Facility: Davis-Besse **Scenario No.: 1** **Op-Test No.: 2009-01**

Examiners: _____ Operators: _____

_____ _____

_____ _____

Initial Conditions: 50% power. Problem exists with MFP #2. Ready to remove MFP #2 from service, HPI #1 OOS for maintenance. Risk is Yellow?

Turnover: Maintain 50% power. Remove MFP #2 from Service and place on turning gear per DB-OP-06224, Section 3.8. The unit will remain at 55% power.

Event No.	Malf. No.	Event Type*	Event Description
1		N (BOP)	Remove MFP #2 from service
2	Malf	C (BOP)	Trip of Running Condensate Pump #1.
3	Malf	C (RO)	CCW #1 Pump trip/Failure of Standby Pump to Auto Start
		SRO	TS 3.7.7 Cond A, TS 3.4.9 Cond A, TS 3.8.1.1, Cond B.
4	Malf	C (RO)	Pressurizer Temp Transmitter (TI-RC-15) fails low
5	Malf	I (RO)	Selected T_H fails high
		C (BOP)	Feedwater Loop 2 Flow Demand Controller FICS32B won't return to AUTO.
6	Malf	R (RO)	SG Tube leak (~30 gpm). Power reduction with FW Loop Demand and SG/Rx Master Controllers in Manual.
		SRO	TS 3.4.13, RCS Allowable Leakage
7	Malf	M	SG Tube Leak transitions to Rupture (400gpm) SG #2. Reactor Trip HPI Pump #2 fails to start.

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

3 hr scenario

Initial conditions for this scenario are that HPI Pump #1 is OOS for maintenance. A fault in included in the initial IC set that prevents HPI Pump #2 from starting.

Operators will remove #2 MFP from service. #1 Condensate pump will trip. The BOP applicant should start #3 Condensate pump since the remaining condensate pump will be pumping 4 Mlbm/hr when maximum allowed flow rate for this pump is 3.5 Mlbm/hr. The loss of CCW #1 pump will require the RO operator to perform followup actions and require a Tech Spec review by the SRO. The operator actions must be completed before reaching RCP trip criteria. The selected pressurizer temperature instrument will fail low on slow ramp preventing SASS actuation. The SRO will direct actions from the abnormal procedures. The selected T_H will fail high on a slow ramp to prevent SASS actuation. This will require immediate operator actions. The SRO will order ICS control stations be placed in HAND. When recovering, the BOP operator will observe that the #2 MFW flow demand controller will not return to AUTO. Since this is a prerequisite to returning the SG/Rx demand station to AUTO, both stations must be controlled in HAND.

The #2 SG tube bundle will develop a leak (~30 gpm). This leak will get the SRO into the abnormal SG Leak procedure, DB-OP-02531 requiring a load reduction. During the power decrease, the both the BOP and RO operators will need to lower reactor power manually. This will require coordination and communication between both operators.

After about 10 minutes, RP will report that SG #2 MS lines have higher radiation levels than SG #1. At this time, with approval from chief examiner, the simulator operator will ramp in a SGTR leak rate of about 400 gpm.

With the RCS/SG tube leak rate exceeding the capacity of one makeup pump, the SRO should order starting the second makeup pump and isolating letdown. Starting the second makeup pump is considered a critical step since each makeup pump is rated for 150 gpm flow rate. The SRO will recognize that HPI pump #1 is OOS and HPI pump #2 will not start. Without both HPI pumps operating, RCS inventory control will rely on operation of both makeup pumps and isolation of letdown. With both makeup pumps running, flow will be just enough to keep up with the tube leak rate, so isolating letdown (closing MU2B or MU3) is considered a critical task. Failing to start the second makeup pump and/or failing to isolate letdown will result in loss of RCS inventory that would complicate this accident sequence.

During performance of DB-OP-02000, the SRO will need to ensure an adequate supply of water to the makeup pumps. Locking MU3971 and MU6405 in the BWST position will fulfill that requirement. The SRO will direct starting of LPI and piggyback LPI discharge into makeup pump suction increasing available flow rates from the makeup system. With the additional flow rates, the operators will be able to perform a cooldown with the SG tube leak and still be able to maintain positive control of RCS inventory. This would make locking open MU3971 and MU6405 and opening piggyback valves DH63 all critical steps and DH64.

The scenario ends when the crew lowers RCS pressure to <1000 psig and <500F.

Op-Test No.: 2009-01	**Scenario No.: 1**	**Page 3 of 20**

Event Description: Scenario setup notes

Time	**Position**	**Applicant's Actions or Behavior**

bat /NRC/nrcsenario2.txt|00:00:02|0
imf hh51 0.11 00:02:00|04:00:00|1

^ nrcsenario 1
^
^Set up 50% power ic 106
^
^Initial set up
^
^
^ HPI #1 out of service
irf bfp1a rackout
irf bfp1c true
^
^ fails HPI 2 breaker open will not start
imf bfp2c
^
^ Fails CCW pump 2 to auto start will start by the switch
imf ka34m
^
^ Fails the auto push button off main feed water loop ics 32b
ior a11a1a12-7 off
^
^ removes fuse for turbine bypass to keep them from going close
imf l3m2b (10) normal
^
^ select PZR 14-1
^
^ Trigger none
^
^

^ events
^
^ event 1 remove main feed #2 pump from service crew
^
^ Event 2
^ Trips #1 Condensate pump
imf fak4i (2)
^
^ Event 3
^ fails breaker for 1 ccw pump open
imf ka30C (3)
^
^ Event 4
^ Fails PZR temp fails low mu32 opens
imf h1c1c (4) 0.0 00:00:05 0.861
^
^ Event 5
^ Fails selected TH fails high
imf l1t6h (5) 1.0 00:00:20 0.74
^
^ Event 6
^ otsg tube leak #2 otsg
imf hh51 (6) 0.008 00:02:00 0.0

Post "Protected Train 2" signs.
Place OOS Tag on HPI Pump #1.

Op-Test No.: 2009-01	**Scenario No.: 1**	**Page 4 of 20**
Event Description: Remove MPF #2 from Service		

Time	Position	Applicant's Actions or Behavior
	SRO	Directs shutdown of MFP #2 and orders MFP #2 be placed on turning gear IAW DB-OP-06224, Section 3.8.
	BOP	Has NLO in field: verify that FW 423, DST Discharge Crossover is OPEN
	CUE	**Tell applicants that keys for ARTS cabinets have already been signed for.**
	BOP	Places the following test toggle switches to the TRIP position in all four Anticipatory Reactor Trip System (ARTS) cabinets: CH 1, C5784A Main Feed Pump Input Test, for MFP- 2. CH 2, C5784B Main Feed Pump Input Test, for MFP- 2. CH 3, C5784C Main Feed Pump Input Test, for MFP- 2. CH 4, C5784D Main Feed Pump Input Test, for MFP- 2.
	BOP	As MFPT 2 speed is reduced has NLO locally monitor FW 491, Main Feed Pump 2 Discharge Non-Return for indications of reverse flow.
	BOP	Places HIC ICS36A Hand/Auto Station for Main Feed Pump 2 Speed, in HAND Reduces MFPT 2 speed to its lowest speed setting using toggle switch to lower position intermittently to minimum output. May receive Annunciator 10-2-F, BFP 2 Discharge Flow Low.
	BOP	Transfer MFPT 2 control from ICS to MDT 20 as follows: a. Verify MFPT speed is between 3900 RPM and 5150 RPM. b. Adjust the MDT 20 output to indicate a zero amp reading on the Xfer Meter Amp YI-806. c. Depress MANUAL on HIS 806C2 and check that MANUAL illuminates. MDT20 is controlling MFPT Speed. If MDT20 Control is unstable, then return to ICS Control. d. Adjust the ICS output to obtain zero amps indicated on the Xfer Meter Amp Y1-806.

Op-Test No.: 2009-01	**Scenario No.: 1**	**Page 5 of 20**
Event Description: Remove MPF #2 from Service		

Time	Position	Applicant's Actions or Behavior
	BOP	Reduces MFPT 2 speed by turning HS 805D, Turbine Speed MDT 20 Pistol Grip to Decrease until green LSS light IL 806A is lit.
	BOP	When MFP 2 discharge pressure is less than 150 PSIG, then has NLO: Opens FW 25, Main Feed Pump Turbine 2 Casing Warmup Valve Outlet Isol. Opens FW 23, Main Feed Pump 2 Warm up vlv inlet isol. Depress AUTO on NV479, Main Feed Pump 2 Warm-up. Verify FW 479, Main Feed Pump 2 Warm-up, is operating.
	BOP	When MFPT is <1000 rpm, then opens TD Drain Valves: 1944, 1947, 1948 1956
	BOP	Trip MFPT 2 using HS 797, Main Feed Pump 2 Turbine Trip Check 8-4-B, MFPT 2 TRIP, alarms. Check the following lights are LIT: Red TRIP light. Green LP STOP VALVE closed light. Green HP STOP VALVE closed light.
	BOP	GEMAC Controller FC436 adjusted to 20 Mlbm/hr on back panel.

Op-Test No.: 2009-01	**Scenario No.: 1**	**Page 6 of 20**
Event Description: Trip of Running Condensate Pump #1		

Time	Position	Applicant's Actions or Behavior
	BOP	Diagnosis that Condensate Pump #1 has tripped.
	SRO	Has crew monitor Deareating Feedwater Tank levels. Observes that #2 Condensate Pump is running above maximum allowed flow rate of 2.5 Mlbm/hr. Directs starting #3 Condensate Pump per DB-OP-06221, Sect 3.7.
	BOP	Calls NLO to ensure prestart of #3 Condensate Pump has been completed. Dispatches NLO to standby for start of #3 Condensate Pump. Starts #3 Condensate Pump using HIS 591
	BOP	Has NLO open CD588 locally, Has NLO close CD15 locally.

Op-Test No.: 2009-01	**Scenario No.: 1**	**Page 7 of 20**
Event Description: CCW #1 Pump Trip / Failure of Standby Pump to Auto Start		

Time	**Position**	**Applicant's Actions or Behavior**
	Crew	Indications Available: 6-5-B, SEAL CCW FLOW LOW 2-3-A, LETDOWN TEMP HIGH Letdown Isolation
	SRO	Enters DB-OP-02523, CCW System Malfunctions.
	RO	Verify the standby CCW Pump starts. (Standby Pump fails to auto start.) Starts the standby CCW Pump. **(CRITICAL Prior to reaching RCP Trip Criteria)**
	RO	IF the standby CCW Pump fails to start, THEN perform the following: IF high temperature computer alarms are received on the RCPs, THEN GO TO Step 4.6.11, Otherwise monitor RCP Temperatures. Monitor RCS Letdown Temperatures.
	BOP	Dispatch an operator to check breaker relay targets.
	CUE	**After 4 minutes, call CR and inform them that Target 50-51A Instantaneous Time Relay on CCW Bkr #1 is up.**
	BOP	Verify the Non-Essential CCW Isolation valves open for the running CCW Pump, AND close for the non-running CCW Pump. LOOP 1: CC 5095, CC 5097, CC 2645 (Close) LOOP 2: CC 5096, CC 5098, CC 2649 (Open)
Contingency		If the crew is too slow to start the standby CCW pump, then the crew will need to return letdown to service using the following steps:

Op-Test No.: 2009-01	**Scenario No.: 1**	**Page 8 of 20**
Event Description: CCW #1 Pump Trip / Failure of Standby Pump to Auto Start		

Time	**Position**	**Applicant's Actions or Behavior**
	RO	Return the Letdown System to service, REFER TO DB-OP-06006, Makeup and Purification. (Letdown is isolated.)
	RO	Isolate Purification Demineralizers 1, 2, and 3 by: Openning MU104, Purification Demineralizer Bypass. Close MU10A, Mixed Bed 1 Letdown Inlet, using HISMU10A and Close MU10B, Mixed Bed 2 Letdown Inlet, using HISMU10B and Close MU1903, Purification Demin 3 Letdown Flow Inlet, using HISMU1903. Manually override the high temperature signal by **HOLDING** the following valves in the OPEN position, until the trip clears (Annunciator 2-3-A resets at 125°F): MU2B, Letdown Coolers Inlet Isolation, using HISMU2B MU1A, RC Letdown Cooler 1 Inlet Isolation, using HISMU1B MU1B, RC Letdown Cooler 2 Inlet Isolation, using HISMU1B Restore the Makeup system to the normal valve lineup by opening the following valves as directed by the Shift Manager: MU10A, Mixed Bed 1 Letdown Inlet, using HISMU10A. MU10B, Mixed Bed 2 Letdown Inlet, using HISMU10B. MU1903, Purifications Demin 3 Letdown Flow Inlet, using HISMU1903 (Many need to open MU6 (MU4 Bypass) to lower pressurizer level. Close MU104, Purification Demineralizer Bypass.
	SRO	Refer to Technical Specifications • TS 3.7.7, Cond A, CCW Pump inoperable, 72 hours • TS 3.8.1.1, Cond A, EDG Inop due to no CCW, • TS 3.4.9, Pressurizer Level

Op-Test No.: 2009-01	Scenario No.: 1	Page 9 of 20
Event Description: CCW #1 Pump Trip / Failure of Standby Pump to Auto Start		

Time	Position	Applicant's Actions or Behavior
	SRO	Directs RO to perform SR 3.8.1 for #1 EDG Inoperable
	SRO	Directs BOP to have NLO lineup CCW Pump #3 as a Train #1 component.

Op-Test No.: 2009-01	**Scenario No.: 1**	**Page 10 of 20**
Event Description: Pressurizer Temp Transmitter (TI-RC-15) fails low, MU32 fails to Open.		

Time	**Position**	**Applicant's Actions or Behavior**
	RO	May receive Annunciators: 4-2-E, PZR LVL LO 2-4-C, MU Flow High Train 2.
	SRO	Enters DB-OP-02513, Pressurizer System Abnormal Operations. If selected pressurizer temperature fails low: Indicated Pressurizer level will lower and MU 32 will open.
	Crew	Refers to Group 61 computer screen to assist in diagnosis.
	SRO.	Enters Section 4.6 of DB-OP-02513: Has RO place MU32 in HAND and adjust pressurizer level to normal band. Refers to DB-PF-06703, graph CC4.1 to assist in proper pzr level control.
	RO	Places MU32 in HAND Adjusts pressurizer level to normal band.
	SRO	Compare Pressurizer temperature instruments and select a functional alternate temperature instrument. Directs selection of TT-RC-15-2.
	RO	Selects alternate temperature instrument TT-RC-15-2.
	SRO	Directs placing MU32 back in AUTO
	RO	Places MU32 back in AUTO. Recovers pressurizer level.
	SRO	May refer to TS 3.4.9, for Pzr level >228."

Op-Test No.: 2009-01	**Scenario No.: 1**	**Page 11 of 20**

Event Description: T_H (TT-RC3A1) Fails High

Time	Position	Applicant's Actions or Behavior
	RO	Announce/acknowledge alarms 14-4-D ICS FW Limited by Reactor Power 14-4-E ICS Input Mismatch 14-6-D ICS in Track
	SRO	Enters DB-OP-02526, Primary to Secondary Heat Imbalance procedure. Directs Diamond Station to Manual, SG/Rx Demand Station to HAND Directs SG Load Ratio in HAND and both FW Loop Demands to HAND.
	RO	Diagnoses failure of selected T_H instrument May use Group 61 computer screen to assist in diagnosis.
	RO	Determines that undesired plant movement is occurring due to an instrument failure and performs the following: Places Diamond station and Reactor Demand stations in HAND Announces current reactor power Stabilizes the plant
	BOP	Places SG Load Ratio in HAND and both FW loop demand stations to HAND
	SRO	Has operators stabilize plant. Directs RO to move control rods to maintain $\pm$ 2% power band. Directs BOP to lower FW Demand to raise Tave back to normal. Directs BOP to maintain Delta Tc to $\pm$ 2F.
	RO	Maintains + 2% power by withdrawing control rods.

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Event Description: T_H (TT-RC3A1) Fails High

Time	Position	Applicant's Actions or Behavior
	BOP	Lowers FW Demand to raise Tave back to 581F Maintains Delta Tc within 2F.
	SRO	Directs selecting good T_H detector (TT-RC-3A3) per DB-OP-06407, Non Nuclear Instrument procedure, Sect. 4.1, Attachment 7.
	RO	Depresses SASS Switch for TT-RC-3A3 to select good instrument.
	SRO	Once Tave has been restored to normal, directs operators to restore ICS from HAND back to AUTO per DB-OP-02526, Attachment 1, "Restoration of ICS HAND/AUTO stations to AUTO."
	RO	Returns Diamond panel to AUTO. When Rx Demand matches load control and Tave is normal, places Rx Demand station in AUTO.
	BOP	Returns Main Feedwater Loop Demands to AUTO. **Recognize that 'A' feedwater loop master fails to return to auto and notifies SRO of failure**
	BOP	Clears Annunciator 14-4-E by depressing Annun reset PB on SASS panel in back.
	SRO	Directs BOP to maintain both FW loop masters in HAND and directs RO to maintain SG/Rx demand station in Manual.

NOTE: It will take 5 minutes from time requested until annunciator is received for next event. May want to start next event as soon as crew starts returning ICS to Manual!

Op-Test No.: 2009-01	**Scenario No.: 1**	**Page 13 of 20**
Event Description: SG #2 Tube Leak / Power Reduction		

Time	**Position**	**Applicant's Actions or Behavior**
	Crew	Check Pressurizer Level – Notes slow decrease, OR may receive alarm: (9-4-A) VAC SYS DISCW RAD HI (5 minutes to alarm) Checks sumps and FW mismatch.
	SRO	Enters into and directs actions from DB-OP-02531, SG Tube Leaks. • Directs RO to perform a leak rate estimation IAW Attachment 1 • Has BOP operator direct performance of Attachments 1, 2 & 3. May refer to DB-OP-01200, RCS Leakage Management Procedure.
	BOP	Checks Main Steam Radiation Monitors 600 and 609 on RM panel.
	Crew	Determine leak rate per DB-OP-02531, Attachment 1, Steps 1, 2, or 3.
	SRO	Refers to DB-OP-02504, Rapid Shutdown. Directs RO to reduce reactor power at rate of 25 Mwe/min. Directs BOP to lower FW loop demand in HAND to match power decrease.
	RO	Perform Power Reduction as follows, with SG/Reactor Demand station in HAND, lower power using the toggle switch to maintain Reactor neutron error slightly positive.
	BOP	Intermittently lowers FW demand using toggle switch on FW Demand controller to maintain Tave relatively constant. Once reactor power is <35%, transfers turbine load to TBVs by opening TBVs.

Op-Test No.: 2009-01	Scenario No.: 1	Page 14 of 20
Event Description: SG #2 Tube Leak / Power Reduction		

Time	Position	Applicant's Actions or Behavior
	SRO	TS 3.4.13, Condition A for RCS leakage limits and actions.
	SRO	Directs BOP to perform Attachments 2, 3 and 4.
	BOP	Directs performance of DB-OP-02531 Attachments: • Has Chemistry perform Attachment 2 • Has RP perform Attachment 3 • Has Field Supervisor perform Attachment 4
	CUE	**10 minutes after requested, report that RP has identified higher radiation levels from #2 SG side than #1 SG side.**
	Driver	**Once lead examiner is satisfied with load decrease,** **Increase SG #2 Leak Rate to 400 gpm.**

Op-Test No.: 2009-01	**Scenario No.: 1**	**Page 15 of 20**
Event Description: SG #2 Tube Rupture / Reactor Trip / Failure of HPI Pump #2		

Time	Position	Applicant's Actions or Behavior
	RO	Should recognize an increase in SG Tube leak rate. • Monitors Pressurizer level response (verifies MU32 opens) • Pressurizer pressure response • OTSG 'B' Level response Receives Annunciator 12-1-B, Main Steam Line Radiation High
	SRO	Enters DB-OP-02000, Directs RO trip reactor if pressurizer level lowers to <100." Directs BOP operator to perform Attachment 8, Placing MU/HPI/LPI in service.
	BOP	Performs steps of Attachment 8: • **Locks MU3971 and MU6405 in the BWST position. (CRITICAL STEP)** • Starts second makeup Pump • **Isolate letdown by closing MU2B or MU3. (CRITICAL STEP)** • Pressurizer heaters off, SCR in HAND and dialed to 0. • Opens MU6421, opens MU6419 • When time permits, open MU6423B, Min-Flow Bypass Around MU6419. • Starts the non-running CCW pump **(Should recognize that CCW pump #1 is inop – does not start CCW pump #1 Places CCW pump #3 in as Train #1, starts CCW pump #3. This must be completed prior to starting LPI pump #2)** • Starts HPI Pump **(Should recognize that HPI pump #1 is OOS, HPI pump #2 will not auto start. Should inform SRO that HPI pump #2 will not start.)** • Opens HPI injection valve HP2A, 2B, 2C, 2D. (May not do this) • Starts LPI Pumps • Opens piggyback valve and DH63 and DH64
	RO	Calculates SG Leak Rate

Op-Test No.: 2009-01	**Scenario No.: 1**	**Page 16 of 20**

Event Description: SG #2 Tube Rupture / Reactor Trip / Failure of HPI Pump #2

Time	Position	Applicant's Actions or Behavior
	SRO	Directs DB-OP-02000, steps 8.8 through 8.16. Directs tripping of reactor if: • Pressurizer level lowers to 100," OR • Turbine load lowered to <50Mwe.
	RO	Trips Reactor using manual push buttons. • All Control Rods (except Group 8) fully insert and Group IN-LIMIT lights come on. • Neutron power lowering in intermediate range. • The Main Turbine trips. (MSV, CV indicate closed)
	SRO	Re-enters DB-OP-02000, RPS, SFAS, SFRCS Trip or SG Tube Rupture. After confirming reactor is tripped, performs a Specific Rule Check. (None apply.) Performs diagnosis.
	Crew	Confirms that SGTR occurred on SG #2.
	SRO	GO TO Section 8, Steam Generator Tube Rupture. Since reactor is shutdown, SRO Enters Step 8.18, Directs re-performance of Attachment 8, Placing MU/HPI/LPI In Service.
	BOP	Re-performs steps of Attachment 8:
	RO	Takes MU32 to AUTO with Setpoint of 100" in pzr.

Op-Test No.: 2009-01 **Scenario No.: 1** **Page 17 of 20**

Event Description: SG #2 Tube Rupture / Reactor Trip / Failure of HPI Pump #2

Time	Position	Applicant's Actions or Behavior
	BOP	Directs performance of DB-OP-02531 Attachments: • Has Chemistry perform Attachment 2 • Has RP perform Attachment 3 • Has Field Supervisor perform Attachment 4
	SRO	Directs performance of DB-OP-02000, SGTR, Steps 8.39 to 8.43, RCS Depressurization.
	RO	Performs Step 8.39: Turn off all pressurizer heaters.
	BOP	Performs Step 8.40: If SFAS has NOT actuated on Low RCS Pressure AND if the RCS pressure decrease is being manually controlled with adequate SCM, THEN block the SFAS Low RCS Pressure trips when the BLOCK PERMITS come in by depressing white SFAS Block PB on front panel.
	RO	Performs 8.41 & 8.42: Use PZR Spray to reduce RCS Pressure to maintain minimum adequate SCM. • Open RC10, PZR SPRAY BLOCK Valve • Open RC2, PZR SPRAY Valve • Manually cycle RC2 AND control PZR Heaters to maintain RCS Pressure Allow MU to recover PZR level and maintain PZR level from 80 to 120 inches by controlling MU.
	Crew	Performs Steps 8.43 & 8.44: Begin an RCS cooldown and depressurization at 100°F/hr, using BOTH SGs to a Th of 500°F and RCS pressure of 1000 PSIG using TBVs. When the SFRCS BLOCK PERMIT lamps come on, THEN block the SFRCS Low Main Steam Line Pressure and high SG Level Trips.

Op-Test No.: 2009-01	**Scenario No.: 1**	**Page 18 of 20**

Event Description: SG #2 Tube Rupture / Reactor Trip / Failure of HPI Pump #2

Time	Position	Applicant's Actions or Behavior
	SRO	Directs performance of Steps 8.45 to 8.48: • Maintain between 980 psig and 1020 psig by steaming SG #1 (Good SG) • Determines that SG #2 is ruptured SG. • IF SG #2 level approaches 200", then increasing steaming rate to prevent exceeding 220."
	SRO	Directs performance of Step 8.49: When RCS conditions of 500°F AND 1000 psig are reached, directs use of TBV on SG#1 to maintain RCS temperature constant or slightly decreasing.
	Crew	When RCS conditions of 500°F AND 1000 psig are reached: Uses TBVs on SG#1 to maintain RCS temperature constant or slightly decreasing.
	SRO	Directs to stop steaming SG #2 and Directs Isolation of SG #2 by performing Attachment 17, SG isolation for SGTR.
	Crew	Stops Steaming the SG #2 per Attachment 17: Places PIC ICS11A, Atms Vent Vlv Control in HAND and lowers demand to zero. Opens MS106, MAIN STEAM LINE 1 TO AFPT I Isolation. Defeats the MSlV to TBV interlock by pulling fuse 14 in the rear of Cabinet C5761, ICS Cabinet 1. **CUE: Another operator will do this. (Fuse 14 is not modeled in simulator)** Closes the following valves: • FW601, SG 2 Main Feedwater Stop • MS100, Main Steam Line 2 Isolation • MS100-1, Main Steam Line 2 MSlV Bypass • MS375, Main Steam Line 2 Warmup Drain • MS107, Main Steam Line 2 TO AFPT 2 Isolation • MS106A, Main Steam Line 2 TO AFPT 1 Isolation • AF599, AFW to Steam Generator 2 Line Stop

Op-Test No.: 2009-01	**Scenario No.: 1**	**Page 19 of 20**
Event Description: SG #2 Tube Rupture / Reactor Trip / Failure of HPI Pump #2		

Time	Position	Applicant's Actions or Behavior
	Crew	Lines up all available Auxiliary Feedwater Trains to feed #1 SG as follows: Verifies AF3870 is open • Opens AF3871 • Closes AF3869 • Closes AF3872 Performs Attachment 16 to override the SFRCS HI LVL TRIP on the tube ruptured #2 SG. Verifies open the MSIV on #1 SG, MS101.
		Sometime during scenario, may want to: • Remove an extra condensate pump from operation. • Reestablish RCP seal return.
	BOP	Removes condensate pump from operation: Stops Condensate Pump 3 using HIS 591, Condensate Pump 3. Opens CD 15, Condensate Pump 3 Discharge Suction Vent. Closes CD 588, Condensate Pump 3 Outlet Pressure Indicator Source. **OR** Stops Condensate Pump 2 using HIS 564, Condensate Pump 2. Opens CD 14, Condensate Pump 2 Discharge Suction Vent. Closes CD 577, Condensate Pump 2 Outlet Pressure Indicator Source.

The scenario ends when the crew commences a unit cooldown.

Scenario Critical Steps

Event #4:

Was Standby CCW Pump started prior to reaching RCP trip critieria? _____

SAT UNSAT

Events #7 & #8:

During the tube leak sequence, the SRO will direct actions that may be duplicated in the SGTR section of DB-OP-02000. Hence critical steps not performed during the SG tube leak sequence (Event 7) must be done during the SGTR sequence (Event 8).

With the RCS leak rate exceeding the capacity of two makeup pumps, did the SRO order a reactor scram and enter into DB-OP-02000?

_____

SAT UNSAT

In order to restore RCS inventory, the SRO will need to start the second makeup pump and isolate letdown. Did the crew start the second makeup pump?

_____

SAT UNSAT

With both makeup pumps running, flow will be just enough to keep up with the tube leak rate, so isolating letdown (closing MU2B and MU3) is considered a critical task. Did the crew isolate letdown?

_____

SAT UNSAT

During performance of DB-OP-02000, the SRO will need to ensure an adequate supply of water to the makeup pumps. Locking MU3971 and MU6405 in the BWST position will fulfill that requirement. Did the crew lock MU3971 and MU6405 in the BWST position?

_____

SAT UNSAT

Facility: Davis-Besse **Scenario No.: 2** **Op-Test No.: 2009-01**

Examiners: _____ Operators: _____

_____ _____

_____ _____

Initial Conditions: 95% power. HPI #1 OOS for maintenance.
Risk is Green

Turnover: Swap Service Water Pumps, escalate power to 100% per grid dispatcher request.

Event No.	Malf. No.	Event Type*	Event Description
1		N (BOP)	Swap SWPs
2	Malf	I (RO)	Pressurizer level Instrument (LT-RC14-1) fails low
		SRO	TS 3.3.17 Cond A, PAM; TS 3.3.8 Cond A Remote S/D panel.
3	Malf	C (BOP)	FW Temperature Instrument (TT-SP1-1) fails to 0 over 4 minutes.
4	Malf	R (BOP) R (RO)	RCP 1-1 Seal failure / Rapid Power Reduction to <72% with ICS in HAND.
5		C (RO) C (BOP)	Trip RCP 1-1 / FW must be re-ratio'd in ICS manually
		SRO	ITS 3.4.4, RCP Operation
6	Malf	M	Hot Leg RCS LOCA (~200 gpm ramp to 1400 gpm in 10 min)
7	Malf	C (RO)	SFAS Failure to Actuate (HPI Pump #2 Fails to Start Automatically)

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

Initial conditions for this scenario are reactor power at 95%, and HPI Pump #1 is OOS for maintenance. Faults included in the initial IC set prevent HPI Pump #2 from starting on SFAS actuation.

Turnover includes swapping SWPs, (starting SWP 3 as Train 1, then removing SWP #1.) A pressurizer temperature instrument will fail low resulting in the RO taking manual control of pressurizer level and pressure. After selecting a non-faulted temperature instrument, the crew will return pressurizer pressure to automatic operation. SRO will have TS's to review.

A FW Temperature instrument will fail slowly to prevent a SASS actuation. This will result in the BOP operator taking ICS stations to hand and stabilizing the plant. The BOP operator will select a non-faulted FW temperature instrument. Before returning the ICS to AUTO, RCP 1-1 will experience a seal failure. This will require both the RO and BOP to perform a forced reactivity change from ~80% power to <72% power, then trip the RCP. The BOP operator should identify that ICS failed to re-ratio FW requiring a manual operation. The change in RCP pump status will require a review of TS by the SRO.

A hot leg RCS LOCA will occur. The RO should recognize that HPI Pump #2 failed to start due to a SFAS module failure. He will manually start HPI Pump #2 by tripping the SFAS module.

The scenario ends when the crew has reestablished sub cooling margin and has started RCS cooldown on AVVs.

Op-Test No.: 2009-01	**Scenario No.: 2**	**Page 3 of 17**
Event Description: Simulator Setup		

Time	**Position**	**Applicant's Actions or Behavior**

bat /NRC/nrcsenario2.txt|00:00:02|0
^ nrcsenario 2
^
^ set up 95 % POWER IC 17
^
^ make PZR level 14-1
^
^ setup 3 SW pump as 1 SW pump for event 1
^
irf kepaa operate
irf kepae normal
irf kepac close
irf ke24 0
irf ke22 1
^
^ HPI #1 out of service
irf bfp1a rackout
irf bfp1c true
^
^ hpi pump two fails to auto start
imf bfp2e
^
^ TRIGGERS
^
^
^

^ EVENTS
^
^ EVENT 1 SWAP SERVICE WATER PUMPS place 3 on take 1 off
^
^ EVENT 2
^ LOSS OF PZR LEVEL 14-1
imf h150e (2) 1.0 00:00:30 0.55
^
^ Event 3
^ fails feedwater temp high
imf l1tnn (3) 0.0 00:04:00 0.75
^
^ Event 4
^ seal failure on rcp 1-1
irf hn07 (4) 0.1 00:00:20 0.0
imf hn07 (4) 1.0 00:00:20 0.0
imf hn08 (4) 1.0 00:00:20 0.0
imf hn09 (4) 1.0 00:00:20 0.0
^
^ Event 4 Stopping of rcp 1-1 feedwater does not re-ratio
^ Place rcs leak in
imf hh41 (5) 0.0013 00:10:00 0.0
^
^ Event 5 Stopping of rcp 1-1 feedwater does not re-ratio
^
^ Event 6 leak rate increase to loca caep file
^
^ Event 7
^ hpi pump two fails to auto start
imf bfp2e (7)

Op-Test No.: 2009-01	**Scenario No.: 2**	**Page 4 of 17**
Event Description: Swap Service Water Pumps		

Time	Position	Applicant's Actions or Behavior
	SRO	Directs starting Service Water Pump #3 as Train 1, and removing from Service Water Pump #1 from service IAW DB-OP-06261, Service Water System Operating Procedure, Section 3.5.
	BOP	Starts SW Pump 3, using HIS1372A, Service Water Pump 3. Stops SW Pump 3 for breaker check. Restarts SW Pump 3. Has NLO check pump discharge pressure is between 60 and 120 PSIG on local indicator.
	BOP	Has NLO Open SW1381
	CUE	**Shaft is not turning**
	BOP	Stops SW Pump 1, using HIS1370, Service Water Pump 1. Informs SRO.
	SRO	Acknowledge stopping of SW Pump #1, exit LCOs 3.7.8., 3.8.1, 3.4.6.
	BOP	Checks Service Water Header pressure is between 60 and 120 PSIG on Computer Point (P945) SW HDR 1 PRESS.
	BOP	Verify the Service Water Temperature Control Valve for the CCW Heat Exchanger aligned to Service Water Loop 1 is in AUTO using the applicable control switch: CCW Heat Exchanger 1, SW1424, CCW HEAT EXCHANGER 1 OUTLET TEMPERATURE CONTROL, using HIS1424.
	BOP	Has NLO place SWP #1 in spare status by: Racking out bkr AC107, SW PMP 1-2, on Bus C1.

Op-Test No.: 2009-01	Scenario No.: 2	Page 5 of 17

Event Description: Pressurizer level (LT-RC14-1) Fails Low

Time	Position	Applicant's Actions or Behavior
	Crew	Annunciator Alarm • 4-1-E, Pressurizer Low Level Heater Trip • 4-2-E, Pressurizer level low Train 2 MU Flow Indicator pegs high. Observes increasing level indicated on setpoint. No corresponding RCS pressure increase to Pzr level increase.
		NOTE: MU32 will go full open.
	SRO	Enters DB-OP-02513, Pressurizer Systems Abnormal Operation, Section 4.6.
	RO	Place MU-32 in HAND. Adjust demand to obtain desired Pressurizer level. Manually operate Pressurizer heaters to maintain RCS pressure Compare Pressurizer level instruments and select a functional alternate level instrument.
	RO	Refers to to DB-PF-06703, Graph CC4.1, Actual vs. Indicated pzr level.
	SRO	Directs RO to select functional pressurizer level instrument 14-2 or 14-3.
	RO	Selects LRC14-2 or LRC 14-3 on switch
	SRO	Directs placing MU32 in AUTO & returning Pzr heaters to normal lineup.
	RO	Places MU32 Control Switch in AUTO Returns Pressurizer heaters to normal lineup, SCR htr from HAND to AUTO.

Op-Test No.: 2009-01	**Scenario No.: 2**	**Page 6 of 17**
Event Description: Pressurizer level (LT-RC14-1) Fails Low		

Time	**Position**	**Applicant's Actions or Behavior**
	SRO	Refers to Technical Specifications 3.3.17, Post-Accident Monitoring, (PAM), Condition A, 30 days. 3.3.18, Remote S/D panel, may review, but not applicable. TS 3.4.9, Condition A, 1 hour, (if pzr level exceeds 228.")

Op-Test No.: 2009-01	**Scenario No.: 2**	**Page 7 of 17**
Event Description: Feedwater Temperature Instrument (TT-SP1-1) Fails Low		

Time	Position	Applicant's Actions or Behavior
	BOP	Identify symptoms of feedwater temperature channel failure: Decreasing FW flow Decreasing SG levels "0" indication on FW temperature meter May receive the following annunciators: • 14-4-E, ICS input mismatch alarm • 14-6-D, ICS In Track • 14-6-E & 14-6-F, BTU Limit alarm (Both SGs)
	Crew	Announce feedwater upset.
	SRO	Enters DB-OP-02526, Primary/Seconday Heat Transfer Upset. Directs operator to place ICS stations in HAND.
	BOP	Verify FW flow is consistent with reactor power. (It is NOT).
	BOP	• Places both FW loop demands in HAND. **(Tave will continue to rise.)** • May take both loops FW main & S/U valve controllers to HAND • Takes both FW Demand controllers to HAND.
	RO	• Places Diamond station in MANUAL • Places SG/Reactor Demand in HAND. • Rx Demand in HAND.
	BOP	Raises FW demand by using ICS FW Demand station toggle switches in raise position intermittently to raise Tave. Maintains Delta Tc within 2F band of 0.

Op-Test No.: 2009-01	Scenario No.: 2	Page 8 of 17

Event Description: Feedwater Temperature Instrument (TT-SPI-1) Fails Low

Time	Position	Applicant's Actions or Behavior
	RO	Inserts Control rods at Diamond station to maintain Rx power within 2% band.
	SRO	May enter TS 3.4.9, Condition A for pzr level high.
	SRO	Enters DB-OP-06407, NNI Procedure: Has operator select good FW Temperature instrument (TT-SP1-2).
	BOP	Operator recovers from FW transient: • Matches FW flow to reactor power using FW valve demand H/A stations. • Identifies FW temperature channel that failed. (Should identify failure on TT-SP1-1) • Selects the alternate FW temperature channel. (Should select TT-SP1-2.)
	SRO	Once Tave has been returned to normal, directs ICS stations back to AUTO IAW DB-OP-06401, Sections 3.3 to 3.6
	RO	Performs DB-OP-06401 Sections 3.3 and 3.4 Returns Diamond Station to AUTO Matches Unit Load Demand to reactor demand and with Tave at setpoint, returns SG/RX demand station to AUTO.
	NOTE:	**When crew starts placing ICS Hand/Auto stations in Auto and BEFORE Loop FW Demand stations are returned to AUTO, put in next event.**
	BOP	Performs DB-OP-06401, Sections 3.5 and 3.6 Returns FW valve demands to AUTO Returns FW Demand station to AUTO.

Op-Test No.: 2009-01	**Scenario No.: 2**	**Page 9 of 17**
Event Description: RCP 1-1 Seal Failure / Rapid Power Reduction		

Time	**Position**	**Applicant's Actions or Behavior**
	Crew	May receive the following annunciators and computer alarms for RCP 1-1: 6-5-A, MONITOR SYSTEM TRBL 6-4-A, RCP1-1 SEAL STANDPIPE LVL HI RCP 1-1 Seal Injection Flow indicator FI-MU-30C goes high on scale. Computer Alarms: P-853 RCP 1-1 2nd Seal Cavity Press 1600/800 PSIG P-854 RCP 1-1 3rd Seal Cavity Press 970/570 PSIG
	Crew	Diagnosis problem with RCP 1-1 seal
	SRO	Enters into DB-OP-02515, Reactor Coolant Pump and Motor Abnromal Operation, Section 4.1, for 4 RCPs operating, directs that reactor power be reduced to <72%. Enters DB-OP-02504, Rapid Shutdown, Section 4.1. Authorizes power decrease to <700 Mwe in accordance with Attachment 3, ICS Stations in HAND.
	BOP	Dispatches NLO to check RCP 1-1 drinking bird.
	RO	Commences power reduction using one of the following methods: 1. At the Load Control panel: Set the Rate of Change to a rate specified by the Unit Supv. Set the Limit to 100 MWe. Depress the DEC pushbutton to lower the unit load to the target determined by the Unit Supv. 2. Manual Control of the ICS station: Place the SG/RX Demand Hand Auto station in Hand. Reduce power by using the SG/RX demand toggle switch to lower. 3. Lowering the Upper Load Limit: Set the Rate of Change to a rate specified by the Unit Supv. Lower the Max Limit - MW to the target load as selected by the Unit Supv.

Op-Test No.: 2009-01	Scenario No.: 2	Page 10 of 17
Event Description: RCP 1-1 Seal Failure / Rapid Power Reduction		

Time	Position	Applicant's Actions or Behavior
	SRO	May authorize placing Delta Tc, SG Load Ratio from HAND to AUTO IAW DB-OP-02515, Attachment 6.
	BOP	Places Delta Tc, SG Load Ratio to HAND.
	Crew	Reduces reactor power with rods at the SG/RX Demand station and with FW Demand in HAND using toggle switch.

Op-Test No.: 2009-01	Scenario No.: 2	Page 11 of 17

Event Description: Trip RCP 1-1 / Feedwater Fails to Re-Ratio in ICS

Time	Position	Applicant's Actions or Behavior
	SRO	**Once reactor power is <72%, authorizes stopping RCP 1-1. (CRITICAL)**
	RO	Stops RCP 1-1 by opening RCP 1-1 bkr on back panel. Ensures lift oil pump is running on RCP 1-1 Verifies Tave control transferred to the RC loop with two RCPs. If the Seal Return Temperature on the idle RCP rises to greater than 200°F, then closes the Seal Return isolation MU59B.
	BOP	Verify proper Feedwater flow ratios of 2.4 to 1. NOTE: Feedwater flow should be 5.65 MPPH and 2.35 MPPH at 72% power but FW does NOT re-ratio with ICS FW Demand in HAND.
	BOP	• Announces/acknowledge alarms o (14-4-E) ICS Input Mismatch o (4-5-C) Loop 1 vs. 2 Cold Leg Delta Tc High • Identifies FW failure to re-ratio • Notifies SRO of failure
	SRO	Enters DB-OP-02004, Reactor Coolant Alarm Panel 4 Annunciator Procedure Authorizes re-ratioing FW IAW Annunciator 4-5-C instructions.
	BOP	Re-ratios Feedwater as follows: • Takes both FW Demand stations to hand and manually re-ratios FW flow o Raises flow to #2 SG, lowers flow on #1 SG • May take Rx Diamond to hand

Op-Test No.: 2009-01	Scenario No.: 2	Page 12 of 17
Event Description: Trip RCP 1-1 / Feedwater Fails to Re-Ratio in ICS		

Time	Position	Applicant's Actions or Behavior
	SRO	Reviews Technical Specifications for applicability. Determines that TS LCO 3.4.1 for 3 RCP Operation is NOT applicable, but should verify RC Total Flow >290,957 gpm for 3 RCP operation. Determines that TS 3.4.4 for 3 RCP Operation is applicable. Need to reset: • RPS High Flux High Setpoint for 3 RCP Operation (10 hr req't) • RPS Flux-ΔFlux-Flow for 3 RCP Operation (6 hr req't)
	NOTE	**Once feedwater has been re-ratioed and SRO has reviewed Tech Specs, inform simulator driver to put in LOCA event.**

Op-Test No.: 2009-01	Scenario No.: 2	Page 13 of 17
Event Description: Hot Leg RCS LOCA / Reactor Trip		

Time	Position	Applicant's Actions or Behavior
	Crew	Containment normal sump level rising radiation levels rising, ctmt fire alarms. MU flow rising, MU tank level dropping. PZR level and RCS Pressure dropping. May receive Annunciators: • 4-4-A CTMT to Annulus Delta P HI/LO • 2-2-C, MU Tank Level Low • 2-4-C, MU Flow High Train 2 • 4-2-E, Pzr Level Low
	SRO	Reviews DB-OP-02522, Small RCS Leaks, directs isolation of letdown and maximize MU flow. Authorizes performance of Attachment 1.
	RO	Closes MU2B or MU3 to Isolate Letdown Performs Attachment 1 of DB-OP-02522: • Maintains 55" – 85" in MUP tank • Starts additional MUP • Locks MU6405 and MU3971 in BWST position • Opens MU6421, Alternate Boron Injection Path • Open MU6419 • Opens MU6423, if time permits.
	SRO	Enters DB-OP-02000, RPS, SFAS, SFRCS Trip or SG Tube Rupture. (If Pzr level lowers below 100 inches, trip the reactor and enter Section 3) With Pressurizer level continuing to lower, directs Reactor Trip and SFAS actuation.
	RO	**Trips the Reactor prior to pressurizer level lowering to <100" (CRITICAL TASK)**

Op-Test No.: 2009-01	Scenario No.: 2	Page 14 of 17
Event Description: Hot Leg RCS LOCA / Rx Trip / HPI Pump #2 Fails to Start		

Time	Position	Applicant's Actions or Behavior
	NOTE	**SFAS will likely AUTO actuate.**
	RO	Performs DB-OP-02000 Immediate Actions, Section 3: • All Control Rods (except Group 8) fully insert and Group IN-LIMIT lights come on. Power lowering in intermediate range NI. • The Main Turbine trips. (MSV, CV indicate closed)
	SRO	Calls out Specific Rules and Symptom Checks.
	Crew	Announces Loss of Subcooling and applies Specific Rule 2. **Trips all RCPs. (CRITICAL)** On PAM panel, transfers T_H to INCORE for both channels
	SRO	Transitions to DB-OP-02000, Section 5, Loss of Subcooling Margin. Directs RO and BOP Operators to perform Attachment 8,
	RO	Performs steps of Attachment 8: • Return MU32 to AUTO with Setpoint of 100" in pzr. • Verifies MU3971 and MU6405 already Locked in the BWST position. • Verifies second makeup Pump is running, (Starts oil pump first) • Closes MU6422.
	BOP	Performs steps of Attachment 8: • Starts the non-running CCW pump • Starts HPI Pump **(Should recognize that HPI pump #1 is OOS. May identify that HPI Pump #2 did not automatically start on SFAS actuation.)** • Opens HPI injection valve HP2A, 2B, 2C, 2D. • Starts LPI Pumps • Opens piggyback valve and DH63 and DH64

Op-Test No.: 2009-01	Scenario No.: 2	Page 15 of 17
Event Description: Hot Leg RCS LOCA / Rx Trip / HPI Pump #2 Fails to Start		

Time	Position	Applicant's Actions or Behavior
	SRO	Directs RO to verify proper SFAS actuation.
	RO	Identifies that HPI Pump #2 failed to auto start. **Starts HPI Pump #2 (CRITICAL).**
	Crew	Crew performs actions from Section 5, Loss of Subcooling Margin: Verifies RCPs tripped. Verifies MU, HPI, AND LPI are in service. • Verifies both MU pumps operating, both HPI pumps operating, both LPI pumps are operating, and both CCW pumps operating. • Verifies HP2A, 2B, 2C and 2D valves are open. Verifies proper SFAS actuation • If not previously identified, recognizes that SFAS did not actuate HPI Pump #2. SFAS Module manually tripped to start HPI Pump. Verify proper SFRCS actuation if req'd by plant conditions.
	SRO	Directs BOP to maintain SG Control IAW Specific Rule 4.
	BOP	Verify proper SG level control by AFW using Specific Rule 4, Steam Generator Control. Maintains MFW or AFW flow to maintain SG water levels. Performs Table 1, SFRCS: Opens MS107, AF3872, MS106A. Closes AF3871, FW612. Performs Attachment 3: Places AVVs in Manual.
	SRO	Directs HPI Flow Balancing IAW Attachment 11.
	RO	Performs Attachment 11, HPI Flow Balancing. Step 1: Closes MU6422 Step 2: N/A Step 3: Determines that flow is balanced, Opens MU6422.

Op-Test No.: 2009-01	Scenario No.: 2	Page 16 of 17
Event Description: Hot Leg RCS LOCA / Rx Trip / HPI Pump #2 Fails to Start		

Time	Position	Applicant's Actions or Behavior
	SRO	Directs performance of Attachment 19, Isolate Potential Leak Paths.
	RO	(Closes various valve to isolate suspect leak paths – unsuccessful in finding leak)
	SRO	Continues in Section 5, of DB-OP-02000, Loss of Subcooling Margin, Note 5.13: Notes that natural circulation is occurring in RCS Loop 1 (not in RCS Loop 2). Proceeds to step 5.18 and 5.19. Directs slowly opening AVVs to commence RCS cooldown.
	BOP	Gradually opens AVV's to steam SGs to regain subcooling margin.
	NOTE:	Sometime during Scenario, crew may want to secure a condensate pump and a feedwater pump.
	BOP	Removes condensate pump from operation: Stops Condensate Pump 1 using HIS 558, CONDENSATE PUMP 1. Opens CD 13, Condensate Pump 1 Discharge Suction Vent. Closes CD 576, Condensate Pump 1 Outlet Pressure Indicator Source. **OR** Stops Condensate Pump 2 using HIS 564, CONDENSATE PUMP 2. Opens CD 14, Condensate Pump 2 Discharge Suction Vent. Closes CD 577, Condensate Pump 2 Outlet Pressure Indicator Source.

The scenario ends when the crew controls cracks open AVVs and starts to regain sub-cooling margin.

Events #4 & #5

Did operators reduce reactor power to <72% prior to tripping RCP 1-1?

_____

SAT UNSAT

Events #7 & #8:

Did the crew trip the reactor prior to pressurizer level lowering to below 100”?

_____

SAT UNSAT

Did the crew recognize a loss of subcooling margin existed and as a result, tripped all RCPs?

_____

SAT UNSAT

Did the crew recognize that HPI Pump #2 failed to start from SFAS actuation and did they start HPI Pump #2 manually?

_____

SAT UNSAT

Facility: Davis-Besse **Scenario No.: 3** **Op-Test No.: 2009-01**

Examiners: _____ Operators: _____

_____ _____

_____ _____

Initial Conditions: Coming out of an outage. Reactor is in Mode 1, at 30% power on Low Level Limits. Startup is in progress per DB-OP-06902, step 4.2.1. Makeup Filter d/p is high – FIN notified. I&C working on heater drain level control valves. Risk is Green

Turnover: Raise reactor power per DB-OP-06902, Step 4.2.1 to 38%. Perform actions at 240 MWe per step 4.3.

Event No.	Malf. No.	Event Type*	Event Description
1		R (RO)	Raise Reactor Power
2		~~N (BOP)~~	~~Transfer A and B Busses to X11 Transformer~~
3	Malf	I (RO)	Power Range Nuclear Instrument 7 Fails High
		SRO	TS 3.3.1 RPS
4	Malf	I (RO)	Letdown Makeup Filter High d/p.
5	Malf	~~C (BOP)~~	~~CCW Surge Tank Low Level Alarm~~
6		SRO	Aux Feedwater Pump #1 Inoperable, TS 3.7.5, Cond B,
7	Malf	I (BOP)	Turbine Header Pressure Instrument (PT-SP-16A) fails to midscale over 45 seconds
8	Malf	M	Unisolable Steam Line Leak/Break in Containment from SG #2.
9	Malf	C (RO)	ATWS, Trips Electrical Breakers to Shutdown Rx.
10	Malf	C (RO)	HIS 6454B fails to Auto Actuate on SFAS Level 2.

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

The scenario starts with the unit coming out of a refuel outage. The crew will be expected to raise reactor power from 30 to 38% IAW DB-OP-06902 to greater than low level limits. This will also clear spurious FW heater alarms. The normal evolution, transferring the A and B busses to the X11 transformer, will be done by the BOP operator IAW the startup procedure at 240 MWe.

Power Range NI-7 will fail high. This will require some operator actions and a TS review by the SRO. When complete, the BOP operator will receive a slow turbine header pressure instrument failure such that there will not be a SASS actuation. After the BOP has resolved this concern, the letdown makeup filter d/p will go high. Operators will take time to diagnose a failure with the filter then swap filters.

Maintenance will phone the SRO and inform the SRO that the #1 AFW pump outboard gage glass is broken with oil on the floor. The SRO will declare the #3 AFW Pump inoperable and reference TS's.

A steam line leak inside containment will cause the operators to take actions including a manual actuation of SFRCS. When the operators trip the reactor and initiate SFRCS, the RO will determine that an ATWS at ~20% reactor power is occurring. The mitigating actions of tripping bkrs to E2 and F2 will not work requiring an emergency boration. Since the operators normally lock open makeup valve to the BWST post accident, alternate actions were needed to include this as a component failure. So MU6405 will stick in the Makeup tank position. This will require an alternate boron path to be used.

When the operators trip the reactor and manually initiate SFRCS, the feedwater header leak will turn into a feedwater line break. To prevent SFRCS isolation of the break, the SP7A and FWIV 601 will stick open. Operators will have to diagnose these failures and eventually isolate the #2 SG and tripping MFWP #2.

The scenario ends when the crew has isolated SG#2 and established a controlled cooldown using SG#1.

Op-Test No.: 2009-01	**Scenario No.: 3**	**Page 3 of 19**

Simulator Setup

Time	**Position**	**Applicant's Actions or Behavior**

```
bat /NRC/nrcsenario3.txt|00:00:02|0
imf bmf1 0.81 00:02:00|04:00:00|1


                    nrcsenario 3
^
^ Set up power to 30% power ic 146
^
^
^ ATWS SETUP
IMF l4
IMF l8
IMF l5D2
IMF l5D1
^
^
^ Makeup filter one delta press
imf bmf1 0.6
^
^ fails sfas to aux feed low on
imf l6z2
^
^  TRIGGERS
^
^ Events
^
^ Event 1 raise off low level limits
^
^ Event 2 raise reactor Power
^
^ Event 3
^ NI 7 fails high
imf r3n7 (3) 100
imf r3n3 (3) 100
^
^
^ Event 4
^makeup  filter delta pressure see caep line one
^
^ Event 6 Afw #1 pump no oil
irf sfeib (6) 0.0
^
^ Event 7
^ ccw leak side 2
imf kaj1 (7) 0.009

^ Event 8
^ Turbine header pressure fails to 900 psig
imf l1t2n (8) 0.5 00:01:00 0.45
^
^
^Steam leak in ctmt
imf sam2 (9) 0.08 00:01:00 0.0
```

Op-Test No.: 2009-01	**Scenario No.: 3**	**Page 4 of 19**
Event Description: Raise Reactor Power from 30% to 38%		

Time	Position	Applicant's Actions or Behavior
	SRO	Reviews DB-OP-06902, Section 3.0, and Technical Specifications. Authorizes operators to raise reactor power to 38% IAW Step 4.2.5.
	RO	Sets maximum load limit to 980 on unit demand controller
	BOP	Sets Main Turbine Load Limit pot to 8.0.
	RO	At Reactor Demand Station, performs power increase as follows: • Places the SG/Reactor Demand in HAND • Raises power using the toggle switch • Raises power until Annunciators 14-5-E & F, ICS SG 1 (2) on Low Level Limit clears.
	SRO	SRO directs placing SG/Rx Demand station in AUTO per DB-OP-06401, Step 3.9.
	BOP	Depresses AUTO pushbutton on SG/Rx Demand ICS Station.

Op-Test No.: 2009-01	**Scenario No.: 3**	**Page 5 of 19**
Event Description: ~~Transfer A and B Busses to X11 Transformer~~ (NOT USED!)		

Time	Position	Applicant's Actions or Behavior
	SRO	When reactor power is raised to 240 MWe, directs BOP operator to perform DB-OP-06902, Section 4.3, transfer A and B busses to Transformer X11.
	BOP	Reviews DB-OP-06902, Section 4.3 then transfers to DB-OP-06314, Section 3.8.
	BOP	Transfers Bus A to Transformer X11 as follows: Bus A Synch Check switch taken from OFF to X11 position. Closes HX11A breaker, HX01A automatically opens. Takes Bus A Synch Check Switch back to OFF Positions Reserve Source Switch to X01 position.
	BOP	Transfers Bus B to Transformer X11 as follows: Bus B Synch Check switch taken from OFF to X11 position. Closes HX11B breaker, HX02B automatically opens. Takes Bus B Synch Check Switch back to OFF Positions Reserve Source Switch to X02 position.
	BOP	Informs SRO that A & B busses have been transferred to X11 transformer.

Op-Test No.: 2009-01	**Scenario No.: 3**	**Page 6 of 19**
Event Description: Power Range NI-7 Fails High		

Time	Position	Applicant's Actions or Behavior
	RO	Announce/acknowledge alarms • (5-1-J) RPS Channel 4 Trip • (5-3-I) Flux-Delta Flux-Flow • (5-2-H) RPS High Flux Trip Observes Neutron Error meter peg high. Observes NI-7 reading 120% Diagnoses NI-7 failure Notifies SRO of failure of NI-7
	BOP	Checks RPS 4 Cabinet for Channel trips Assists in diagnosis
	SRO	Enters DB-OP-02505, Nuclear Instrument Failures, Section 4.1. Directs operators to stabilize plant • Put Rod Control station in Manual • Reactor Demand Station in Hand • Places both FW Demand Stations in HAND • Places Main Turbine in MANUAL.
	RO	At Diamond Station, places rod control station in Manual At Reactor Demand Station, places Reactor Demand Station in Hand.
	BOP	If a large difference between actual Tave and Tave setpoint exists, then places Main Turbine in MANUAL. Adjusts main turbine controller to raise throttle pressure to 870 psig.
	SRO	Reviews Technical Specifications: TS 3.3.1. RPS, Condition A: Requires to Bypass RPS Channel #4 in <1hr. TS 3.3.16, ARTS (Not Applicable since minimum channels operable met)

Op-Test No.: 2009-01	**Scenario No.: 3**	**Page 7 of 19**
Event Description: Power Range NI-7 Fails High		

Time	Position	Applicant's Actions or Behavior
	SRO	Once Tave has been stabilized, directs BOP to place Main Turbine controller back in AUTO.
	BOP	Places Main Turbine back in AUTO.
	SRO	Refers to DB-OP-06403, RPS and NI Operating Procedure, Section 4.5, Placing a RPS Channel in Manual Bypass. Directs placing inoperable RPS Channel 4 in Bypass.
	BOP	Places RPS Channel 4 in Bypass at RPS cabinet as follows: Obtains RPS Cabinet #4 Key Verifies "Protective Sub-System" lamps on top of RPS Channel Cabinets #1, #2 and #3 are DIM. ON RPS Channel Cabinet #4: (Right Cabinet) • Rotates the MANUAL BY-PASS KEY SWITCH to actuate the manual bypass relay on reactor trip module. • Checks the MANUAL BY-PASS light on the indicating panel is BRIGHT. • Checks the protective SUB-SYSTEM light on the indicating panel is DIM. Verifies annunciator alarm (5-4-J), "RPS CHANNEL 4 BYPASSED" is LIT Notifies SRO that RPS channel C is bypassed
	SRO	Reviews DB-OP-02505, Section 4.1. Directs BOP to place Test/Operate Switch on RPS Channel 4 to Test/Operate
	BOP	On RPS Channel #4, (Left Cabinet) Takes Test/Operate Switch on Power Range Test Module from Operate to Test/Operate.

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Event Description: Power Range NI-7 Fails High		

Time	**Position**	**Applicant's Actions or Behavior**
	SRO	Directs returning ICS to Automatic IAW DB-OP-06401.
	RO	At Diamond Panel, places Rod Control in AUTO At Reactor Demand station, places Reactor Demand in AUTO.
	BOP	At FW Demand Station, equalizes demand and actual then places FW Demand Station in AUTO.

Op-Test No.: 2009-01	**Scenario No.: 3**	**Page 9 of 19**

Event Description: Letdown Makeup Filter High d/p

Time	Position	Applicant's Actions or Behavior
	RO	Annunciator (2-4-A) "Letdown or Makeup Filter d/p High" Informs SRO of a letdown filter high d/p.
	SRO	Refers to DB-OP-06006, Letdown / Makeup Procedure, Section 3.24. Directs placing spare filter on line and isolating filter with high d/p.
	RO	Opens MU12B Closes MU12A
	SRO	Calls WCC to replace letdown MU Filter per section 4.11 of DB-OP-06006.

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Event Description: ~~CCW Surge Tank Low Level Alarm~~ (NOT USED!)		

Time	Position	Applicant's Actions or Behavior
	BOP	Receives the following Annunciator: 11-3-A, Surge Tank Level Low Alarm
	Crew	Refers to DB-OP-02011, Annunciator Panel 11 Procedure.
	BOP	Calls out NLO's to walk down CCW System piping to find leak.
	SRO	Enters DB-OP-02523, CCW Abnormal procedure, Section 4.1. Directs refilling CCW Tank, to level between 51 and 53 inches.
	BOP	Opens DW2643 to refill CCW Tank to between 51 and 53 inches. Then closes DW2643.

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Event Description: Inoperable Aux Feedwater Pump #1

Time	Position	Applicant's Actions or Behavior
	Driver	This is the zone operator calling. I've identified the AFW Pump #1 outboard bearing turbine site glass is broken. It indicates empty and there is oil on the floor.
	SRO	Declares AFW Pump #1 inoperable. Reviews TS 3.7.5, Condition B, 72 hour to repair. Directs operators to place #1 AFW Pump in Trip condition. Contacts Field Supv and Work week manager to effect repairs.
	BOP	Contacts Zone 2 NLO. Directs tripping AFW Pump Turbine throttle valve
	Crew	Illuminates "BLUE" light for AFW Inoperable.
	NOTE:	**Will receive Annunciator 10-4-G, AFP 1 Trouble when throttle valve is tripped. This annunciator must be in before starting the next event.**

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Event Description: Turbine Header Pressure Instrument (PT-SP-16A) fails to midscale

Time	Position	Applicant's Actions or Behavior
	BOP	Receives the following Annunciator Alarms: • ICS INPUT MISMATCH (14-4-E) • ICS IN TRACK (If Turbine trips to manual) (14-6-D) Additional indications: Failed controlling pressure is indicated on PRS SP16. Turbine valves close to correct for error and actual OTSG pressure increases. • TBVs open Diagnose a failure of the selected Turbine Header Pressure instrument.
	RO	Observes the following increase • Tave • PZR level • RCS pressure
	SRO	Direct corrective actions to terminate the transient per DB-OP-02526, "Primary to Secondary Heat Transfer Upset." Stabilize plant by taking ICS control stations to HAND.
	BOP	Check SG Pressures. Recognize Turbine header pressure instrument failure. Immediate Actions: • Places FW Loop Demands to Manual. • Places Delta Tc Station in Hand. • Places Turbine Controls to Manual. Adjusts FW Flow to stabilize Tave and Keep Delta Tc <2°F.
	RO	Immediate Actions: Places SG/Rx Demand Station in HAND, Places Diamond station to HAND, Places Reactor Demand Station in HAND.
	SRO	Establishes control bands for Tave, delta Tc, and turbine header pressure.

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Event Description: Turbine Header Pressure Instrument (PT-SP-16A) fails to midscale

Time	Position	Applicant's Actions or Behavior
	Crew	Maintains Tave within assigned band by adjusting FW and/or control rods and maintains RCS Cold leg delta Tc <2F. Maintains Turbine header within 10 psig band.
	SRO	Direct actions to mitigate the consequences and return to normal operations per DB-OP-06407 "Non-Nuclear Instrumentation Operating Procedure" and DB-OP-06401 "ICS Operating Procedure". Directs placing PT-SP-16B in service for faulted PT-SP-16A
	BOP	Selects PT-SP-16B using SASS pushbutton.
	BOP	Maintains Tave by: • slowly raising Main Turbine header pressure to 870 psig AND • slowly raising FW Demand (ideally, no TBV's will open during these adjustments) When plant is stabilized, places turbine back into AUTO (ICS IN/ICS Ready lights)
	SRO	Directs DB-OP-02526, Attachment 1, Returning ICS into Automatic Operation.
	NOTE	**Put in next event as determined by examiner.**

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Event Description: Unisolable Steam Line Leak / Break in Containment from SG #2

Time	Position	Applicant's Actions or Behavior
	Crew	SG-2 level decrease followed by SG-1 as Delta Tc builds in. Multiple fire alarms in #4 MPR Increase in the following • Tave • RC pressure • PZR level Receives the following Annunciators: 4-4-A, Ctmt to Annulus Delta P Hi/Low 4-3-A, Ctmt Normal Sump Level High 4-2-A, Ctmt Pressure High
	SRO	Refers to DB-OP-02525, Steam Leaks, Section 3.2: Directs Tripping the Reactor. **Directs SFRCS using MANUAL ACTUATION Switches. (CRITICAL)** **(Must depress Lower PB – Results in Isolation and Actuation)** Goes To DB-OP-02000, RPS, SFAS, SFRCS Trip, or SG Tube Rupture.
	RO	Recognizes that Steam Break did not result in Reactor trip Attempts manual trip of reactor. (Reactor does NOT trip). Notifies SRO of RPS failure.
	RO	**Momentarily deenergizes 480 volt buses E2 <u>and</u> F2. (CRITICAL)** Identifies that Control Rod Groups insert.
	Crew	Performs DB-OP-02000 Immediate Actions, Section 3: • All Control Rods (except Group 8) fully insert and Group IN-LIMIT lights come on. Neutron power lowering in intermediate range. • The Main Turbine trips. (SV, CV indicate closed) Crew informs SRO that reactor is shutdown.
	NOTE	**TIME OF SFAS ACTUATION:** _____

Op-Test No.: 2009-01	**Scenario No.: 3**	**Page 15 of 19**
Event Description: Unisolable Steam Line Leak in Containment from SG #2		

Time	Position	Applicant's Actions or Behavior
	SRO	Calls out for applicability of Specific Rules.
	Crew	Identify that Specific Rule 4 is applicable, Steam Generator Control. Authorizes start of Motor Driven Feedwater Pump (MDFWP)
	BOP	Starts Motor Driven Feedwater Pump (MDFWP) Adjusts control signals on MDFWP Disch vlv controllers, FW6459 and FW6460 Controls AFW Flow to SG #1 at ~800 gpm. Verifies SG #1water level rising.
	SRO	Calls out for applicability of Symptom Checks.
	Crew	Announces that Overcooling Event is applicable.
	SRO	Transitions to Section 7, Overcooling of DB-OP-02000. Authorizes performance of Attachment 8, MU/HPI/LPI in Service:
	RO	Performs steps of Attachment 8, MU/HPI/LPI in Service: • Return MU32 to AUTO with Setpoint of 100" in pzr. • Verifies MU3971 and MU6405 already Locked in the BWST position. • Verifies second makeup Pump is running • Deenergizes pressurizer heaters • Opens MU6421 and MU6419
	BOP	Performs steps of Attachment 8, MU/HPI/LPI in Service: • Starts the non-running CCW pump • Starts HPI Pump • Opens HPI injection valves HP2A, 2B, 2C, 2D. • Starts LPI Pumps • Opens piggyback valves and DH63 and DH64.

Op-Test No.: 2009-01	Scenario No.: 3	Page 16 of 19
Event Description: Unisolable Steam Line Leak in Containment from SG #2		

Time	Position	Applicant's Actions or Behavior
	SRO	Recognizes that SFRCS Isolation trip was required. Goes to Step 7.11 in Section 7, "Overcooling." Has BOP operator check for proper SFRCS Actuation.
	BOP	Should have previously recognized an improper SFRCS Actuation occurred. Should have manually started MDFP and started feeding SG #1. May have started isolating SG #2. **Should have identified that AFW is <u>NOT</u> controlling SGWL at 124" on SG #1 due to SFAS Module failure. Manually actuates SFAS Module for HIS6454B OR manually feeds SG #1 with AFWP #1 OR with MDFP with target rock valve in manual. (CRITICAL to control SG#1 level at 124")**
	SRO	Continues in DB-OP-02000, Section 7, "Overcooling." Recognizes that steam leak is unisolable. SFRCS should have isolated SG #2 and generator has blown dry thus terminating overcooling event. Goes to Step 7.15, SG Pressure Checks
	BOP	Checks SG Pressures are unequal due to SG #2 unisolable break.
	SRO	Continues in DB-OP-02000, Section 7, "Overcooling." Goes to Step 7.20, then 7.26, Verify Proper Operation of AFW feeding Non-Isolated SG.
	Crew	Checks proper operation of AFW to SG #1 using Table 1 of DB-OP-02000.
	SRO	Has RO check that RCS Cooldown rate is <100°F/hr. Authorizes crew to perform a controlled cooldown of RCS using Atmospheric Vent Valves (AVV's), and Pressurizer heaters and Spray.
	BOP	WHEN the overcooling has been terminated or controlled, then control the AVV on SG #1 to maintain RCS temperature constant or slightly lowering.

Op-Test No.: 2009-01	Scenario No.: 3	Page 17 of 19
Event Description: Unisolable Steam Line Leak in Containment from SG #2		

Time	Position	Applicant's Actions or Behavior
	RO	Begin to depressurize the RCS using Pressurizer Spray and Heaters to maintain pressure close to the minimum adequate subcooling margin, but above the RCP NPSH limits.
	SRO	Directs restoration of Reactor Coolant Pump Seal Return and Seal Injection IAW Attachment 10, Reactor Coolant Pump Operation.
	Crew	Verify MU19, FLOW CONTROL is closed. Verify a MU Pump Cross Connect Header isolation valve is open to supply seal injection. MU6408 or MU6409 IF RCS pressure is greater than the SFAS Low Low RCS Pressure Trip Setpoint AND Instrument Air is available, then block and open the following valves: • MU66A, RCP SEAL INJECTION 2-1 • MU66B, RCP SEAL INJECTION 2-2 • MU66C, RCP SEAL INJECTION 1-1 • MU66D, RCP SEAL INJECTION 1-2 Gradually (over approximately 2 minutes) open MU19 to establish Seal Injection Flow of 12-15 gpm (approximately 3 gpm per RCP). Opens: MU59A, MU59B, MU59C, and MU59D. Blocks, then opens MU38. **TIME for restoration of RCP Seal Cooling: _____ (CRITICAL)**
	NOTE:	**Must restore RCP Seal cooling (MU32 open and MU59A-D open) within 30 minutes of SFAS Actuation.**

Op-Test No.: 2009-01	Scenario No.: 3	Page 18 of 19
Event Description: Unisolable Steam Line Leak in Containment from SG #2		

Time	Position	Applicant's Actions or Behavior
		Sometime during Scenario, crew may want to secure a feedwater pump and/or a condensate pump.
	BOP	Removes condensate pump from operation: Stops Condensate Pump 1 using HIS 558, CONDENSATE PUMP 1. Opens CD 13, Condensate Pump 1 Discharge Suction Vent. Closes CD 576, Condensate Pump 1 Outlet Pressure Indicator Source. **OR** Stops Condensate Pump 2 using HIS 564, CONDENSATE PUMP 2. Opens CD 14, Condensate Pump 2 Discharge Suction Vent. Closes CD 577, Condensate Pump 2 Outlet Pressure Indicator Source.

Termination Criteria: SG #2 has been isolated, Crew starts cooldown of plant in controlled manner, and reestablishes RCP seal cooling.

Events #9:

Did the crew identify the failure to scram and open breakers E2 and F2?

_____

SAT UNSAT

Event #10:

Did the crew identify that AFW was NOT controlling SGWL at 124" on SG #1 due to SFAS Module failure? Did the crew manually actuate SFAS Module for HIS6454B as a mitigative action or manually control SG#1 water level at 124"?

_____

SAT UNSAT

Event #8:

Did the crew re-establish seal cooling to the reactor coolant pumps within 30 minutes of the Level 2 SFAS Actuation?

_____

SAT UNSAT

Facility: Davis-Besse **Scenario No.: 4** **Op-Test No.: 2009-01**

Examiners: _____ Operators: _____

_____ _____

_____ _____

Initial Conditions: Unit is at 95% power.

Turnover: Swap Letdown Purification Demineralizers DB-OP-06006, Section 3.14.

Event No.	Malf. No.	Event Type*	Event Description
1		N (RO)	Swap Letdown Purification Demineralizers for Li+ Control
2	Malf	C (RO)	Core Flood Tank #1 Slow Nitrogen leak
		SRO	TS 3.5.1 Core Flood Tank, 1 hr to restore pressure.
3	Malf	I (BOP)	BWST Lo-Lo Level Instrument (LI 1525A) Fails High
		SRO	TS 3.3.5 SFAS, Place channel in Trip in < 1hr.
4	Malf	C (BOP)	Station Air Compressor #2 trips, Standby AC Fails to Auto Start
5	Malf	C (BOP) R (RO)	Circ Water Pump #4 Trips / Power Reduction
6	Malf	M	Vacuum Leak HP Condenser / Reactor Trip
7	Malf	C (BOP)	SFRCS Manual PBs in Control Room Fails / Manual Actuation of SFRCS

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

The scenario starts with the unit at 95% power. The crew will be expected to swap letdown purification demineralizers as a Normal evolution

A slow nitrogen leak on a core flood tank will result in CFT pressure lowering below its TS minimum pressure requiring actions for the operators to repressurize and requiring the SRO to review ITS 3.5.1. Similarly a BWST low-low level instrument fails high requiring SRO review of Tech Specs. Although there are minimal actions for the RO, the BOP operator must trip the SFAS instrument channel IAW ITS 3.3.5 within 1 hour.

The crew will receive an annunciator indicating loss of a Station Air Compressor. The standby air compressor will fail to auto start requiring manual actions for the BOP operator to correct. Circulating water pump #4 will trip due to a breaker over current problem. This will cause condenser vacuum pressure to rise necessitating an emergent power reduction. This condition will eventually degrade into a loss of vacuum in the main condenser. The crew must trip the main turbine prior to condenser pressure rising to >7.5" and must trip the reactor prior to condenser pressure rising to >10."

A fault in the SFRCS Manual Actuation switches on the front panels will require operators to actuate SFRCS by manually realigning SFRCS equipment.

The scenario ends when the crew has tripped the main turbine, tripped the reactor, and has properly aligned SFRCS manually to feed AFW and isolate BOTH SGs.

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Simulator Setup

Time	**Position**	**Applicant's Actions or Behavior**

bat /NRC/nrcsenario4.txt|00:00:02|0

^ nrcsenario 4
^
^ Setup to 95 % power ic 17
^
^ Event 7
^ Both SFRCS no manual or auto trips
IMF F30db
IMF F30dc
IMF F30cc
IMF F30cb
imf f30ab
imf f30ac
imf f30bb
imf f30bc
^
^
^ station and instrument air compressors fail to auto start
imf kfece
imf kfs1g
^
6
^ Triggers
^
^
^
^

^ Events
^
^ Event 1 swap letdown demin
^
^ Event 2
^ slow N2 leak on 1 Core flood tank
irf bft1d (2) 575.0 00:02:00 596.9
^
^ Event 3
^ fails bwst level transmiter high
imf bfa5i (3)
^
^ Event 4
^ station air compressor 2 trips
imf kfs2o (4)
^
^ Event 5
^ cir water pump 4 tripped
imf kkp4q (5)
irf d4p1c (5) 6.0 00:05:00 0.6
^
^ Event 6
^ Loss of vacuum
imf dcm1 (6) 0.2 00:00:20 0.0

Op-Test No.: 2009-01	**Scenario No.: 4**	**Page 4 of 17**
Event Description: Swap Letdown Purification Demineralizers for Li+ Control		

Time	**Position**	**Applicant's Actions or Behavior**
	SRO	Authorizes removing #2 mixed bed demineralizer from service and placing #1 mixed bed demineralizer in service IAW DB-OP-06006, Sect. 3.14.
	RO	RO performs DB-OP-06006, Section 3.14: Opens MU10A, RC Letdown Cooler 1 Inlet Isolation, using HISMU10A. Closes MU10B, RC Letdown Cooler 2 Inlet Isolation, using HISMU10B.
	RO	After 30 minutes, Open MU10B, Close MU10A Verify letdown flow <70 gpm

Op-Test No.: 2009-01	**Scenario No.: 4**	**Page 5 of 17**
Event Description: Core Flood Tank #1 Slow Nitrogen Leak		

Time	Position	Applicant's Actions or Behavior
	Crew	Annunciator Alarm: (3-2-F) Core Flood Tank 1 Pressure Low Low pressure in CFT 1 as observed at PI CF4Bl or PI CF4B2 in the Control Room.
	SRO	Refers to DB-OP-06014, Core Flood Procedure, Sect. 3.3, Pressurizing CFT #1.
	SRO	Reviews TS 3.5.1, Core Flood Tank, Cond B, 1 hour action statement. Directs repressurizing CFT #1 IAW Section 3.3 to >590 psig.
	BOP	Contacts outside operator to line up Nitrogen to CFT #1. When outside operator reports that Nitrogen is lined up, Operator opens CF1544, Core Flood Tank 1 Fill and Pressurization Isolation, using HIS1544.
	BOP	When the CFT 1 reaches the desired pressure (>590 psig), has outside operator: • Close NN 822A, 600 Pound Nitrogen Pressure Regulating Valve. • Close NN 19, High Pressure Nitrogen System To Core Flood Tanks Pressure Regulator Bypass. BOP closes CF1544, Core Flood Tank 1 Fill and Pressurization Isolation. Has outside operator close NN 197, Nitrogen System To Core Flood Tank Isolation Gate Valve.
	SRO	After CFT #1 is repressurized, exits LCO.

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Event Description: BWST Lo-Lo Level Instrument (LT1525A) Fails High

Time	Position	Applicant's Actions or Behavior
	Crew	Annunciator: • (5-4-D) BWST Level High Fail L861 BWST Computer Point Alarms Level Indicator 1525A indicates pegged high
	RO	Diagnosis that a BWST Level Indicator has failed high.
	BOP	Checks SFAS Cabinets around back to assist in diagnosis.
	SRO	References DB-OP-03006, Miscellaneous Instrument Shift Check to determine if the instrument is operable.
	RO	Performs DB-OP-03006 for BWST level instruments and determines that level indicator is pegged high.
	SRO	Declares BWST Level Transmitter LT1525A Inoperable. Reviews TS 3.3.5, Cond A, must trip level transmitter in SFAS in < 1 hr. Reviews DB-OP-06405 and directs operators to trip failed BWST Level indicator.
	BOP	Trips LT1525A on SFAS cabinets IAW DB-OP-06405: Depresses Test Trip black pushbutton on SFAS Ch #1, Input Module BA112. • Red light illuminates on Module Verifies 1/5 lights ON on all 4 SFAS Output Modules: L511, L512, L513, & L514.
	SRO	May review TS 3.3.17, Post Accident Monitor but this is Not Applicable.

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Event Description: Station Air Compressor #2 trips, Standby AC Fails to Auto Start

Time	Position	Applicant's Actions or Behavior
	BOP	Receives the following annunciator alarms: 9-2-E, SAC 2 Trouble / Trip 9-3-E, Station Header Pressure Low 9-1-F, Instrument Air Header Pressure Low Operator diagnosis SAC #2 tripped but standby air compressor did not auto start.
	SRO	Refers to DB-OP-02528, Section 4.3, Air Compressor Trip Directs operator to start another air compressor.
	BOP	Starts Station Air Compressor #1
	BOP	Dispatches NLO to determine cause of SAC #2 trip.
	CUE	**SAC 2 trip due to breaker 50-51 instanteneous overload relay trip.**
	SRO	Directs BOP to have NLO Shutdown locally SAC #2.

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Event Description: Trip of #4 Circulating Water Pump / Power Reduction

Time	Position	Applicant's Actions or Behavior
	Crew	Indicators: #4 Circulating Water pump green tripped light is ON. #4 Circulating Water pumps motor current at zero. #4 Circulating Water pump discharge valve green CLOSED light ON. #3 Circulating Water pump discharge valve amber THROT light ON. May receive the following annunciator alarms: 15-2-F, LP Condenser Pressure High 15-1-F, High Condenser Pressure High
	SRO	References DB-OP-02517, Circ Water Pump Trip / Circ Water System Ruptures or DB-OP-02518, High Condenser Pressure. Recognizes need to decrease power level to maintain Condenser pressure ≤ 5.0 inches Hg A. Directs power decrease IAW DB-OP-02504, Rapid Shutdown
	RO	Commences power reduction using one of the following methods: At the Load Control panel: Set the Rate of Change 10 MWe is - 1% RTP per minute or to a rate specified by the Unit Supv. Set the Min Limit 20 MWe/min. Depress the DEC pushbutton to lower the unit load to the target determined by the Unit Supv.
	DRIVER	**If crew does not reduce power quickly enough and SRO orders a manual reactor trip, then put in next event as soon as reactor trip is ordered by SRO.**
	BOP	Dispatches operator to check out Circ Water Pump Breaker #4
	CUE	**After a few minutes, have operator report that there is a motor over current flag on the power supply breaker to Circ Water Pump #4.**

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Event Description: Vacuum Leak HP Condenser / Reactor Trip

Time	**Position**	**Applicant's Actions or Behavior**
	BOP	Annunciator 15-1-F, HP Condenser Pressure High 15-2-F, LP Condenser Pressure High Unexplained continuing rise in condenser pressure
	SRO	Recognizes need to decrease power level to maintain Condenser pressure $\leq$ 5.0 inches Hg A. References DB-OP-02518, High Condenser Pressure, Directs power decrease IAW DB-OP-02504, Rapid Shutdown.
	RO	Commences power reduction using one of the following methods: 1. At the Load Control panel: Set the Rate of Change 50 MWe is - 1% RTP per minute or to a rate specified by the Unit Supv. (May increase rate of change) Set the Target band to 700 MWe. (May decrease target band) Depress the DEC pushbutton to lower the unit load to the target determined by the Unit Supv. 2. Manual Control of the ICS station: Place the selected Hand Auto station in Hand. Control the power reduction by lowering the demand at the selected station. 3. Lowering the Upper Load Limit: Set the Rate of Change to a rate specified by the Unit Supv. Lower the Max Limit - MW to the target load as selected by the Unit Supv.
	SRO	Directs BOP to perform DB-OP-02518, Attachment 1. May direct Mechanical Hogger started May direct placing 2nd stage of Standby SJAE in service.

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Event Description: Vacuum Leak HP Condenser / Reactor Trip / SFRCS Failure

Time	Position	Applicant's Actions or Behavior
	BOP	Calls zone operator to perform Attachment 1 in an attempt to identify source of vacuum loss.
	SRO	Recognizes that crew will not be able to maintain plant operations with condenser vacuum leak. Per DB-OP-02518, orders the Main Turbine be tripped prior to reaching 7.5" HgA. **If reactor power is still >280 Mwe, this will also produce a reactor trip.** **Must trip the reactor prior to 10" HgA condenser vacuum (CRITICAL)**
	BOP	**Trips Main Turbine prior to 7.5" HgA. If reactor power is still >280 Mwe, this will also produce a reactor trip.** Verifies that turbine stop and control valves close.
	SRO	Transitions from DB-OP-02518, High Condenser Pressure to DB-OP-02000. (If not previously ordered), Orders reactor be tripped.
	RO	Performs DB-OP-02000 Immediate Actions, Section 3: • All Control Rods (except Group 8) fully insert and Group IN-LIMIT lights come on. • Neutron power lowering in the intermediate range. • Verifies that Main Turbine tripped. (MSV, CV indicate closed)
	SRO	Calls out Specific Rules and Symptom Checks.
	Crew	No Specific Rules or Symptoms identified.
	SRO	Directs performance of DB-OP-02000, Steps 4.3, RO performs Attachment 1, BOP performs Attachment 2.

Op-Test No.: 2009-01	**Scenario No.: 4**	**Page 11 of 17**

Event Description: Vacuum Leak HP Condenser / Reactor Trip / SFRCS Failure

Time	Position	Applicant's Actions or Behavior
	RO	Performs DB-OP-02000, Attachment 1: • Lock MU3971 and MU6405 in the BWST position • Verifies second makeup Pump is running • Set Pressurizer Level Controller to 100 inches. • Control Makeup System per Attachment 13.
	BOP	Performs DB-OP-02000, Attachment 2: Verify Steam Generator Pressures are being controlled by automatic operation of the Turbine Bypass Valves (TBVs) or Atmospheric Vent Valves (AVVs). When Condensate Flow is less than 3.5 MPPH, then establish one Condensate Pump operation. (Actions for this are found on pg 17)
	SRO	With condenser pressure at 10," orders reactor trip (if not done previously.) Directs Initiation of SFRCS
	BOP	Acknowledges that SFRCS did not actuate using push buttons.
	SRO	SRO directs manual Initiation and Isolation of SFRCS equipment using DB-OP-02000, Table 1, SFRCS Actuated Equipment.
	BOP	Manually repositions SFRCS equipment IAW DB-OP-02000, Table 1. **(Table 1 is attached, see pages 15 and 16. BOP performs last column in Table, Manual Initiate & Isolate. Must isolate since condenser is not available!)**
	SRO	Directs steps from DB-OP-02000, Section 4: 4.5 Check for NNI Power available. 4.6 Check for ICS Power available. 4.7 Check for Instrument Air available. 4.8 Check SFAS has NOT actuated AND plant conditions do NOT require an SFAS actuation.

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Event Description: Vacuum Leak HP Condenser / Reactor Trip / SFRCS Failure

Time	Position	Applicant's Actions or Behavior
	BOP	Crew Responds to SRO questions. 4.5 All 4 NNI Power Lights Lit? YES 4.6 Annunciator ICS/NNI 118 VAC PWR TRBL lit? NO 4.7 At least one compressor running with Instrument Air greater than 75 psig? Yes 4.8 SFAS has NOT actuated and not needed.
	SRO	Directs steps from DB-OP-02000: 4.9 Check SFRCS has NOT actuated and plant conditions do not require SFRCS actuation. 4.10 Check for Adequate Subcooling Margin. 4.11 Check proper Primary to Secondary Heat Transfer exists.
	Crew	Responds to SRO questions from DB-OP-02000: 4.9 No, SFRCS has been manually actuated. Verifies proper operation of SFRCS: • Both AFW pumps started and delivering full continuous flow to the SG(s). • Proper SG level control using Specific Rule 4. Maintain SG Levels at 124" in the SU Range using AFW 4.10 Crew responds, Yes, Adequate Subcooling Margin exists. 4.11 Crew responds, Yes, proper heat transfer exists.
	SRO	4.12 & 4.13 Check for SGTR 4.14 May have Shift Manager perform EP classification. 4.15 Perform Electrical Actions IAW Attachment 26. 4.16 Ensures compliance with Technical Specification Requirements for electrical power.
	Crew	4.12 & 4.13 No SGTR event exists.

Op-Test No.: 2009-01	**Scenario No.: 4**	**Page 13 of 17**

Event Description: Vacuum Leak HP Condenser / Reactor Trip / SFRCS Failure

Time	Position	Applicant's Actions or Behavior
	BOP	Performs Attachment 26: Verifies A & B busses energized. Verifies Generator Output breakers are open Verifies Main Generator Output MW reads "0" Verifies Main Generator exciter and field breakers are open. Requests Load Dispatcher to Open Disconnect 34620. Logs voltages on K & J busses and C1 and D1 busses
	SRO	4.17 Evaluates primary conditions. May direct MU returned to normal lineup. 4.18 Checks that AFW is NOT operating. Determines that AFW IS operating. Has operator shift AFW pump recirc flow directed back to the CST.
	Crew	4.18 Has plant operator Open AF50 and AF51. Unlocks and closes AF59.
		During Scenario, BOP may want to remove a feed and condensate pump from operation:
	BOP	Removes condensate pump from operation: Stops Condensate Pump 3 using HIS 558, CONDENSATE PUMP 3. Opens CD 13, Condensate Pump 3 Discharge Suction Vent. Closes CD 576, Condensate Pump 3 Outlet Pressure Indicator Source. **OR** Stops Condensate Pump 2 using HIS 564, CONDENSATE PUMP 2. Opens CD 14, Condensate Pump 2 Discharge Suction Vent. Closes CD 577, Condensate Pump 2 Outlet Pressure Indicator Source.

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Event Description: Vacuum Leak HP Condenser / Reactor Trip / SFRCS Failure

Time	Position	Applicant's Actions or Behavior
	BOP	If shutdown of #1 MFPT is desired, then perform the following: Place HIC ICS 36B, #1 Main Feedwater Speed, station in HAND. Lower #I MFPT speed to 3950 RPM using HIC ICs 36B, #1 Main Feed pump speed. Adjust the MDT 20 output to indicate zero amps reading on the XFER METER. Depress MANUAL on HIS 805C2 AND check MANUAL illuminates. Reduce MFPT 1 speed by turning HS 805D, Turbine Speed MDT 20 PISTOL GRIP, to Decrease until green LSS light IL 805A is LIT. Trip MFPT 1. Check the following lights are LIT: • Red TRIP light • Green LP STOP VALVE closed • Green HP STOP VALVE closed Check FW 488, Main Feed Pump 1 is seated.

Termination Criteria: Main Turbine and Reactor have been tripped.
AFW and Initiation and Isolation have been initiated for BOTH SG's.

TABLE 1, SFRCS Actuated Equipment, Sheet 1 of 2

SFRCS Actuated Equipment	SFRCS AUTOMATIC ACTUATION				SFRCS MANUAL ACTUATION[3]	
	SG Low Pressure		SG High Level OR Reverse Delta P	SG Low Level OR Loss of All RCPs	Manual Initiate	Manual Initiate & Isol
	SG 1	SG 2			6401 & 6402	6403 & 6404
FW612 (Z674)	CL	CL	CL	-	-	***CL**
SP6B (Z673)	CL	CL	CL	-	-	-
FW780	CL	CL	CL	-	-	CL
FW779	CL	CL	CL	-	-	CL
SP6A (Z678)	CL	CL	CL	-	-	-
FW601 (Z679)	CL	CL	CL	-	-	***CL**
ICS11B (Z961)	CL	CL	CL	-	-	CL
SP7B (Z675)	CL	CL	CL	-	-	CL
SP7A (Z680)	CL	CL	CL	-	-	CL
ICS11A (Z969)	CL	CL	CL	-	-	CL
MS101 (Z683)	CL	CL	CL	-	-	***CL**
MS100 (Z686)	CL	CL	CL	-	-	***CL**
MS101-1 (Z685)	CL	CL	CL	-	-	CL
MS100-1 (Z688)	CL	CL	CL	-	-	CL
MS611	CL	CL	CL	-	-	CL
MS394 (Z684)	CL	CL	CL	-	-	***CL**
MS375 (Z687)	CL	CL	CL	-	-	***CL**
MS603	CL	CL	CL	-	-	CL

*** - Must reposition to correct lineup.**

TABLE 1, SFRCS Actuated Equipment, Sheet 2 of 2

SFRCS AUTOMATIC ACTUATION						SFRCS MANUAL ACTUATION[3]	
SFRCS Actuated Components		SG Low Pressure		SG High Level OR Reverse Delta P	SG Low Level OR Loss of All RCPs	Manual Initiate	Manual Initiate & Isol
		SG 1	SG 2			6401 & 6402	6403 & 6404
AF3870	(Z008)	CL[1]	OP	OP	OP	OP	OP
MS106	(Z003)	CL	OP	OP	OP	OP	***OP**
MS107	(Z006)	OP	CL	OP	OP	OP	***OP**
AF3872	(Z010)	OP	CL[2]	OP	OP	OP	OP
MS5889A	(Z014)	OP	OP	OP	OP	OP	***OP**
MS5889B	(Z015)	OP	OP	OP	OP	OP	***OP**
MS106A	(Z004)	OP	CL	OP	OP	-	-
MS107A	(Z007)	CL	OP	OP	OP	-	-
AF3869	(Z009)	OP	CL	CL	CL	CL	CL
AF3871	(Z011)	CL	OP	CL	CL	CL	CL
RX Trip (ARTS)		TR	TR	TR	TR	TR	TR
Turbine Trip		TR	TR	TR	TR	TR	TR

*** - Must reposition to correct lineup.**

Events #6:

Did the crew trip the reactor prior to condenser vacuum pressure rising above 10” HgA?

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SAT UNSAT

Event #7:

Did the operators actuate SFRCS in a manner to cause AFW initiation and main feedwater and main steam isolation?

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SAT UNSAT