard. If the crew manually trips the reactor, the loss of offsite power will be automatically input. The critical step to manually isolate the steam leak will occur during the EOP response.

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Event Description: After the steam leak is isolated a loss of offsite power will occur that causes the reactor to trip. Emergency Diesel Generator (EDG) 2 will fail to automatically start requiring the crew to manually start the EDG. After EDG 2 is started, Makeup Pump (MUP) 2 fails to start which causes a loss of all Makeup to the RCS.

Time	Position	Applicant's Actions or Behavior
	RO/SRO/BOP	Recognize indications of a reactor trip caused by a loss of offsite power <ul style="list-style-type: none"> <li>- All control rods inserted and power lowering</li> <li>- Control room lights go off</li> <li>- Annunciator alarm 8-1-A, CRD TRIP CONFIRM</li> </ul>
	RO	Perform immediate actions of DB-OP-02000, RPS, SFAS, SFRCS Trip or SG Tube Rupture: <ul style="list-style-type: none"> <li>- Manually trip the reactor</li> <li>- Verify reactor power lowering</li> <li>- Manually trip the turbine</li> </ul>
	BOP	Announce the reactor trip
	RO/SRO	Verify the immediate actions are complete
	RO/SRO/BOP	Check for Specific Rule or Symptom Direction <ul style="list-style-type: none"> <li>- Recognize the need to implement Specific Rule 6 due to the loss of power to C1 and D1 Buses</li> </ul>
	SRO	Direct RO actions per Specific Rule 6 <ul style="list-style-type: none"> <li>- Verify both MUP breakers are open</li> <li>- *Press the EDG START button in the Control Room</li> <li>- Verify AD101, EDG 2 output breaker closes</li> <li>- Verify Component Cooling Water Pump (CCW) 2 starts</li> <li>- Verify Service Water Pump (SWP) 2 starts</li> <li>- Direct an Equipment Operator to monitor EDG 2</li> </ul>
	RO	Execute Specific Rule actions per SRO directions
	SRO	Route to DB-OP-02000 Supplementary Actions

\* Critical Task

Op-Test No.: 1,2,3 Scenario No.: 1 Event No.: 6,7,8Page 2 of 6Event Description: Events 6.7 and 8 continued

Time	Position	Applicant's Actions or Behavior
	SRO	Direct actions per DB-OP-02000 Supplementary Actions
	RO	Check all control rods inserted
	RO	Check for Makeup System operation - Transfer MUP suctions to the Borated Water Storage Tank (BWST) - Close MU 6408 and MU 6409 - Attempt to start MUP 2 - Recognize MUP 2 did not start - Verify CCW Pump 2 is running - *Start High Pressure Injection (HPI) Pump 2 - *Open HP 2A and HP 2B - *Start Low Pressure Injection (LPI) Pump 2 - *Open DH 63 - Control RCS pressure between 1700 and 1800 psig using Pressurizer Spray and Heaters - Throttle HP 2A and HP 2B to maintain Pressurizer level 80 to 120 inches
	BOP	Check Secondary System Response - Establish one Condensate Pump operation - Check Main Steam Isolation Valves are closed
	BOP	Check NNI power is available - Check all 4 NNI power supply lights are LIT
	BOP	Check ICS power is available - Check annunciator alarms 14-1-C, ICS 24 VDC BUS TRIP, and 14-2-D, ICS/NNI 118 VAC PWR TRBL, are not lit - Check ICS Hand/Auto station indicating lights are ON
	BOP	Check for Instrument Air available - Recognize no air compressors are running (if D2 Bus has not been re-energized) - Manually initiate AFW flow and Isolation of both SGs

\* Critical Task

Op-Test No.: 1,2,3 Scenario No.: 1 Event No.: 6,7,8Page 3 of 6Event Description: Events 6.7 and 8 continued

Time	Position	Applicant's Actions or Behavior
	RO	Check for Safety Features Actuation System (SFAS) actuation - Check RCS pressure is greater than the SFAS actuation setpoint - Check Containment pressure is greater than the SFAS actuation setpoint
	BOP	Check for Steam Feed Rupture Control System (SFRCS) actuation - Verify proper SFRCS actuation using Table 1 - Verify proper level control for SG 1 using Specific Rule 4 - Direct an Equipment Operator to shift AFP recirculation flowpaths - If D2 Bus has been re-energized, place the Motor Driven Feed Pump (MDFP) in service: - Enable both MDFP discharge valves - Close both MDFP discharge valves - Start the MDFP - Establish flow to SG 2 at less than 1000 gpm - Verify proper SG level control per Specific Rule 4 - Direct an Equipment Operator to shift AFP recirculation flowpaths
	RO/BOP	Check for adequate Subcooling Margin - Check SCM is greater than 20 °F
	RO/BOP	Check for lack of heat transfer - Check RCS temperature is not increasing with SG pressure constant or decreasing
	RO/BOP	Check for an overcooling - Check SG pressures are less than 960 psig
	SRO	Route to DB-OP-02000, Section 7

Op-Test No.: 1,2,3 Scenario No.: 1 Event No.: 6,7,8Page 4 of 6Event Description: Events 6,7 and 8 continued

Time	Position	Applicant's Actions or Behavior
	SRO	Direct RO/BOP actions per DB-OP-02000 Section 7
	RO	Maintain RCS Inventory - Set Pressurizer level controller to 100 inches - Transfer MUP suction to the BWST - Control Pressurizer level 80 to 120 inches using HP 2A and HP 2B
	BOP	Check for SFRCS actuation
	BOP	Verify proper SFRCS actuation per Table 1
	BOP	Maintain SG 1 level per Specific Rule 4
	RO/SRO	Check for entry into PTS criteria per Specific Rule 5
	BOP/SRO	Direct an Equipment Operator to locally control Atmospheric Vent Valve (AVV) 1
	RO/SRO	Check for adequate Subcooling Margin
	RO/SRO/BOP	Check for a SG tube rupture - Place Main Steam Line Radiation Monitors in GROSS - Check Pressurizer level is not decreasing
	SRO	Route to DB-OP-02000, Supplementary Actions



Op-Test No.: 1,2,3 Scenario No.: 1 Event No.: 6,7,8Page 6 of 6Event Description: Events 6.7 and 8 continued

Time	Position	Applicant's Actions or Behavior
	SRO	Direct RO/BOP actions per DB-OP-02521
	BOP/SRO	Direct an Equipment Operator to begin load shedding of Battery 2 per Attachment 5, Step 2.0
	RO	Verify MUP 1 breaker is open
	SRO	Direct RO/BOP actions per DB-OP-02521 Attachment 6, Attachment 4 and Attachment 1
	BOP/RO	Execute Attachment 4 actions - Verify the following breakers open: ABDD2, AD205, AD206, AD201, AD202, AD204, AD207, AD210, AD208
	BOP/RO	Execute Attachment 6 actions to power D2 Bus from the Station Blackout Diesel Generator (SBODG) - Start the SBODG - Check SBODG at 900 RPM - Verify AD213 is closed - Close AD301
	BOP/RO	Execute Attachment 1 actions - Verify the following breakers open: AC107, AC113, AC112, AC111, AC109, AC108, AC105, AC110, ABDC1, AC101
	BOP/RO	Execute Attachment 6 actions to power C1 Bus from D2 Bus - Verify HBBD is open - Close ABDD2 - Close ABDC1
	SRO	Direct the start of desired components on C1 Bus and D2 Bus
	RO/BOP	Start components on C1 Bus and D2 Bus as directed by the SRO

## Simulator Instructions

Scenario No.: 04 - 1

1. Initialize at 28% power with Steam Generators on low-level limits (IC scen 1 04-1)

2. Equipment Status

- a. Tagout EDG 1 Output Breaker (AC101)
- b. Make the following entries on the Tech Spec status sheet:  
EDG 1: Tech Spec 3.8.1.1, Out of service for unscheduled maintenance due to damage to the turbo charger, DB-SC-03023 due (current time + 6 hours), DB-SC-03071 due (current time + 18 hours). Restore by current time + 23 hours
- c. Turn on blue status lights for EDG
- d. Hang Protected Train 2 signs
- e. Ensure Service Water Pump 1 is supplying secondary loads
- f. Ensure CCW Pump 1 and Makeup Pump 2 are running
- g. Ensure the SG/Rx Hand/Auto station is in HAND
- h. Ensure the Feedwater Loop Demand Hand/Auto stations are in HAND
- i. Initialize the Makeup Tank at 85 inches

3. Initial Malfunctions (Setup)

- a. Remove EDG 1 from service.  
Close DA44 - irf gd44 close  
Close DA 30 - irf gd43 close  
Rack out AC 101 - irf g535a 3.0
- b. EDG 2 auto start failure - imf g532b  
Delete auto start failure when the Control Room pushbutton is depressed
- c. Makeup Pump 2 fails to start - imf b2m21
- d. Batch File 04-1.txt

#### 4. Triggers

- a. Loss of offsite power when the reactor trips

TRGSET 5 LIZG1API<90

#### 5. Events

- a. Service Water Pump 1 trip

Event 1 - irf kep1e (1) TRIP

- b. NI5 fails high

Event 2 - imf r3n5 (2)

- c. Quill shaft failure

Event 3 - imf ukrf (3)

- d. Steam leak

Event 4 - imf sfeg (4) 0.1

When steam leak is isolated fail MS 107 and MS 107A closed

- e. AFP Room 2 Fire Alarms

Event 4 - imf kn099 (4 00:00:02)  
imf kn100 (4 00:00:03)  
imf kn098 (4 00:00:04)  
imf kn101 (4 00:00:05)

- f. Loss of offsite power when the reactor trips

Event 5 - imf p8rfc

## 6. Instructor Station Cues

### Event 2 - SWP 1 Trip

After  $\approx$  1 minute, role play as an engineer in the "A" High Voltage Switchgear Room to report he may have bumped AC107 while inspecting seismic restraints.

Role play as an Equipment operator to check for targets on AC107, SWP1 breaker. After  $\approx$  3 minutes, inform the Control Room that no targets are present on AC107.

Role play as an Equipment Operator to check the status of SWP 1. After  $\approx$  4 minutes inform the Control that SWP 1 appears normal.

Role play as station management for notifications.

### Event 3 - NI 5 Failed High

Role play as I&C, System Engineer, Field Supervisor and/or the Work Week Manager if called. Inform the Control Room you will discuss with your manager and assemble a team to begin the trouble shooting and repair of NI 5.

Role play as station management for notifications.

### Event 4 - Quill Shaft Failure

Role play as an Equipment Operator to monitor Main Turbine Lube Oil

Role play as station management for notifications.

### Event 5 - Aux. Feed Pump Room Steam Leak

Fail MS 107 and MS 107A closed after the valves are closed to prevent reopening on SFRCS

### Event 6,7 and 8 - LOOP, Reactor Trip, EDG 2 fails to auto start, MUP 2 fails to start

Role play as an Equipment Operator to monitor EDG 2.

Role play as an Equipment Operator to locally operate AVV1.

Role play as an Equipment Operator to shift AFP recirc.

Role play as an Equipment Operator to Load Battery 2.

Facility: Davis-Besse NPS Scenario No.: 2 Op-Test No.: 1, 2, and 3

Examiners: \_\_\_\_\_ Operators: \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_

Initial Conditions: 100% Reactor Power, Makeup Pump 1 Out of Service  
 \_\_\_\_\_  
 \_\_\_\_\_

Turnover: \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_

Event No.	Malf. No.	Event Type*	Event Description
1	L616O	I (RO)	Safety Features Actuation System RCS pressure transmitter fails high (Tech. Spec.)
2	FAKMD	C (BOP)	High Pressure Feedwater Heater tube leak
3	G530A	C (SRO)	EDG 1 Trouble Alarm (Tech. Spec.)
4	L1T2V or L1T2N	I (BOP)	Main Steam Header Pressure transmitter fails mid-scale
5	HH46	C (RO)	Small RCS leak
6	-----	R (RO)	Power reduction
7	F41S1595	I (BOP)	Loss of all Condensate Pumps
8	L4, L8	C (RO)	ATWS
9	FKM1D	C (BOP)	Auxiliary Feedwater Target Rock Valve fails open
10	HH46	M (All)	Small Break LOCA

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



Op-Test No.: 1,2,3 Scenario No.: 2 Event No.: 2Page 1 of 1

Event Description: After SFAS Channel 2 is tripped a tube leak will develop in High Pressure Feedwater (HPFW) Heater 1-4 which forces a power reduction to remove the HPFW Heater string from service.

Time	Position	Applicant's Actions or Behavior
	RO/SRO/BOP	Recognize indications of a tube leak in HPFW heater 1-4 - Annunciator Alarm 13-6-E, HP FW HTR 1-4 LVL - HPFW Heater level increase - Computer Alarm L454, HP HEATER 1-4 HIGH LEVEL ALARM
	SRO	Direct RO/BOP actions per DB-OP-02013, Condensate Feedwater Alarm Panel 13 Annunciators and DB-OP-06229, High Pressure Feedwater Heater System Operation - Direct an Equipment Operator to check HPFW Heater level locally - Initiate a power reduction to 95% per DB-OP-02504, Rapid Shutdown - Notify the System Dispatcher - On the Load Control Panel, set Rate of Change - On the Load Control Panel, set Min Limit-MW to 180 MWE - Lower unit load to 95% power - Isolate HPFW Heater train 1 - Throttle open FW 460, HP Htr Trains Bypass while closing FW 448 and FW 440, HP Heater Trains Isolation valves - Close ES 2014, Ext Stm to HP Htrs Iso Train 1 - Verify ES 252, Feedwater Heater-Ext Stm Line Drains Train 1 - Direct an Equipment Operator to locally isolate HPFW Heater Train 1 using Attachment 10 of DB-OP-06229
	RO/BOP	Execute procedure actions per SRO direction
	BOP	Monitor feedwater flow and throttle FW 460 as necessary



Op-Test No.: 1,2,3 Scenario No.: 2 Event No.: 4Page 1 of 1

Event Description: After the SRO has referred to Tech Specs, the selected steam header pressure transmitter will fail mid-scale requiring manual control of the Main Turbine until the alternate transmitter is selected

Time	Position	Applicant's Actions or Behavior
	RO/SRO/BOP	Recognize indications of a steam header pressure transmitter failure <ul style="list-style-type: none"> <li>- Turbine control valves going open</li> <li>- SG pressure decreasing</li> <li>- Actual header pressure decreasing</li> <li>- Annunciator alarm 14-4-E, ICS INPUT MISMATCH</li> </ul>
	SRO	Direct RO/BOP actions per DB-OP-02014, MSR/ICS Alarm Panel 14 Annunciators, DB-OP-06407, Non Nuclear Instrumentation System Operating Procedure and DB-OP-06401, Integrated Control System Operating Procedure <ul style="list-style-type: none"> <li>- Determine which instrument pair has caused the mismatch</li> <li>- Reset the SASS annunciator</li> <li>- Place the affected ICS Hand/Auto stations in HAND and control parameters manually               <ul style="list-style-type: none"> <li>- EHC Control Panel</li> <li>- Steam Generator/Reactor Demand</li> <li>- Turbine Bypass Valves</li> <li>- Atmospheric Vent Valves</li> </ul> </li> <li>- Select the good header pressure transmitter</li> <li>- Raise header pressure with the Turbine in manual</li> <li>- Return the ICS stations to automatic</li> </ul>
	RO/BOP	Execute alarm procedure actions per SRO direction

Op-Test No.: 1,2,3 Scenario No.: 2 Event No.: 5,6Page 1 of 2Event Description: After ICS is returned to automatic a small RCS leak ( $\approx$  150 gpm) will require a plant shutdown.

Time	Position	Applicant's Actions or Behavior
	RO/SRO/BOP	Recognize indications of an RCS leak <ul style="list-style-type: none"> <li>- Makeup Tank (MUT) level dropping</li> <li>- Makeup flow rising</li> <li>- Containment sump level rising</li> <li>- Containment Radiation levels rising</li> <li>- Pressurizer level lowering</li> </ul>
	SRO	Direct RO actions per DB-OP-02522, Small RCS Leaks <ul style="list-style-type: none"> <li>- Verify Pressurizer level is NOT being maintained</li> <li>- Isolate Letdown by closing MU 2B, Letdown Isolation</li> <li>- Monitor Pressurizer level</li> <li>- Monitor MUT level</li> <li>- Calculate the leak rate using Attachment 1 of DB-OP-02522</li> <li>- Locate the leak</li> <li>- Attempt to isolate the leak using Attachment 2 of DB-OP-02522               <ul style="list-style-type: none"> <li>- Close RC 11, Pressurizer PORV Block</li> <li>- Close RC 2, Spray Valve</li> <li>- Close RC 10, Spray Block Valve</li> </ul> </li> <li>- Verify closed RC 239A and RC 239B, Pressurizer sample valves</li> <li>- Verify closed RC 4608A, RC 4608B, RC 4610A and RC4610B, RCS high point vents</li> <li>- Verify closed RC 4632, RC Cold Leg Loop 2-1</li> </ul> Determine the leak is not in the Makeup system Determine the leak is not in the Letdown system Commence a plant shutdown
	RO	Execute abnormal procedure actions per SRO direction

Op-Test No.: 1,2,3 Scenario No.: 2 Event No.: 5,6Page 2 of 2Event Description: Events 5,6 continued

Time	Position	Applicant's Actions or Behavior
	SRO	<p>Supervise/coordinate the power reduction per DB-OP-02504, Rapid Shutdown</p> <ul style="list-style-type: none"> <li>- Notify the System Dispatcher</li> <li>- At the Load Control Panel, set the Rate of Change</li> <li>- At the Load Control Panel, set the Min Limit</li> <li>- Lower unit load</li> <li>- Control core imbalance with axial power shaping rods (APSR)</li> <li>- Request Chemistry monitor condensate polishers and sample the RCS</li> <li>- If time permits <ul style="list-style-type: none"> <li>- Transfer station electrical loads</li> <li>- Lineup the Motor Driven Feed Pump in the Main Feedwater mode</li> <li>- Start the Auxiliary Boiler</li> <li>- Maintain MUT level 55 to 86 inches</li> </ul> </li> <li>- Direct an Equipment Operator to remove AFPT minimum flow lines from service</li> </ul>
	RO/BOP	<p>Execute abnormal procedure action per SRO direction</p> <ul style="list-style-type: none"> <li>- Coordinate to initiate the power reduction</li> </ul>
	SRO	<p>Direct the initiation of Makeup/High Pressure Injection piggyback operation per DB-OP-02522</p> <ul style="list-style-type: none"> <li>- Verify MU 6405 and MU 3971, MUP Three-Way Suction Valves, are in the BWST position</li> <li>- Start the standby Component Cooling Water (CCW) Pump</li> <li>- Start both High Pressure Injection (HPI) Pumps</li> <li>- Open HP 2A, HP2B, HP2C and HP2D, HPI Injection Valves</li> <li>- Start both Low Pressure Injection (LPI) Pumps</li> <li>- Open DH 63 and DH 64, Decay Heat Cooler Outlet to HPI Pump Suction valves</li> </ul>
	RO/BOP	<p>Execute abnormal procedure actions per SRO direction</p>

Op-Test No.: 1,2,3 Scenario No.: 2 Event No.: 7, 8Page 1 of 1

Event Description: After the power reduction has started, a loss of all Condensate Pumps will occur and require a reactor trip and manual initiation of the Steam Feed Rupture Control System (SFRCS). The control rods will fail to insert requiring the Reactor Operator to perform the actions for an ATWS.

Time	Position	Applicant's Actions or Behavior
	RO/SRO/BOP	Recognize a loss of all Condensate Pumps - Annunciator Alarm 13-2-B, CNDS PMP DISCH HDR PRESS - Annunciator Alarm 13-4-C, DEAR STRG TK 1 LVL - Annunciator Alarm 13-4-D, DEAR STRG TK 2 LVL - Decreasing Condensate flow - No Condensate Pumps running
	SRO	Direct RO/BOP actions per DB-OP-02013, Condensate Feedwater Alarm Panel 13 Annunciators - Determine Condensate header pressure is low - Determine Deaerator Storage Tank (DST) level is low - When DST level approaches off-scale low then: - Manually trip the reactor - Perform immediate actions of DB-OP-02000, RPS, SFAS, SFRCS Trip or SG Tube Rupture - Trip both Main Feedwater Pumps - Initiate SFRCS
	RO	Perform DB-OP-02000 immediate actions: - Recognize the control rods did not insert on the manual Reactor trip - *Momentarily de-energize 480 VAC unit substations E2 and F2 simultaneously - Verify control rods inserted - Verify power is lowering on the Intermediate Range - Manually trip the turbine - Verify the Main Turbine Stop or Control valves are closed

\* Critical Task

Op-Test No.: 1,2,3 Scenario No.: 2 Event No.: 9,10Page 1 of 1

Event Description: After the reactor is tripped, the RCS leak will increase in size leading to a loss of subcooling margin. AF 6451, Auxiliary Feedwater Pump Discharge Valve, will fail open causing an overfeed of SG 2

Time	Position	Applicant's Actions or Behavior
	RO/SRO/BOP	Recognize indications of a loss of subcooling margin - TSAT meters indicate less than 20°F - Annunciator alarm 4-1-B, SUBCOOL MARGIN LO
	SRO	Direct RO actions per section 5 of DB-OP-02000 - *Trip all Reactor Coolant Pumps - Verify both CCW trains are in service - Verify both HPI Pumps are running - Verify all HPI injection line valves are open - Lock MUP suction to the BWST - Start both LPI Pumps - Open MU 6420 - Verify MU 6422 is open - Open DH 63 and DH 64 - Verify proper SFAS response
	RO	Execute EOP actions per SRO direction
	SRO	Direct BOP actions per section 5 of DB-OP-02000 - Verify proper SFRCS response - Verify proper SG level control by AFW
	BOP	Execute EOP actions per SRO direction - Recognize indications of a SG overfill due to AF 6451 failed open
	SRO	Direct BOP actions per section 7 of DB-OP-02000 - *Stop the SG 2 overfill by taking manual control of AFW - Reduce AFPT speed - Close AF 599 - Manually control SG 2 level
	BOP	Execute EOP actions per SRO direction

\*Critical Task

## Simulator Instructions

Scenario No.: 04 - 2

1. Initialize at 100% power (IC 04-2 scen2)

2. Equipment Status

a. Tagout Makeup Pump 1

- Place caution tags on MUP 1 control switch

- Place caution tags on MUP 1 Oil Pumps control switches

b. Make the following entries on the Tech Spec status sheet:

Makeup Pump 1: Tech Spec 3.1.2.4, Out of service to repair an oil leak.  
Return time is (current date and time + 60 hours)

c. Hang Protected Train 2 signs

d. Ensure the Safety Monitor computer program reflects MUP1 out of service

e. Ensure CCW Pump 1 and Makeup Pump 2 are running

3. Initial Malfunctions (Setup)

a. Remove MUP 1 from service.

IRF B2M1A 3.0

IRF BME5A open

IRF BME5D open

IRF BME5I open

b. Override RPS, ARTS and DSS trips

IMF L4

IMF L8

IMF L5D2

IMF L5D1

#### 4. Events

- a. SFAS Channel 2 RCS Pressure Transmitter fails high

Event 1 - imf l6i6o (1)

- b. HPFW Heater Tube leak over a 3 minute ramp

Event 2 - imf fakkd (2) 0.5 00:03:00

- d. Header Pressure instrument fails mid-scale

Event 4 - imf l1t2n (4) 0.5 00:01:00 0.45

- e. RCS leak

Event 5 - imf hh46 (5) 0.0001

- e. AFP Target Rock valve fails open

Event 6 - imf fkm1d (6)

#### 5. CAEP File

- a. Event 3 - EDG 1 Trouble Alarm

set tala111 = 0.01 | 06:00:00 | 1

- b. Event 7 - Hotwell Level Switch fails low

set f4lsl595 = T | 06:00:00 | 2

- c. Event 8 - RCS leak size increase

mmf hh46 0.0017 | 6:00:00 | 3

## 6. Instructor Station Cues

Event 1- SFAS Channel 2 Press Transmitter fails high

Role play as I&C, System Engineer, Field Supervisor and/or the Work Week Manager if called

If called, role play as station management for notifications.

Event 2 - HPFW Heater 1-6 tube leak

Role play as an Equipment Operator to isolate the HPFW heater locally

Event 3 - EDG 1 annunciator

Role play as an Equipment Operator to investigate EDG 1

Role play as station management for notifications.

Event 4 - Main Steam Header pressure failure

Role play as I&C, System Engineer, Field Supervisor and/or the Work Week Manager if called

If called, role play as station management for notifications

Facility: Davis-Besse NPS Scenario No.: 3 Op-Test No.: 3

Examiners: \_\_\_\_\_ Operators: \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_

Initial Conditions: 50% Reactor Power, both Main Feedwater Pumps in service  
 \_\_\_\_\_  
 \_\_\_\_\_

Turnover: Main Feedwater Pump 2 has been placed in service, ready to begin power increase  
 \_\_\_\_\_  
 \_\_\_\_\_

Event No.	Malf. No.	Event Type*	Event Description
1	-----	R (RO)	Raise reactor power
2	H1C1C	I (RO)	Fail Pressurizer Temperature Transmitter mid-scale (Tech. Spec)
3	BMF1	C (RO)	Makeup Filter differential pressure high
4	-----	C (SRO)	Loss of Shield Building Integrity (Tech Spec)
5	DCM1	C (BOP)	Loss of Condenser Vacuum
6	HH51	M (All)	Steam Generator Tube Rupture
7	L1TL20	I (BOP)	Steam Generator Level Transmitter fails mid-scale

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

Op-Test No.: 2,3 Scenario No.: 3 Event No.: 1,2Page 1 of 1

Event Description: After shift turnover the crew will begin a power increase towards 100% power. During the power increase, the selected Pressurizer temperature transmitter will fail mid-scale requiring manual control of MU 32, Pressurizer Level Control Valve

Time	Position	Applicant's Actions or Behavior
	SRO	Direct the power increase per DB-OP-06902, Power Operations - Adjust the Unit Load Demand (ULD) on the Load Control Panel by depressing the INCREASE pushbutton
	RO	Execute procedure actions per SRO direction
	RO/BOP	Perform actions as necessary - Maintain generator transfer volts at zero - Maintain MFPT transfer volts at zero - Perform an Nuclear Instrument / Heat Balance Power (NI/HBP) comparison - Maintain Axial Power Imbalance (API) and Rod Insertion Limits within limits of the Core Operating Limits Report (COLR)
	RO/SRO/BOP	Recognize indications of a Pressurizer temperature transmitter failure - Annunciator alarm 4-2-E, PZR LVL LO - MU 32 going open - Indicated Pressurizer level low - Indicated Pressurizer temperature low
	SRO	Direct RO actions per DB-OP-02513, Pressurizer System Abnormal Operation - Stop the power increase - Place MU 32 in HAND and adjust to desired flow - Select the alternate temperature instrument - Place MU 32 in automatic control
	RO	Execute abnormal procedure actions per SRP direction
	SRO	Refer to Tech Spec 3.4.4 for Pressurizer level





Op-Test No.: 2,3 Scenario No.: 3 Event No.: 5Page 1 of 1

Event Description: After the Shield Building Tech Spec is entered Main Condenser vacuum will slowly rise requiring a power reduction. One of the Main Feedwater Pumps (MFP) will be removed from service prior to correcting the vacuum leak.

Time	Position	Applicant's Actions or Behavior
	RO/SRO/BOP	Recognize indications of a decreasing Main Condenser vacuum <ul style="list-style-type: none"> <li>- Condenser pressure rising</li> <li>- Annunciator alarm 15-1-F, HP COND PRESS HI</li> <li>- Annunciator alarm 15-2-F, LP COND PRESS HI</li> </ul>
	SRO	Direct RO/BOP actions per DB-OP-02518, High Condenser Pressure <ul style="list-style-type: none"> <li>- Verify the Mechanical Hogger starts</li> <li>- Reduce Reactor power when Condenser vacuum reaches 5.0 inches per DB-OP-02504, Rapid Shutdown</li> <li>- At the Load Control Panel set Rate of Change</li> <li>- At the Load Control Panel set the Minimum Limit</li> <li>- At the Load Control Panel set press the Decrease pushbutton</li> <li>- Control Axial Power Imbalance with Axial Power Shaping Rods (APSR)</li> <li>- Request Chemistry monitor Condensate Polishers and RCS iodine</li> <li>- Shutdown MFP 1</li> </ul>
	RO/BOP	Execute abnormal procedure actions per SRO direction
	BOP	Shutdown MFP 1 using Attachment 4 of DB-OP-02504 <ul style="list-style-type: none"> <li>- Place MFP 1 ICS Hand/Auto station in HAND and reduce speed to 3900 RPM</li> <li>- Adjust MDT 20 output to indicate zero amps on the Transfer Meter</li> <li>- Place MDT 20 in manual control</li> <li>- Lower MFPT 1 speed until the Low Speed Switch (LSS) light is lit</li> <li>- Trip MFPT 1</li> </ul>
	RO/SRO/BOP	Stop the power decrease after the vacuum problem is corrected

Op-Test No.: 2,3 Scenario No.: 3 Event No.: 6/7Page 1 of 3

Event Description: After MFPT 1 is removed from service, a tube rupture will develop in Steam Generator (SG) 1 which will require a rapid shutdown to Low Level Limits (LLL). After the plant reaches LLLs, steam loads will be transferred from the Main Turbine to the Turbine Bypass Valves (TBV) and the reactor will be manually tripped. After the Reactor is tripped, Condenser vacuum will rise to the point where the crew will be required to manually initiate SFRCS. After SFRCS is initiated, the level transmitter for SG 2 will fail mid-scale requiring manual control of AFW to SG 2.

Time	Position	Applicant's Actions or Behavior
	RO/SRO/BOP	Recognize indications of a tube rupture in SG 1 - Annunciator alarm 9-4-A, VACM SYS DISCH RAD HI - Annunciator Alarm 12-1-A, MN STM LINE 1 RAD HI - Pressurizer level decreasing - Makeup flow increasing
	SRO	Direct RO actions per DB-OP-02531, Steam Generator Tube Leaks - *Isolate Letdown - *Start the second Makeup Pump - Recognize Pressurizer level is decreasing - Route to DB-OP-02000, RPS, SFAS or SFRCS Trip or Steam Generator Tube Rupture
	RO	Execute abnormal procedure actions per SRO direction
	SRO	Direct RO/BOP actions per DB-OP-02000 - Lock MUP suctions on the BWST - *Place the Alternate Makeup Injection Line in service - Control Pressurizer level using MU 32 and MU 6419 - Begin a plant shutdown with the SG/Reactor Hand/Auto station - Direct an Equipment Operator to start the Auxiliary Boiler - Lineup and start piggyback operation - Start the standby CCW Pump - Start both High Pressure Injection (HPI) Pumps - Open HP 2A, HP 2B, HP 2C and HP 2D - Start both Low Pressure Injection (LPI) Pumps - Open DH 63 and DH 64 - Transfer station electrical loads
	RO/BOP	Execute EOP actions per SRO direction

\*Critical Step

Op-Test No.: 2,3 Scenario No.: 3 Event No.: 6,7Page 2 of 3Event Description: Events 6 and 7 continued

Time	Position	Applicant's Actions or Behavior
	SRO	Direct RO/BOP actions per DB-OP-02000, section 8 - Verify SG/Reactor Demand Hand/Auto station is at zero demand - Place both Feedwater Loop Demand Hand/Auto stations in HAND and reduce demand to zero - Manually open the Turbine Bypass Valves (TBV) to transfer steam loads from the Turbine - Manually trip the reactor
	RO/BOP	Execute EOP actions per SRO direction
	RO	Perform immediate actions of DB-OP-02000, RPS, SFAS, SFRCS Trip or SG Tube Rupture: - Manually trip the reactor - Verify reactor power lowering - Manually trip the turbine
	BOP	Announce the reactor trip
	ROP/SRO	Verify the immediate actions are complete
	BOP	Recognize Condenser vacuum is rapidly rising - Manually initiate SFRCS
	RO/SRO/BOP	Check for Specific Rule or Symptom Direction - Recognize an AFW system overfeed of SG 2 - Route to DB-OP-02000, section 7
	SRO	Direct RO/BOP actions per DB-OP-02000, section 7 - Verify RCS Inventory - Verify proper SFRCS actuation
	BOP	Recognize SG 2 level is rising above the appropriate setpoint - *Manually control AFW - Manually control AF 6451, SG 2 AFW Level Control Valve OR - Reduce AFPT 2 speed

\*Critical Step



## Simulator Instructions

Scenario No.: 04 - 3

1. Initialize at 50% power with both Main Feed Pumps in service

2. Equipment Status

- a. Hang Protected Train 2 signs
- b. Ensure the Safety Monitor computer program reflects no equipment out of service
- c. Ensure Pressurizer temperature is selected to TT 15-1

3. Initial Malfunctions (Setup)

4. Triggers

- a. Fail SG 2 startup range level transmitter mid-scale when AFPT 2 speed is > 1000 rpm

target set 5 s5:5816 > 1000"  
imf l1th20 (5) 0.5

5. Events

- a. Fail Pressurizer temperature transmitter TT 15-1 to mid-scale

Event 1 - imf h1c1c (1) 0.5

- b. Clog Makeup Filter 1 on a 5 minute ramp

Event 2 - imf bmf1 (2) 0.815 00:05:00 0

- c. Increase Condenser pressure on a 5 minute ramp

Event 3 - imf dcm1 0.0005 00:05:00

- d. SG 1 tube rupture on a 5 minute ramp

Event 4 - imf hh50 0.08 00:05:00

6. CAEP File

- a. Increase the condenser vacuum leak when the reactor trips

mmf dcm1 0.8 | 06:00:00 | 1

## 7. Instructor Station Cues

### Event 1 - Power increase

Role play as the System Dispatcher for the power increase

### Event 2 - Pressurizer temperature transmitter mid-scale failure

Role play as I&C, System Engineer, Field Supervisor and/or the Work Week Manager if called. Inform the Control Room you will discuss with your manager and assemble a team to begin the trouble shooting and repair of TT 15-1.

Role play as station management for notifications.

### Event 3 - Makeup filter high differential pressure

Role play as I&C, System Engineer, Field Supervisor and/or the Work Week Manager if called. Inform the Control Room you will initiate the order to replace the filter cartridge.

Role play as station management for notifications.

### Event 4 - Door 107, Access from ECCS Room 2 to the MISC. Waste Monitor Tank Room, failure

Role play as an Equipment Operator to report the latch mechanism on Door 107 is broken and the door will not close

Role play as station management for notifications.

### Event 5 - Condenser pressure rising

Role play as Equipment Operators to look for vacuum leaks. After MFPT 1 is removed from service, report that the condenser boot seal water level is low and request permission to fill the boot seal.

### Event 6 and 7 - SG 1 Tube Rupture

Role play as Chemistry and Radiation Protection to perform Attachments 2 and 3 of DB-OP-02531, SG Tube Leak.