Facility: ANO-2	Scenario No.: 1 (New)	Op-Test No.: 2002-1 Page 1 of 16

Examiners:		Operators:

Initial Conditions:
40%, MOL, All ESF systems in standby except 2P7A.

Turnover:
Continue power escalation from 40% following forced main condenser outage for 10 days. Emergency feedwater pump 2P7A tagged for mechanics to repair the trip throttle valve. TS 3.7.1.2 72-hour action statement started 0400 this morning. Green Train Maintenance Week. Acceptable risk, 8.4.

Event No.	Malf. No.	Event Type*	Event Description
1 T = 0		N (CBOT)	Place 'B' MFP on line.
2 T=0		N (ALL) R (CBOR)	Continue power escalation.
3 T = 15	XRCCHAPCNT	I (CBOR)	Pressurizer pressure control channel fails low.
4 T=20	XSG2PT10411	I (CBOT)	Channel A SG pressure transmitter fails low.
5 CUED	FWPMPBLBRK	M (ALL)	Feedwater Pump 'B' Discharge line break.
6 TRIP	CEA47STUCK CEA04STUCK	C (CBOR)	Two CEAs fail to insert on reactor trip.
7 TRIP	69002H15 500FAILSU3	M (ALL)	SU #3 lockout due to 2H1 feeder breaker failure and lockout on bus.
8 EFAS	EFW2P7BFLT	C (CBOT)	2P7B EFW pump fails on start (motor overload). Start AACG or SU #2 and energize 2A1. Use 2P75 to feed SGs.

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

SCENARIO #1 NARRATIVE

Simulator session begins with the plant at 40% power and a power increase in progress. Two Condensate pumps and 'A' MFP are in service with 'B' MFP idling. The crew will enter OP 2102.004, Power operations procedure, step 9.22, power increase. The CBOT will place 'B' MFP inservice using OP 2104.007, Main Feedwater Pump and FWCS operations. At the same time, the CBOR will start a power increase with rate of less than 15 %/ hr by RCS dilution and raising turbine load on the turbine load potentiometer to maintain Tave-Tref within 2°F.

Approximately fifteen minutes into the scenario, the in service pressurizer (PZR) pressure control channel will fail low. This will result in all the PZR heaters energizing and actual PZR pressure increasing. AOP 2203.018, PZR Systems Malfunctions, will be entered and actions directed by the CRS. The CBOR will verify that the other pressure control channel is reading correctly and select that channel for control (note the normal spray valves may open if actual PZR pressure rises above 2225 psia). The CBOT will take the SDBCS master controller to 'AL' and adjust the setpoint to 1000 psia. If no action is taken, the plant will trip when RCS pressure rises above 2362 psia.

Approximately twenty minutes into the scenario, 2PT1041-1, safety channel for 'A' SG pressure, will fail low. This will trip one of the four PPS trip channels for low SG pressure trip and MSIS. Alarms for MSIS pre-trip, RPS channel trip/pre-trip, and channel 'A' operator insert (2C03) trip and pre-trip lights will be lit. The CRS will refer to the ACA 2203.012D and tech specs 3.3.1.1, 3.3.2.1 and 3.3.3.5 for guidance. The CBOT will place Channel 'A' PPS in bypass for point 11, SG pressure low, point 19, 'A' SG delta-P for EFAS 1, and point 20, 'B' SG delta-P for EFAS 2 for maintenance and trouble shooting. The crew will have one hour to place these points in bypass before exceeding the tech spec LCO.

When lead examiner is ready, then a main feed line break inside the turbine building will be initiated. Control Room indications received are heater drain pump delta-P and MFP Suction Pressure low alarms, Feedwater flow oscillations, main hotwell level lowering, turbine sump alarms and inability to maintain SG level. The crew will manually trip the reactor and trip all Condensate pumps, MFP's and heater drain pumps.

Upon the reactor trip a lockout of Startup # 3 will result due to failure of 2H15, the SU #3 feeder breaker to 2H1 with a fault on 2H1. During SPTA's, the CBOR will recognize two CEA's that did not insert during the reactor trip. The CBOR will initiate emergency boration using standard attachment exhibit 1. When the RCS heat removal safety function is being assessed, the crew will recognize that no feed is available and manually actuate EFAS on 2C03. When 2P7B is started, it will trip due to a motor fault.

SCENARIO #1 NARRATIVE (Continued)

During the RCS heat removal safety function, the crew will recognize that SG pressure is dropping due to main steam flow through MSR main steam isolation valves (non-vital power to MOV's) and they will shut the MSIV's. The crew will then control SG pressure using the main steam safety valves or take manual control of the upstream atmospheric dump valves. After SPTA's are complete the CRS will diagnose a Loss of all feedwater event and enter EOP 2202.006.

In EOP 2202.006, the crew has the option of energizing 2A1, which is the power supply to 2P75, auxiliary feedwater pump, from either SU #2 or the AACG. Once the CBOT energizes 2A1, 2P75 will be started and feed will be controlled to the SG's through the EFW isolation valves at less than 150 gpm for 5 minutes or until a level rise is observed. The lead examiner may terminate the scenario after feed is established to the SG's.

Simulator Instructions for Scenario 1

Reset simulator to MOL 40% power IC with 'A' MFP inservice and 'B' MFP in standby.
Markup OP 2102.004, power operations up to step 9.22.
Ensure that AACG is secured and PLT is reset.
Ensure hotwell level is ~80%.
Place 2CV0340-2, component override, value equal to '0' and override green light.
Place 2SV0317, component override, value equal to '0' and override green light.
Override and close 2P7A suction and discharge valves, 2EFW3A and 2EFW4A.
Enter TS 3.7.1.2 on status board. Place ACCEPTABLE RISK and Green Train Maintenance Week signs on 2C100.
Triggers T1, T3 and T4 are set to False.
Conditional Trigger T2 is set to Reactor trip.
Conditional Trigger T5 is set to EFAS 1.

Event No.	Malf. No.	Value/ Ramp Time	Event Description
1			Crew will place 'B' MFP in service.
2			Crew will continue with plant power increase.
3	XRCCHAPCNT Trigger = T1	0/0 T=15	Pressurizer pressure control channel A fails low.
4	XSG2PT10411 Trigger = T3	0/0 T=20	Channel 1 steam generator pressure transmitter fails low.
5	FWPMPBLBRK Trigger = T4	10000/ 5 min CUED	'B' MFP discharge line break in turbine building.
6	CEA47STUCK CEA04STUCK Trigger = T2	0/0 TRIP	Two CEA's stuck on reactor trip
7	6902H15 690BUS2H1 500FAILSU3 Trigger = T2	TRUE TRIP 10 sec TD	Lockout on 2H1 SU #3 feeder breaker to 2H1 lock closed(2H15). Lose startup #3, Switchyard breaker 126 trips.
8	EFW2P7BFLT Trigger = T5	TRUE 2 min TD	2P7B motor overload on start

Op-Test No.: 1 Scenario No.: 1 Event No.: 1 Page 5 of 16

Event Description: Crew will place 'B' MFP on line.

Time	Position	Applicant's Actions or Behavior
	ALL	Crew will brief the evolution (may be included in power escalation brief).
	CRS	Direct the CBOT to place 'B' MFP inservice using OP 2106.007 section 10.0.
	CBOT	Review procedure steps 9.0 – 9.15 to ensure 'B' MFP is in required configuration. No actions will be taken.
	CBOT	Verify condensate discharge pressure is 650-700 psig.
	CBOT	Verify that FWCS is maintaining Steam Generator levels ~70% and stable.
	CBOT	Verify that 'B' MFP flow through recirculation valve to condenser is ~ 1 gpm per 1 rpm (~ 1100 gpm).
	CBOT	Display Speed Demand Tracking on page 2 of respective MFRV Controller or on PMS computer (PMPDMDTA or PMPDMDTB). Slowly raise 'B' MFP speed using 2HIC-0310 until pump speed matches the speed tracking demand for 'B' FWCS. CBOT will watch 'B' MFP discharge pressure and MFW (condensate) flow, 2FIC0735 as 'B' MFP speed is raised.
	CBOT	Place 'B' MFP speed controller, 2HIC-0310 in automatic when speed signals are approximately matched (speed demand tracking and 'B' MFP speed controller demand)
	CBOT	When flow and S/G levels stabilized slowly close the 'B' MFP recirc valve and place controller in automatic.

Termination criteria: 'B' MFP is feeding SG's in automatic and 'B' MFP recirc controller in automatic or at examiners discretion.

Op-Test No.: 1 Scenario No.: 1 Event No.: 2 Page 6 of 16

Event Description: Power escalation.

Time	Position	Applicant's Actions or Behavior
	ALL	Crew will conduct brief for power increase (the power increase will be done concurrently with placing 'B' MFP in service).
	CRS	Implement normal operating procedure 2102.004, power operations section 9.0. (step 9.22) Direct CBOT to place 'B' MFP in service. Direct CBOR to dilute to raise RCS temperature and adjust turbine load using load set potentiometer.
	CBOR	Commence RCS dilution using OP2104.003, Chemical addition. Verify Reactor makeup water pump running. Verify mode selector switch (2HS-4928) in DILUTE. Verify reactor makeup water flow controller (2FIC-4927) in MANUAL or AUTO and demand less than CCP flow. Verify VCT makeup isolation valve (2CV-4941-2) open. Depress red pushbutton on reactor makeup water flow batch controller (2FQIS-4927). Verify that 2FQIS-4927 has desired quantity set and 2FIC-4927 indicates desired flow.
	CBOR	Adjust turbine load to maintain reference temperature and RCS average temperature within two degrees. Obtain PEER check.
	CBOR	Maintain ASI within 0.05 of power dependant ESI by withdrawing CEA's. Obtain PEER check and CRS permission to withdraw CEA's.

Termination criteria: Reactivity manipulation observed at examiner's discretion.

Op-Test No.: 1 Scenario No.: 1 Event No.: 3 Page 7 of 16

Event Description: Channel 1 Pressurizer Pressure Control Channel fails low.

Time	Position	Applicant's Actions or Behavior
	CBOR	Announce annunciator 2K10-E6 Pressurizer Pressure Control Channel 1 Pressure HI / LO. Report ALL PZR backup heaters energized.
	CRS	Refer to PZR Systems Malfunctions AOP 2203.028 and direct board operators actions. Refer to **TS 3.2.8** if pressure not 2025 to 2275 psia.
	CBOR	Verify PZR spray valves closed. Control backup heaters manually to maintain pressure < 2275 psia. Compare channels and determine Channel 1 failed low. Place PZR Pressure Channel Select switch (2HS-4626) to channel 2. Restore backup heaters to automatic control.
	CBOT	Place SDBCS Master controller in AUTO local and adjust setpoint to 1000 psia.

Termination Criteria: PZR pressure control selected to channel 2 in auto control or at examiner's discretion.

Op-Test No.: 1 Scenario No.: 1 Event No.: 4 Page 8 of 16

Event Description: 2PT1041-1, Channel 'A' SG pressure transmitter fails low.

Time	Position	Applicant's Actions or Behavior
	CBOR	Announce annunciators: 2K04-A4 CH A RPS/ESF/PRETRIP/TRIP 2K04 B3 PPS TRIP 2K04-E4 MSIS PRETRIP
	CRS	Implement Annunciator Corrective Action AOP 2203.012D.
	CBOR	Report A SG pressure low pretrip and trip.
	CBOT	Compare all four channels and report 2PI-1041-1 indicates 0 psia.
	CRS	Refer to Tech Spec 3.3.1.1, 3.3.2.1, 3.3.3.5, 3.3.3.6.
	CBOT	Place the following channels in bypass on Channel A: A SG pressure low - RPS (Bistable 11) A SG ΔP - EFAS 1 (Bistable 19) B SG ΔP - EFAS 2 (Bistable 20)
	CBOR	Verify annunciator 2K04-C3 PPS CHANNEL BYPASSED Verify correct channels in bypass.
	CRS	Contact maintenance/PS liaison.

Termination Criteria: Effected channels bypassed or at examiner's discretion.

Op-Test No.: 1 Scenario No.: 1 Event No.: 5 Page 9 of 16

Event Description: Main Feedwater line break in the turbine building on the discharge line of 'B' MFP resulting in a manual reactor trip.

Time	Position	Applicant's Actions or Behavior
	CBOT	Announce indications of feedwater line break: Heater Drain pump ΔP and MFP Suction Press low alarms. Feedwater flow oscillations. Hotwell level lowering. Feed flow going up on 'B' MFP suction flow. 'B' MFP discharge pressure dropping. Steam generator levels dropping. Turbine building sump level alarms (2K12 J12, turbine building station #1 level high.
	CRS	Direct CBOR to manually trip reactor and manually secure all MFP's, heater drain pumps and condensate pumps OR manually actuate MSIS.
	CBOR	Manually trip reactor
	CBOT	Verify that on loss of SU #3 all MFP's, heater drain pumps and condensate pumps are secured.

Termination Criteria: Event terminated when reactor tripped and MFP's, heater drain pumps and Condensate pumps are secured or at examiner's discretion.

Op-Test No.: 1 Scenario No.: 1 Event No.: 6 & 7 Page 10 of 16

Event Description: Implement SPTA's and diagnose event. On the reactor trip, two (2) CEA's fail to insert into the core requiring emergency boration by the CBOR. A lockout on startup transformer #3 results in non-vital busses being deenergized and the EDG's supplying the vital busses.

Time	Position	Applicant's Actions or Behavior
	CREW	Announce reactor trip.
	CRS	**Implement Standard Post Trip Actions,** notify operators to monitor Exhibit 7 CBO Reactor Trip Checklist, track safety functions, and direct board operator actions.
	CBOR	Announce that two CEA's did not insert on the reactor trip.
	CBOT	Announce lockout on SU #3 and 2H1.
	CRS	Direct crew to use Exhibit 7 CBO Reactor Trip Checklist, track safety functions, and that the CRS has control of annunciator horn during moment of silence.
	CRS	Directs crew to take control of annunciator horns and implement SPTA's.
CT	CBOR	**Check reactivity control:** Report reactor power lowering. Announce that CEA 004 and CEA 047 did not insert fully into the core. * Perform emergency boration using Exhibit 1. * (NOTE: Actions can be taken during moment of silence)
	CBOT	**Check maintenance of vital auxiliaries:** Report main turbine tripped. Report generator output and exciter breakers open. Report both 4160vac and 6900vac non-vital buses deenergized with a lockout on SU#3 and 2H1 (Crew may elect to open 2H15) Report both 4160v and 480v vital AC bus energized from EDG's. Report service water is supplying both EDG's. Report both 125v vital DC bus energized.
	CBOR	**Check inventory control:** Report PZR level 10 to 80%. Report PZR level trending to setpoint. Report RCS MTS greater than 30 °F

Termination Criteria: Emergency boration established.

Op-Test No.: 1 Scenario No.: 1 Event No.: 7 & 8 Page 11 of 16

Event Description: When EFAS is manually actuated, 2P7B will trip on motor overload this will result in a loss of ALL feedwater.

Time	Position	Applicant's Actions or Behavior
	CBOR	**Check RCS pressure control:** Report RCS pressure 1800 to 2250 psia. (NOTE: RCS pressure May go above 2250 psia due to RCS heatup then, CRS will direct auxiliary spray.) Initiate auxiliary spray using Attachment 27 to maintain RCS pressure less than 2250 psia.
	CBOR	**Check core heat removal by forced circulation:** Report RCP's are tripped.
	CBOT	**Check RCS Heat Removal:** Report SG levels are lowering. Manually actuate EFAS, emergency feed actuation signal, on 2C03 by taking handswitches to actuate on red and green channels and then take the four handswitches back to normal. Announce that 2P7B tripped on Motor overload. (2K07 A9, 2P7B failure on EFAS , 100 second TD) and 2K07 C9, 2P7B Motor overload) Report all RCP's are secured. Close SG blowdown isolation valves, 2CV 1016-1 and 2CV 1066-1 Report feedwater line is not intact. Report all condensate pumps are secured. Report both MFW pumps are secured. Close MFW block valves. Report SG pressures are lowering due to 2CV 0460 and 0400 are open and close MSIV's (NOTE: this step may be done earlier). Report that SG safety valves are maintaining SG pressure after MSIV's. CRS can direct the CBOT to control SG pressures using upstream ADV's.
Simulator Instructor Cue: When contacted as AO, report back that overcurrent drop flags are dropped on 2P7B breaker, 2A311.		
Termination Criteria: Emergency boration established.		

Op-Test No.: 1 Scenario No.: 1 Event No.: 7 & 8 Page 12 of 16

Event Description: Loss of all Feedwater

Time	Position	Applicant's Actions or Behavior
	CBOR	Report RCS Tc 540 to 555°F and slowly lowering.
	CBOR	**Check CNTMT parameters:** Report temperature less than 140° F. Report pressure less than 16 psia. Report containment spray pumps secured. Report status of radiation alarms: CAMS (2K10-B6) not in alarm Area radiation (2K11-B10) not in alarm Process liquid (2K11-C10) not in alarm Report stable trends on radiation monitors. Report SEC SYS RADIATION HI (2K11-A10) not in alarm. Report stable trends on secondary system radiation monitors.
	CRS	Notify SE to report to control room. Announce reactor trip on plant page. Notify SM to refer to Tech Specs and EALs. **(3.0.3 – loss of EFW trains and NUE – 4.1, degraded power)**
	CRS	Direct CBOs to acknowledge all control room annunciators and announce all significant alarms. Notify crew of status of Safety functions. Diagnose Loss of ALL feedwater. Conduct crew brief.

Event Termination: 2A1 energized and feed restored to SG or at examiners discretion.

Continued on next page.

Op-Test No.: 1 Scenario No.: 1 Event No.: 7 & 8 Page 13 of 16

Event Description: Loss of ALL feedwater.

Time	Position	Applicant's Actions or Behavior
	CRS	Implement LOSS OF ALL FEEDWATER Event EOP 2202.006. Direct board operators in performing the below actions.
	CBOR	Verify all RCP's secured and both spray valves in manual and closed.
	CBOT	Verify that SG blowdown valves are closed, 2CV 1016-1 and 2CV-1066-1. Verify both MSIV's closed.
	CRS	Direct implementation of standard attachment 11, Degraded Power, to energize 2A1.
	CBOT	Using attachment 11: Cross connect Instrument air with unit 1, open 2CV-3004/3015. Close at least ONE RCP to CCW isolation valve (2CV-5255-1, 2CV-5254-2, 2CV-5236-1) Determine that transformer SU #2 should be used to restore power to 2A1.
	CBOR	Maintain RCS pressure 1800 psia to 2250 psia with auxiliary spray using attachment 27, PZR spray operation.
NOTE: 2A1 may be energized using SU#2 or AACG. **When contacted as AO report that startup #2 load shed circuit is enabled.**		
	CBOT	**Using attachment 29:** Use flow chart and determine that SU #2 is powered from the autotransformer and that unit 1 is not using it. Enter the attachment at step 1 Contact AO to locally verify SU XFMR #2 load shed circuit enabled. Place Load Center Supply breakers 2A102, 2A104 and 2A202 in PTL. Place BOTH Condenser Vacuum pumps (2C5A/B) in PTL. Place ALL CCW pumps in PTL (2P33A, 2P33B and 2P33C) Close SU #2 XFMR Feeder breakers 2A111 to energize bus 2A1. (Note Candidate may energize 2A2, 2H1 and 2H2 from SU#2. The SU#3 feeder breaker 2H15 is closed due to failure but will open when handswitch is taken to the OPEN or PTL position)

Event Termination: 2A1 energized and feed restored to SG or at examiner's discretion.

Continued on next page.

Op-Test No.: 1 Scenario No.: 1 Event No.: 7 & 8 Page 14 of 16

Event Description: Loss of ALL feedwater.

Time	Position	Applicant's Actions or Behavior
NOTE: the following actions are implemented only if 2A1 has not been energized by Startup Transformer #2.		
	CBOT	**Using AACG:** Use OP 2104.037, Alternate AC Diesel Generator Operations, attachment 'E', AAC Generator Emergency start. START AAC GENERATOR AS FOLLOWS: Touch ENGINE START/STOP. Touch START Screen. Touch START button. Verify Generator frequency ~ 60 Hz (900 RPM) and voltage ~ 4160 volts. TOUCH ELECTRICAL BUS CONTROL. TOUCH 4160 V BREAKERS. VERIFY AAC GENERATOR OUTPUT BREAKER (2A-1001) CLOSED. Contact Unit 1 to determine electrical power status.
Note: When contacted as Unit 1 report that Unit 1 does not need the AACG.		

Event Termination: 2A1 energized and feed restored to SG or at examiner's discretion.

Continued on next page.

Op-Test No.: 1 Scenario No.: 1 Event No.: 7 & 8 Page 15 of 16

Event Description: Loss of ALL feedwater.

Time	Position	Applicant's Actions or Behavior
	CBOT	Energizing 2A1 from AACG: Place the following handswitches in PTL and verify breakers open: SU #2 to 2A1 (2A-111) Unit Aux to 2A1 (2A-112) SU #3 to 2A1 (2A-113) LC 2B3 Feeder (2A-103) LC 2B9 Feeder (2A-109) Condensate Pump (2P-2A) Condensate Pump (2P-2C) Heater Drain Pump (2P-8A) Auxiliary Feed Pump (2P-75) Main Chiller (2VCH-1A) Verify the following breakers closed: 2A1 to 2B1 (2A-102) 2A1 to 2B7 (2A-104) Contact the AO to verify the following breakers closed AND open all remaining breakers on Load Center 2B1: LC 2B1 Supply (2B-112) MCC 2B12 Supply (2B-114) Instrument Air Compressor 2C-27A (2B-133) Contact the AO and Locally verify the following breakers closed AND open all remaining breakers on Load Center 2B7. LC 2B7 Supply (2B-712) CCW Pump 2P-33C (2B-721)

Event Termination: 2A1 energized and feed restored to SG or at examiners discretion.

Continued on next page.

Op-Test No.: 1 Scenario No.: 1 Event No.: 7 & 8 Page 16 of 16

Event Description: Loss of ALL feedwater.

Time	Position	Applicant's Actions or Behavior
		Contact AO and Locally verify the following breakers closed AND open all remaining breakers on 2B12: 2P-9A Condensate Transfer Pump (2B12-B2) Oil Cooling Fan 2C-72 (2B12-A4) Oil Pump 2P-225 (2B12-A5) 2P-75 to EFW Train B Flow Control 2CV-0760 (2B12-B3) 2P-75 to EFW Train A Flow Control 2CV-0761 (2B12-B4) 2P-75 to MFW Flow Control 2CV-0762 (2B12-K3) Close at least one RCP CCW Isolation valve. 2CV-5255-1 2CV-5254-2 2CV-5236-1 Touch ELECTRICAL BUS CONTROL. Touch 4160 V BREAKERS. Touch 2A-904. Touch CLOSE on the PLC. Verify 2A1 indicates ~4160 volts.
NOTE: If MSIS was actuated, then the AO must be contacted to manually open the DC control power in breaker cubicles 2A106 and 2A205 (2202.006 Step 13.B) before 2P75 can be started.		
CT	CBOT	Check MSIS and CIAS reset. IF not then direct AO to open DC control power in cubicles 2A106 and 2A205. Start 2P225, AFW lube oil pump. Start AFW pump, 2P75, and feed SGs at less than 150 gpm.
Event Termination: 2A1 energized and feed restored to SG or at examiners discretion.		

Facility: ANO-2	Scenario No.: 2	Op-Test No.: 2002-1 Page 1 of 14
Examiners:		Operators:

Initial Conditions:
100%, MOL, All ESF systems in standby. 'B' CCW pump tagged out. 2CV 4810, letdown backpressure control valve tagged out.

Turnover:
Continue 100% operations. Backpressure control valve, 2CV 4810, is tagged out for maintenance on the valve actuator. 'B' CCW pump tagged out for coupling repair. Green Train Maintenance week. Minimal Risk, 10.0.

Event No.	Malf. No.	Event Type*	Event Description
1 T = 0	XRCCHAPLVL	I (CBOR)	Channel A pressurizer level transmitter fails high.
2 T = 10	XFW2FT0742 (Modified)	I (CBOT)	Condensate loop B flow transmitter fails low.
3 T = 20	SGATUBE (Modified)	R (CBOR) N (CBOT)	10 gpm primary to secondary leakage on 'A' steam generator requiring a plant shutdown.
4 T = 40	SGATUBE (Modified)	M (ALL)	Leakage increases to 200 gpm (SGTR) requiring manual reactor trip.
5 POST TRIP	2K11_C2 or 2K11_C4 (New)	C (CBOR)	'A' or 'B' RCP reverse rotation (whichever is secured at 1400 psia). (Results in securing ALL RCP's)
6 CUED	CNDVACPPA (New)	C (CBOT)	'A' Vacuum pump trip 'B' Vacuum pump fails to auto start (result in steaming to atmosphere if not corrected)

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

SCENARIO #2 NARRATIVE

Simulator session begins with the plant at 100% power and steady state.

The inservice Pressurizer (PZR) control channel level instrument will fail high. Alarms on control channel 1 level hi and level hi hi will come in. This will result in letdown going to maximum flow and actual PZR level dropping. AOP 2203.018, PZR Systems Malfunctions, will be entered and actions directed by the CRS. The CBOR will take the letdown flow controller to manual and control PZR level. The CBOR will also verify that the other level control channel is reading correctly and select that channel for control and place the PZR low low level cutoff switch to the unaffected channel. When the auto and manual signals are matched, the CBOR will place the letdown flow controller to automatic

Approximately 10 minutes into the scenario, the 'B' MFP suction flow transmitter will fail low, 2FT-0742. The 'B' MFP suction flow low alarm will come in. The CRS will enter the ACA 2203.012C. Both the 'B' MFP recirc valve and the 'B' condensate pump recircs will automatically open on low flow. The standby Condensate pump will automatically start at 425 psi due to the recirc valves opening and increasing actual Condensate flow. The crew will take both the 'B' MFP recirc valve and the 'B' Condensate pump recircs to manual to control Condensate pressure 650 to 700 psig.

A ten (10) gpm SG tube leak (5-minute ramp) will start about 20 minutes into the scenario. The Secondary system radiation alarm and the N-16 leakrate alarms will come in. The crew will look at the 'prisec' screen on PMS, 2C14 chart recorder and radiation monitors on 2C25 to help determine which SG is leaking. The CRS will enter the primary to secondary leakage AOP, 2203.038 and direct crew operations. The CBOR will perform an RCS mass balance leakrate calculation, Charging-letdown mismatch and PMS 'leak mass' program (not temperature compensated) to help quantify the leakrate. The crew will perform a power reduction such that the plant will be off line in one hour. The CBOR will both borate the RCS and reduce turbine load to maintain Tave-Tref within 2°F. The CBOT will make preparations to remove secondary plant equipment out of service as power is reduced. The CBOT will also isolate steam to 2P7A from 'A' SG.

The SG tube leak will be increased to 200 gpm after about 20 minutes of power reduction. The crew will recognize that SG tube leakage exceeds the capacity of the CCP's and that they cannot maintain PZR level. The CRS will then direct the CBOR to manually trip the reactor. The Crew will then perform SPTA's.
Crew will manually actuate SIAS and CCAS when pressure is observed to be trending towards the trip setpoint of 1675 psia. The CBOR will secure one RCP in each loop when RCS pressure reaches 1400 psia.

SCENARIO #2 NARRATIVE (continued)

This will cause one of the pumps to rotate in the reverse direction when secured resulting in a reverse rotation alarm. The CRS will refer to the ACA and direct the CBOR to secure the remaining RCP's (this is a critical step) resulting in natural circulation operations.

After SPTA's, the CRS will diagnose a SGTR and enter EOP 2202.004. The CRS will direct the CBOR to cooldown the RCS to less than 520°F on 'A' Th. The CBOR will cooldown the RCS using the SDBCS bypass valves to the condenser and plot and record the cooldown using standard attachments 1 and 8. The CBOT will restore service water to ACW (this is needed to cool the vacuum pumps and maintain condenser vacuum).

After the EOP is entered, the RCS cooldown is started and at the lead examiner's discretion, 'A' vacuum pump will trip and 'B' vacuum pump will NOT automatically start. The CBOT will manually start 'B' vacuum pump. If this vacuum pump is not started, the SDBCS bypass valves will close and the crew will have to steam the ruptured SG to atmosphere resulting in an off site radiological release.

When the ruptured SG Th is less than 520°F, the CRS will direct the CBOT to isolate 'A' SG. When RCS Th is less than 520°F, 'B' Vacuum pump started and the 'A' SG isolated the scenario may be terminated by the lead examiner.

Simulator Instructions for Scenario 2

Reset to 100% MOL IC.

For 2CV 4810 override red and green lights and set component malfunction set value to 0.

Place 2P33B handswitch in PTL. Override Green, Red and White lights off. Set suction and discharge valves remote to a value of "0".

Set 'B' Vacuum pump remote will not automatically start.

'B' SW pump, 2P4B, is aligned to Green train.

Place Green train maintenance week sign in simulator.

Place Minimal Risk sign in simulator.

Triggers T1, T3, T4, T5, T6,T7 are set to False.

Event No.	Malf. No.	Value/ Ramp Time	Event Description
1	XRCCHAPLVL Trigger = T1	100	Channel A pressurizer level transmitter fails high.
2	XFW2FIS 0742 Trigger = T3	0	Condensate loop B flow transmitter fails low.
3	SGATUBE Trigger = T4	10 5 min	10 gpm primary to secondary leakage on 'A' steam generator requiring a plant shutdown.
4	SGATUBE	200 5 min	Increase leakage to 200 gpm (SGTR) requiring manual reactor trip.
5	2K11_C2 or 2K11_C4 Trigger = T5,T6	True	Remote 2K11_C2 ('A' RCP reverse rotation) is set to on. Remote 2K11_C4 ('B' RCP reverse rotation) is set to on.
6	CNDVACPPA CND2C5B Trigger = T7	True	'A' Vacuum pump trip. 'B' Vacuum pump fails to automatically start.

Op-Test No.: 1 Scenario No.: 2 Event No.: 1 Page 5 of 14

Event Description: Channel A pressurizer level instrument (2LI-4627-1) fails high.

Time	Position	Applicant's Actions or Behavior
	CBOR	Announce annunciators: 2K10-J6 CNTRL CH 1 LEVEL HI 2K10-H6 CNTRL CH 1 LEVEL HI HI
	CRS	Implement PZR System Malfunction AOP 2203.028 and direct board operators actions.
NOTE: **As letdown flow increases, annunciators 2K12-E1 (LD HX DISCH PRESS HI) and F1 (LD TO PURIF FILTERS FLOW HI) alarm.**		
	CBOR	Compare PZR level instruments to determine affected channel. Place letdown flow controller (2HIC-4817) in manual. Place PZR level channel select switch to unaffected channel. Place PZR low low level cutoff switch to unaffected channel. Verify PZR heaters and normal spray operating to restore RCS pressure 2025 to 2275 psia. Place letdown flow controller in auto when auto and manual signals match.
	CRS	Inform SM to refer to 3.3.3.6 Post Accident Instrumentation. Contact maintenance/PS liaison Conduct short brief discussing failure of level channel and plant status.
Termination criteria: Letdown restored to auto or at examiners discretion.		

Op-Test No.: 1 Scenario No.: 2 Event No.: 2 Page 6 of 14

Event Description: Condensate loop 'B' flow transmitter (2FIS-0742) fails low.

Time	Position	Applicant's Actions or Behavior
	CBOT	Announce annunciator 2K03-D12 (B MFP SUCT FLOW LO)
	CRS	Implement annunciator corrective action 2203.012C and direct board operator actions. (Note MFP suction flow LO trip is bypassed)
	CBOT	Report that 'B' MFP recirc valve is fully open. (**Note**: the ACA requires operators to open this valve if an actual low flow situation exists. This should prompt the operators to question why the recirc is already fully open and investigate the problem more fully.) Report that 'B' condensate recirc valve is fully open. Determine instrument 2FIS-0742 failure by use of PMS, control board indications and PID's. Place "B" condensate recirc valve and "B" main feed pump recirc valve in manual to control condensate header pressure. (**Examiners Note**: Crew may elect to manually start the fourth Condensate pump to raise MFP suction pressure.)
	CRS	Diagnose that flow instrument 2FE 742 has failed low and recognize need to leave the 'B' MFP and 'B' Condensate recircs in manual. Contact maintenance/PS liaison to investigate failed transmitter. Conduct short brief.

Termination criteria: Condensate and MFP recirc valves placed in manual with condensate header pressure steady and the fourth Condensate Pump is secured (if started) or at examiners discretion.

Op-Test No.: 1 Scenario No.: 2 Event No.: 3 Page 7 of 14

Event Description: 10 gpm primary to secondary leakage on A steam generator requiring a plant shutdown.

Time	Position	Applicant's Actions or Behavior
	CBOR	Announce annunciators : SG tube LKRT high - 2K11-K8 Sec Sys Rad high - 2K11-A10 (with reflashes) Rate of change high - 2K11-J8 Process Gas high - 2K11-D10
	CRS	Implement Primary to Secondary Leakage AOP 2203.038 and direct board operator actions.
	CBOR	Check PZR level trend.
	CRS	Direct crew that if PZR level can not be maintained within10% of setpoint with letdown isolated and all available CCP's running then the reactor will be tripped. Notify chemist to sample steam generators for activity.
	CRS	Contact AO to commence Control of Secondary Contamination, Attachment 19
	CBOR	Maintain VCT level 60 to 75%. Determine RCS leakrate.
	CRS	Determine affected steam generator. Inform SM to refer to EALs.
	CBOT	Adjust steam generator blowdown flow to maximum. Isolate main steam to 2P7A from 'A' SG by closing 2CV1000-1
	CRS	Inform SM to refer to Tech Spec 3.7.1.2 for EFW operability and Tech Spec 3.4.6.2 for RCS leakage to steam generators greater than 150 gpd.

Termination criteria: Plant shutdown in progress or at examiner's discretion.

CONTINUED ON NEXT PAGE

Op-Test No.: 1 Scenario No.: 2 Event No.: 3 Page 8 of 14

Event Description: 10 gpm primary to secondary leakage on A steam generator requiring a plant shutdown.

Time	Position	Applicant's Actions or Behavior
	CRS	Direct crew to perform a rapid plant SD, requiring the plant to be off line within one hour per 2102.004, Power Ops. OR direct crew to perform a plant SD using 2104.004, Power Ops, and be less than 50% power W/I one hour and be off line in 2 hours. Contact Entergy Dispatcher and Rx Eng to inform of shutdown.
	CBOR	Commence boration and CEA insertion for ASI control. Obtain PEER Check when inserting CEA's.
	CBOR	Lower turbine load to maintain Tref within ± 2° F of program Tave. Obtain PEER check when reducing Turbine Load and when inserting CEA's.
	CBOT	Prepare to secure secondary system equipment during plant shutdown.

Termination criteria: Plant shutdown in progress or at examiner's discretion.

Op-Test No.: 1 Scenario No.: 2 Event No.: 4 and 5 Page 9 of 14

Event Description: Primary to secondary leakage increases to 200 gpm requiring a manual reactor trip. When RCS pressure drops less than 1400 psia, then two RCP's will be secured. A reverse rotation alarm will actuate which requires securing ALL RCP's resulting in a natural circulation condition. Complete SPTA's and diagnose SGTR on 'A' SG.

Time	Position	Applicant's Actions or Behavior
CT	CBOR	Announce RCS leakage greater than charging pump capacity and PZR level cannot be maintained. Manually trip the reactor prior to exceeding a reactor trip setpoint.
	CRS	**Implement Standard Post Trip Actions,** notify operators to monitor Exhibit 7 CBO Reactor Trip Checklist, track safety functions, and direct board operator actions.
	CBOR	**Check reactivity control:** Reactor power decreasing. All CEAs inserted.
	CBOT	**Check maintenance of vital auxiliaries:** Main turbine tripped. Generator output and exciter breakers open. At least one 4160v and 6900 v bus energized. At least one 125v vital DC bus energized. At least one 4160v and 480v vital AC bus energized.
	CBOR	**Check inventory control:** PZR level 10 to 80%. Trending from setpoint. RCS MTS > 30°F

Termination criteria: RCP's secured and SGTR diagnosed or at examiners discretion.

Continued on next Page.

Op-Test No.: 1 Scenario No.: 2 Event No.: 4 and 5 Page 10 of 14 Event Description: Primary to secondary leakage increases to 200 gpm requiring a manual reactor trip. When RCS pressure drops less than 1400 psia, then two RCP's will be secured. A reverse rotation alarm will actuate which requires securing ALL RCP's resulting in a natural circulation condition. Complete SPTA's and diagnose SGTR on 'A' SG.		
Time	Position	Applicant's Actions or Behavior
	CBOR	**Check RCS pressure control:** RCS pressure 1800 to 2250 psia. Trend from setpoint. Verify SIAS when pressure less than 1675 psia. (Note: crew may elect to manually actuate SIAS prior to 1675 psia) Trip one RCP in each loop when pressure less than 1400 psia. Place spray valve for secured RCP in manual closed.
NOTE: The following four steps will be performed when RCS pressure is less than 1400 psia.		
	CBOR	Secure one RCP in each loop
	CBOR	Announce either 'A' or 'B' RCP reverse rotation alarm
	CRS	Refer to 2203.012K (C-2 or C-4) ACA and direct CBOR to secure remaining RCP's
CT	CBOR	Secure remaining RCP's due to reverse rotation of RCP.
NOTE: The following two steps may be completed before the RCP's are secured (depending on RCS pressure). If performed after RCP's are secured, core heat removal safety function is checked as NOT satisfied and no other verifications are completed.		
	CBOR	**Check core heat removal by forced circulation:** RCP status. Loop Δ T less than 10° F. RCS MTS 30° F or greater. Service water pump suction aligned to Lake. Component cooling water aligned to RCPs.
	CBOT	Restore SW to CCW and ACW per Exhibit 5. (NOTE: This action requires several minutes) Check SIAS actuated. Maintain SW pressure greater than 85 psig. (May start B SW pump on bus 2A4)
Termination criteria: RCP's secured and SGTR diagnosed or at examiners discretion. **Continued on next Page.**		

Op-Test No.: 1 Scenario No.: 2 Event No.: 4 and 5 Page 11 of 14

Event Description: Primary to secondary leakage increases to 200 gpm requiring a manual reactor trip. When RCS pressure drops less than 1400 psia, then two RCP's will be secured. A reverse rotation alarm will actuate which requires securing ALL RCP's resulting in a natural circulation condition. Complete SPTA's and diagnose SGTR on 'A' SG.

Time	Position	Applicant's Actions or Behavior
	CBOT	**Check RCS Heat Removal:** Report SG levels and method of feed. Verify MFW in reactor trip override Report feedwater line intact. Report SG pressures (May control SG pressure by reducing the master controller setpoint in Auto local 950-1000)
	CBOR	Report RCS Tcold 540 to 555° F.
	CBOR	**Check CNTMT parameters:** Temperature less than 140° F. Pressure less than 16 psia. Status of radiation alarms: CAMS (2K10-B6) not in. Area radiation (2K11-B10) not in. Process liquid (2K11-C10) not in. Report Secondary Sys Radiation Hi (2K11-A10) in alarm. Trend on radiation monitor shows 'A' steam generator ruptured.
	CRS	Notify SM to perform the following: SE report to control room. Announce reactor trip on plant page. Refer to Tech Specs and EALs.
	CRS	Direct CBOs to acknowledge all control room annunciators and announce all significant alarms. Diagnose Steam Generator Tube Rupture

Termination criteria: RCP's secured and SGTR diagnosed or at examiner's discretion.

Op-Test No.: 1 Scenario No.: 2 Event No.: 6 Page 12 of 14

Event Description: At the completion of SPTA's and at the examiner's discretion, 'A' vacuum pump will trip and 'B' will not automatically start. If action is not taken, then the ruptured SG will be steamed directly to atmosphere. Crew will cooldown the RCS Th < 520°F and isolate the 'A' SG.

Time	Position	Applicant's Actions or Behavior
	CRS	Implement Steam Generator Tube Rupture, 2202.004, and open place keeping page. Direct board operators in performing the following actions.
	All	Perform crew brief and review floating steps.
	CRS	**Determine applicable floating steps:** Restore SW to ACW. Commence RCS cooldown to less than 520° F T_h.
	CBOR	**Commence RCS cooldown: (floating step)** Reset low SG pressure setpoints. Commence RCS depressurization to maintain RCS MTS 30 to 45° Use Attachment 8 to record cooldown and plot RCS press vs. temp using Attachment 1. Take manual control of SDBCS bypass valve (2CV-0303). Place all SDBCS ADVs permissive switches in OFF. Secure running MFP. Close SG block valves
	CBOT	**Perform post-SIAS actions:** Report status of service water pumps. Verify service water supplied to diesel generators. SW pump suction aligned to Lake. Status of electrical buses SW to CCW and ACW with header pressure greater than 85 psig. Verify SG sample valves open.

Termination criteria: 'B' Vacuum pump has been started, RCS has been cooled down to 520F and 'A' SG has been isolated.

Continued on next page.

Op-Test No.: 1 Scenario No.: 2 Event No.: 6 Page 13 of 14

Event Description: At the completion of SPTA's and at the examiner's discretion, 'A' vacuum pump will trip and 'B' will not automatically start. If action is not taken, then the ruptured SG will be steamed directly to atmosphere. Crew will cooldown the RCS Th < 520°F and isolate the 'A' SG.

Time	Position	Applicant's Actions or Behavior
	CRS	Inform SM to have Chemistry to sample both SG and monitor RDACS for offsite dose release.
	CBOT	**Verify safety injection flow to RCS:** Check HPSI flow using Exhibit 2.
Note: Vacuum may degrade and alarms on condenser high-pressure alarm(s), 2K03 A-3 and A-4. This will shut the SDBCS bypass valve to the condenser. This valve will automatically open when vacuum is restored.		
CT	CBOT	Announce 'A' Vacuum Pump (2C5A) trip alarm 2K03 D-3. Start 'B' vacuum pump. Verify condenser vacuum restores.
	CBOR	Check IA pressure greater than 65 psig.
	CRS	**Determine ruptured SG:** Radmonitors and trends. SG level trends. Steam flow and feedwater flow prior to trip. SG samples.
	CBOR	Minimize RCS break flow by allowing RCS pressure to lower. Maintain RCS pressure within 100 psi of RCP NPSH. Depressurize RCS when HPSI flow has been overridden and controlled.
	CRS	Contact AO to shut manual valves on 'A' SG per standard attachment 10. (2SGS 1042, 2MS-43-1, 2MS-43-2, 2MS-74, 2MS-2102)

Termination criteria: 'B' Vacuum pump has been started, RCS has been cooled down to 520F and 'A' SG has been isolated.

Continued on next page.

Op-Test No.: 1 Scenario No.: 2 Event No.: 6 Page 14 of 14

Event Description: At the completion of SPTA's and at the examiner's discretion, 'A' vacuum pump will trip and 'B' will not automatically start. If action is not taken, then the ruptured SG will be steamed directly to atmosphere. Crew will cooldown the RCS Th < 520°F and isolate the 'A' SG.

Time	Position	Applicant's Actions or Behavior
	CBOR	Report when Thot less than 520° F.
CT	CBOT	**Isolate ruptured SG:** Use Att. 10 to isolate 'A' SG.
	CBOR	Adjust steaming to maintain RCS temp < 520°F Th and compensate for shutting 'A' MSIV.
	CRS	**Check correct SG isolated:** Sample activity. Steam line radiation monitors. Response to EFW flow.

Termination criteria: 'B' Vacuum pump has been started, RCS has been cooled down to 520F and 'A' SG has been isolated.

Facility: ANO-2	Scenario No.: 3 (Spare)	Op-Test No.: 2002-1 Page 1 of 16
Examiners:		Operators:

Initial Conditions:
100%, MOL, All ESF systems in standby. 'D' Condensate Pump tagged out.

Turnover:
Maintain 100% power. Maintenance scheduled to clean circ water screens later in shift. 'D' Condensate Pump tagged out for packing replacement. Green Train Maintenance Week. Minimal Risk, 10.0.

Event No.	Malf. No.	Event Type*	Event Description
1 T = 0	XRCCHAPLVL	I (CBOR)	Control Channel "A" pressurizer level fails Low.
2 T=2	XSPUPFAIL	C (CBOR)	Loss of Safety Parameter Display System (SPDS) Update
3 T = 5	**T0361failure** (New)	I (CBOT)	Common MFP lube oil **supply** temperature transmitter fails low (actual temperature increases).
4 T = 15	**RCP2P32ALOW** **RCP2P32AMID**	R (CBOR) N (ALL)	RCP seal failures requiring a plant shutdown.
5 CUED	**RCO2P32AUPP** (Modified)	C (CBOR)	Third RCP seal Failure results in a manual reactor trip and securing of 'A' RCP
6 TRIP	RCSLOCATCB	M (ALL)	Loss of coolant accident after reactor trip due to vapor seal leakage.
7 SIAS	HPI2P89AFAL ESFK110A	C (CBOT)	A HPSI pump fails to auto start due to faulty ESF relay K110A. This relay failure also prevents CNTMT air sample valves 2SV-8273-1 and 8233-1 from auto closing.
8 SIAS	416_2A406 (Remote)	C (CBOT)	B HPSI pump fails due to breaker fault.

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

SCENARIO #3 NARRATIVE

Simulator session begins with the plant at 100% power and steady state. 'D' Condensate pump is tagged out for maintenance.

The in service Pressurizer (PZR) control channel level instrument will fail low. Alarms on control channel 1 level lo and level lo lo will come in. This will result in letdown going to minimum flow, the two backup CCP's will automatically start, all PZR heaters de-energizing and actual PZR level go up. AOP 2203.018, PZR Systems Malfunctions, will be entered and actions directed by the CRS. The CBOR will take the letdown flow controller to manual and control PZR level. The CBOR will also verify that the other level control channel is reading correctly and select that channel for control and place the PZR low low level cutoff switch to the unaffected channel. When the auto and manual signals are matched, the CBOR will place the letdown flow controller to automatic.

About two minutes into scenario, the SPDS computer will fail to update. The CBOR will report that the SPDS is not updating. This will remain failed the rest of the scenario. Primarily the CBOR will be forced into using redundant indications since one of the SPDS CRT's is on 2C03 and the CBOR relies heavily on it for indications. The CBOT also will be forced to use redundant indications as one of the SPDS CRT is located on the upper part of 2C16. The CRS will notify maintenance and log the time SPDS is lost. This is a 1-hour reportable event if SPDS cannot be restored(10CFR50.72).

Five minutes into the scenario, 2TE0361 fails low. This will result in CCW isolation to the common MFP lube oil cooler. Temperature alarms will come in on supply temperature at 135°F. The CRS will refer to ACA2203.012C that will direct obtaining local lube oil temperatures from the AO. The CBOT will monitor MFP lube oil temperatures on 2TRS 0325 chart recorder located on 2C11. The CBOT will recognize that 2TIC-5283, MFP Lube Oil Temp. Controller on 2C04 has zero output due to the temperature feed failing low. The CBOT will take manual control of 2TIC-5283 to lower and control MFP lube oil temp using the PMS MFP screen to watch temperature.

Approximately 15 minutes into the scenario, two seals on 'A' RCP will fail. Annunciator 2K11-G3, RCP Bleedoff flow hi/lo will alarm. The CBOT will verify using PMS and RCP chart recorder on 2C14 that the lower and middle seals have failed. The CRS will enter the RCP emergencies AOP, 2203.025 and direct the board operator actions. The crew will perform a power reduction such that the plant will be off line in one hour. The CBOR will borate the RCS and reduce turbine load to maintain Tave-Tref within 2°F. The CBOT will make preparations to remove secondary plant equipment out of service as power is reduced.

SCENARIO #3 NARRATIVE

When the lead examiner is ready, the third seal will fail on ‘A’ RCP. When the crew recognizes the failure the CRS will direct a manual Reactor trip and securing of ‘A’ RCP. The Crew will complete SPTA’s when the reactor is tripped.
On the Reactor trip, the vapor seal on ‘A’ RCP will fail resulting in a 400 gpm LOCA ramped over 5 minutes. The crew will manually actuate SIAS and CCAS when pressure is observed to be trending towards the trip setpoint of 1675 psia. The CBOR will secure one RCP in each loop when RCS pressure reaches 1400 psia. When SIAS is manually actuated, the ‘A’ HPSI pump will fail to automatically start and two of the CAMs, containment air monitoring sample isolation valves will fail to close (same relay). The CBOT will recognize the ‘A’ HPSI pump not starting (annunciator will alarm) and manually start the pump (with direction from the CRS). Also when SIAS is manually actuated, the ‘B’ HPSI pump will fail due to a breaker fault (annunciator will alarm). The CBOT will place ‘B’ HPSI pump in PTL and start ‘C’ HPSI pump.

After SPTA’s are complete, the CRS will diagnose a LOCA and enter the LOCA EOP 2202.003. The CRS will direct the CBOR to cooldown the RCS. The CBOR will cooldown the RCS using the SDBCS bypass valves to the condenser and plot and record the cooldown using standard attachments 1 and 8. When HPSI termination criteria is met, the crew will secure one HPSI pump and throttle the opposite loop HPSI injection MOV’s to maintain PZR level. The scenario may be terminated at the lead examiner’s discretion.

Simulator Instructions for Scenario 3 (Spare)

Reset to 100% power MOL IC.

Triggers T1, T3, T4, T5 set to false.

Conditional trigger T2 set to reactor trip.

Conditional trigger T6 set to SIAS-1.

Place Green train maintenance week sign in simulator.

Place Minimal Risk sign in simulator.

Align 'C' HPSI to Green Train in PTL.

PZR level control HS-4628 in Channel A.

'D' Condensate pump tagged out. Green and White lights set to false. Breaker A206 in locked open.

Event No.	Malf. No.	Value/Ramp Time	Event Description
1	XRCCHAPLVL Trigger = T1	0	Control Channel "A" pressurizer level fails low.
2	XSPUPFAIL Trigger = T1	0 2 min TD	Failure of the SPDS Computer to Update
3	**T0371**failure Trigger = T3	0	Common MFP lube oil **supply** temperature transmitter fails low (actual temperature increases).
4	**RCP2P32ALOW** **RCP2P32AMID** Trigger = T4	True 3 min TD	2 RCP seal failures requiring a plant shutdown.
5	**RCO2P32AUPP** Trigger = T5	True	Failure of Upper Seal resulting in Manual Reactor Trip and securing of "A" RCP.
6	RCSLOCATCB Trigger = T2	400 gpm 5 min Ramp	Loss of coolant accident after reactor trip due to vapor seal leakage.
7	HPI2P89AFAL ESFK110A Trigger = T6	True True	A HPSI pump fails to auto start due to faulty ESF relay K110A. This relay failure also prevents CNTMT air sample valves 2SV-8273-1 and 8233-1 from auto closing.
8	416_2A406 Trigger = T6	True	B HPSI pump fails due to breaker fault.

Op-Test No.: 1 Scenario No.: 3 Event No.: 1 Page 5 of 16 Event Description: Channel A pressurizer level control channel 2LT-4627-1 fails low.		
Time	Position	Applicant's Actions or Behavior
	CBOR	Announce alarms 2K10-G6 CNTRL CH 1 LEVEL LO. 2K10-F6 CNTRL CH 1 LEVEL LO LO. Report 2LI-4627-2 and 2LR-4625 indicate normal. Report backup charging pumps started.
	CRS	Refer to **PZR Systems Malfunctions AOP 2203.028** and direct board operators actions.
	CBOR	Determine PZR level Channel A failed. Place Letdown Flow controller (2HIC-4817) in MANUAL. Place PZR Level Channel Select switch (2HS-4628) to Channel B. Place PZR Low Low Level Cutoff select switch (2HS-4642) to Channel B. Verify PZR heaters and Normal Spray maintaining RCS pressure 2025 to 2275 psia. The CBOR will take the letdown flow controller to manual and control PZR level.
	CRS	Inform SM to refer to TS 3.3.3.5 Remote Shutdown Instrumentation and 3.3.3.6 Post Accident Instrumentation.
Termination criteria: Unaffected PZR level channel selected and letdown in automatic or at examiner's discretion.		

Op-Test No.: 1 Scenario No.: 3 Event No.: 2 Page 6 of 16

Event Description: Loss of the Safety Parameter Display Update.

Time	Position	Applicant's Actions or Behavior
	CBOR	Announce the loss of the SPDS computer to the CRS
	CRS	Logs the failure of the SPDS.
	CRS	Direct the CBOR/CBOT to use the other means of monitoring plant parameters.
	CBOR CBOT	Monitors the plant and provides information from other panel indications.
	CRS	Inform SM to: ♦ Contact maintenance (CSG), ♦ That it is a 1-hour reportable occurrence if it cannot be restarted within 1 hour. (10CFR50.72(b) (1) (v) and ANO procedure 2105.014, SPDS.

Termination criteria: SPDS is logged out of service, maintenance is contacted (CSG) and SS informed of loss of SPDS or at the examiner's discretion (NOTE: this condition will remain throughout the rest of the scenario).

Op-Test No.: 1 Scenario No.: 3 Event No.: 3 Page 7 of 16

Event Description: Common MFP lube oil supply temperature transmitter fails low (actual temperature increases).

Time	Position	Applicant's Actions or Behavior
	CBOT	Announce annunciators: 2K03-E8/E11 Turbine bearing Metal Temperature High. 2K03-D8/D11 Turbine Bearing Oil Temperature High.
	CRS	Implement **Annunciator Corrective Action AOP 2203.012C**.
NOTE: When contacted by control room as AO, report that local MFP bearing temperatures to 'A' MFP (2TI2611A) and 'B' MFP (2TI2611B) are trending up are reading the value obtained from instructor's area qume.		
	CBOT	Report that 2TE-0374('A' MFP) and 2TE-0371('B' MFP) are > 135°F and trending up. Also Report that bearing metal temperatures are also trending up.
	CBOT	Report that MFP Lube Oil TEMP Controller (2TIC-5283) has zero output. Take manual control of controller and control MFP lube oil temperature < 135°F.
	CBOT	Report that PMS point T0371 has failed low. (P&ID M-2216 sh2, E7 & M-2234 sh 1, G-2)
Termination Criteria: When MFP Lube Oil controller is in manually controlling MFP lube oil temperature or at examiner's discretion.		

Op-Test No.: 1 Scenario No.: 2 Event No.: 4 Page 8 of 16

Event Description: Reactor Coolant Pump 2P32A seal failures.

Time	Position	Applicant's Actions or Behavior
	CBOR	Announce alarm 2K11-G3 RCP BLEEDOFF FLOW HI/LO. Report lower seal failure.
	CRS	Refer to **RCP Emergencies AOP 2203.025** and direct board operator actions.
	CBOR CBOT	Monitor RCP seals for further degradation. Report middle seal failure.
	CRS	Setup contingency to trip reactor and RCP if upper seal fails. **Refer to OP 2102.004 Power Operations** and commence a plant shutdown. Notify NLOs, Management, Dispatcher, Chemist, and Nuclear Eng.
	CBOR	Commence boration ~ 20 gpm. Maintain ASI –0.20 to +0.20 with Group 6 or P CEAs.
	CBOT	Reduce main turbine load to maintain Tave within 2° F of Tref.

Termination criteria: Plant shutdown in progress or at examiner's discretion.

Op-Test No.: 1 Scenario No.: 2 Event No. 5, 6 , 7 & 8 Page 9 of 16

Event Description: Third RCP seal fails, manual reactor trip, vapor seal failure, and HPSI failures.

Time	Position	Applicant's Actions or Behavior
	CBOR	Announce third RCP seal failure. Manually trip reactor. Secure A RCP and place spray valve in MANUAL and closed.
	CRS	**Implement Standard Post Trip Actions,** notify operators to monitor Exhibit 7 CBO Reactor Trip Checklist, track safety functions, and direct board operator actions.
	CBOR	**Check reactivity control:** Reactor power decreasing. All CEAs inserted.
	CBOT	**Check maintenance of vital auxiliaries:** Main turbine tripped. Generator output and exciter breakers open. Both 4160v and 6900 v non-vital buses energized. Both 4160v and 480v vital AC bus energized. Both 125v vital DC bus energized.
	CBOR	**Check inventory control:** PZR level 10 to 80%. Trend from setpoint. RCS MTS > 30°F

Termination criteria: Cooldown in progress with HPSI throttled or at examiner's discretion.

Continued to next page

Op-Test No.: 1 Scenario No.: 2 Event No. 5, 6 , 7 & 8 Page 10 of 16

Event Description: Third RCP seal fails, manual reactor trip, vapor seal failure, and HPSI failures.

Time	Position	Applicant's Actions or Behavior
	CBOR	**Check RCS pressure control:** RCS pressure 1800 to 2250 psia. Trend from setpoint Verify SIAS when pressure less than 1675 psia. Trip one RCP in each loop when pressure less than 1400 psia. Place spray valve for secured RCP in manual closed. Secure ALL RCPs **if** NPSH requirements violated.
	CBOR	**Check core heat removal by forced circulation:** RCP status Loop Δ T less than 10° F. RCS MTS 30° F or greater. Component cooling water aligned to RCPs. Service water not aligned to CCW.
	CBOT	**Restore SW to CCW using Exhibit 5.**
	CBOT or CBOR	**Check RCS Heat Removal:** Report SG levels. MFW in RTO. Report feedwater line intact. Report SG pressures.
	CBOR	Report RCS Tc 540 to 555°F.

Termination criteria: Cooldown in progress with HPSI throttled or at examiner's discretion.

Continued to next page

Op-Test No.: 1 Scenario No.: 2 Event No. 5, 6 , 7 & 8 Page 11 of 16
Event Description: Third RCP seal fails, manual reactor trip, vapor seal failure, and HPSI failures.

Time	Position	Applicant's Actions or Behavior
	CBOR	**Check CNTMT parameters:** Temperature less than 140° F and trending up. Pressure less than 16 psia and trending up. Status of radiation alarms: CAMS (2K10-B6) In alarm Area radiation (2K11-B10) in alarm. Process liquid (2K11-C10) Report trends on radiation monitors increasing. Status of SEC SYS RADIATION HI (2K11-A10) Report trends on secondary system radiation monitors stable.
	CRS	Notify SM to perform the following: SE report to control room. Announce reactor trip on plant page. Refer to Tech Specs and EALs. **Tech Specs 3.0.3, 3.6.3.1 and in Alert Emergency Class**
	CRS	Direct CBOs to acknowledge all control room annunciators and announce all significant alarms. **Diagnose Loss of Coolant Accident EOP 2202.003.**
	CRS	Implement Loss of Coolant ORP, open place keeping page, and direct board operators' actions.
	CRS	Perform crew brief and review floating steps.
	CRS	Contact chemistry to sample SG for activity

Termination criteria: Cooldown in progress with HPSI throttled or at examiner's discretion.

Continued to next page

Op-Test No.: 1 Scenario No.: 2 Event No. 5, 6 , 7 & 8 Page 12 of 16

Event Description: Third RCP seal fails, manual reactor trip, vapor seal failure, and HPSI failures.

Time	Position	Applicant's Actions or Behavior
	CBOR	Verify SIAS and CCAS actuated on PPS inserts.
	CBOT	Verify CCW aligned to RCPs **(Floating Step)**
	CBOR	Check RCS pressure greater than 1400 psia. **(Floating Step)** • Secure one RCP in loop 2 (if not done in SPTA's). • Secure ALL RCPs if MTS <30°F.
	CBOT	Restore ESF/Non-ESF systems: **(Floating step)** • Verify at least one SW pump running in each loop. • Verify DG SW outlet valves open. • Verify SW suction aligned to Lake. • Check 4160v Non-vital buses energized from offsite power. • Start SW pumps as needed to maintain header pressure. • Restore SW to ACW per Exhibit 5. • Maintain SW header greater than 85 psig.

Termination criteria: Cooldown in progress with HPSI throttled or at examiner's discretion.

Continued to next page

Op-Test No.: 1 Scenario No.: 2 Event No. 5, 6 , 7 & 8 Page 13 of 16

Event Description: Third RCP seal fails, manual reactor trip, vapor seal failure, and HPSI failures.

CT	CBOT	Verify HPSI flow to RCS: Report A HPSI pump failure to auto start and manually start. Report B HPSI Pump breaker trip. Manually start 'C' HPSI pump (Only one HPSI pump is required to be started).
	CBOT	Verify all CNTMT Cooling Fans running in emergency mode.
	CBOT	Verify SG levels greater than 22.2%. **(Floating Step)**
	CBOT	Align Feedwater: • Check EFW pump 2P7B running. • Secure EFW pump 2P7A. • Verify AFW pump 2P75 secured. • Secure running MFW pump and close ALL FW blocks.
	CBOT	Verify CCW surge tank constant and CCW radiation monitor trend stable.
	CBOR	Check LOCA is limited to containment. • Containment sump level going up. • Containment temperature, humidity and pressure are going up. • Auxiliary Building radiation levels steady. • Auxiliary building sump is less than 53%. • Waste tanks 2T20 A/B levels are steady.

Termination criteria: Cooldown in progress with HPSI throttled or at examiner's discretion.

Continued to next page

Op-Test No.: 1 Scenario No.: 2 Event No. 5, 6 , 7 & 8 Page 14 of 16
Event Description: Third RCP seal fails, manual reactor trip, vapor seal failure, and HPSI failures.

Time	Position	Applicant's Actions or Behavior
	CBOR	Check CNTMT Isolation parameters. **(Floating Step)** CNTMT pressure exceed 18.3 psia. CNTMT RADIATION HI alarm 2K10-A6 in alarm. Actuate CIAS and commence Attachment 5. Verify ONE Penetration Room Ventilation Fan Running.
	CBOR	Check CNTMT pressure trend not exceeded 23.3 psia. **(Floating Step)** • Verify CSAS actuated on PPS inserts. • Stop ALL RCPs, place spray valves in manual closed. • Verify spray pumps running with greater than 1875 gpm each.
	CBOT	Terminate CNTMT Spray if conditions met.
	CBOT	Start both Hydrogen Analyzers per 2104.044. Report CNTMT Air Sample valves 2SV-8273-1 and 2SV-8233-1 failed to auto close. (NOTE Due to K110A Relay Failure)
	CBOT	Verify All available miscellaneous CNTMT ventilation running: • CNTMT Bldg. Recirc fans (2VSF-31A-D) • Reactor Cavity fans (2VSF-34A&B) • Three CEDM Shroud Cooling fans (2VSF-35s)

Termination criteria: Cooldown in progress with HPSI throttled or at examiner's discretion.

Continued to next page

Op-Test No.: 1 Scenario No.: 2 Event No. 5, 6 , 7 & 8 Page 15 of 16

Event Description: Third RCP seal fails, manual reactor trip, vapor seal failure, and HPSI failures.

Time	Position	Applicant's Actions or Behavior
	CBOT	Check ALL AC and vital DC buses energized. **(Floating Step)**
	CBOR	Check IA pressure greater than 65 psig. **(Floating Step)**
	CRS	Check **LOCA not isolated and proceed to Section 3**
	CBOR	Perform controlled cooldown to 275°F. **(Float Step)** • Reset low PZR pressure and low SG pressure setpoints. • Record and plot cooldown on Attachments 1 and 8. Initiate cooldown using SDBCS bypass valves.
	CBOT	Check Condensate pump in service.
	CBOT	Maintain SG levels 45 to 90%. Check CST level greater than 82%
	CBOR	Restore PZR level. **(Floating Step)** Maintain 29% to 80%
	CBOR	Verify Natural Circulation if RCPs secured: • Loop ΔT less than 50° F. • Thot and Tcold constant or lowering. • RCS MTS 30° F or greater. • ΔT between Thot and average CETs less than 10° F.

Termination criteria: Cooldown in progress with HPSI throttled or at examiner's discretion.

Continued to next page

Op-Test No.: 1 Scenario No.: 2 Event No. 5, 6 , 7 & 8 Page 16 of 16

Event Description: Third RCP seal fails, manual reactor trip, vapor seal failure, and HPSI failures.

Time	Position	Applicant's Actions or Behavior
	CRS	Check that RCP restart criteria is NOT met.
	CBOR	Check RCS void free: • PZR level stable using aux spray. • RVLMS LVL 01 indicates WET. • Upper head thermocouples indicate subcooled.
	CBOR	Maintain RCS P-T limits and RCP NPSH per Attachment 1. Check uncontrolled RCS cooldown below 500° F Tcold has not occurred.
CT	CBOT CBOR	Override HPSI when termination criteria met: **(Floating Step)** • RCS MTS 30° F or greater. • PZR level greater than 29% and controlled. • RVLMS LVL 03 or higher indicates WET. • At least one SG available – Level 10 to 90% with FW available OR level being restored with FW flow greater than 485 gpm. Throttle HPSI flow OR place HPSI pump in PTL as needed to control RCS pressure, inventory, and heat removal.

Termination criteria: Cooldown in progress with HPSI throttled or at examiner's discretion.