

Facility: ANO-2		Scenario No.: 1		OpTest: 1	
				Page 1 of 15	
Examiners:				Operators:	
<p>Objectives:</p> <p>Evaluate NOP usage for plant shutdown. Evaluate AOP usage for charging header flow instrument failure, steam generator level instrument failure, and tornado warning. Evaluate EOP usage for stuck CEAs, loss of offsite power, and a SGTR.</p>					
<p>Initial Conditions:</p> <p>80% MOL Group 6 at 129 inches. Emergency feedwater pump 2P7B tagged out.</p>					
<p>Turnover::</p> <p>Continue plant shutdown due to EFW Pump Operability Tech Spec action 3.7.1.2a. Need to be in HOT SHUTDOWN (200 – 300 degrees) in 8 hours. Must expedite to complete the shutdown and Cooldown within the LCO. The AAC DG out of service to replace main lube oil pump suction filter. Receiving NOAH weather Alerts over the last two hours.</p>					
Event No.	Malf. No.	Event Type*	Event Description		
1 T = 0	None	N (CBOT) R (CBOR)	Continue plant shutdown.		
2 T = 10	2FIS-4863-1	I (CBOR)	Charging header flow instrument fails low.		
3 T = 15	XSG2LT10312	I (CBOT)	Steam generator level instrument fails low.		
4 T = 25	500LOSE161	M (ALL)	Loss of 161 KV Lines		
T = 30	None		Tornado warning, Tornado sighted in Protected Area.		
5 T = 35	500LOSE500 CEA02STUCK CEA66STUCK	M (ALL) C (CBOR)	Loss of offsite power (500 KV Lines)  Two CEAs fail to insert on reactor trip.		
6 T = 35	SGBTUBE EFW2P7AESF (New Malf)	M (ALL) C (CBOT)	200 gpm SGTR B SG 2P7A EFW pump fails to autostart on EFAS.		

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

### Simulator Instructions for Scenario 1

Override green and white lights for 2HS-0710-A1 and place handswitch in Pull-To-Lock.

Event No.	Malf. No.	Value/ Ramp Time	Event Description
1	None		Continue plant shutdown.
2	2FIS-4863-1 (Override)  Trigger = T1	0.0	Charging header flow instrument fails low.
3	XSG2LT10312  Trigger = T3	0.0	Steam generator level instrument fails low.
4	500LOSE161  Trigger = T4	True	Loss of 161 KV Lines
	None		Tornado warning.
5	CEA02STUCK CEA66STUCK  Trigger = T1	0.0 0.0	Two CEAs fail to insert on reactor trip.
6	500LOSE500  Trigger = T5	True True	Lose of offsite power (500 KV Lines
7	SGBTUBE  Trigger = T2	200  Ramp 2 min  TD 2min	200 gpm SGTR
8	EFW2P7AESF  Trigger = T1	True	2P7A EFW pump fails to auto start on EFAS.

Op-Test No.: 1    Scenario No.: 1    Event No.: 1,2    Page 3 of 15 Event Description: Continue plant shutdown and charging header flow instrument failure.		
Time	Position	Applicant's Actions or Behavior
	CRS	Direct plant shutdown per 2102.004.
	CBOT/CBOR	Reduce turbine load to maintain Tave within 2° F of Tref.
	CBOR	Borate and insert CEAs to reduce reactor power.

	CBOR	Announce annunciator 2K12-B3 CHARGING HEADER FLOW LO
	CRS	Implement Loss of Charging AOP 2203.036 and direct board operator actions.
	CBOR	Verify suction and discharge flow path. Identify the Charging Flow not available. Isolate Letdown. Stop all running Charging Pumps. Isolate Charging Suction and Discharge Flowpaths. Check for indications of charging header rupture.
	CRS	Contact WCO to check charging pump for gas binding per Attachment B.
<b>Simulator Operator Cue: When contacted as WCO to perform charging pump venting (Attachment B) then delete Transmitter malfunction and report that I &amp; C Technician had inadvertently opened the equalizing valve for the Charging Flow Transmitter. Transmitter has now been restored to normal. No gas binding had occurred.</b>		
	CRS	Direct SS to reference Chg Pump Tech Specs (3.1.2.1, 3.1.2.2, 3.1.2.3, 3.1.2.4)
	CRS	Enter <b>Tech Spec 3.0.3</b> due to all Chg Pumps in Stop.

	CRS	Directs CBOR to restore Charging System Lineup.
	CBOR	Establishes suction and discharge paths, start the charging pump, verifies charging flow indication.
	CBOR	Restores Letdown System to operation.
	CRS	Exits Tech Specs.

Termination criteria: Plant shutdown in progress, CVCS restored to operation, or at examiner's discretion.

Event Description: Steam generator level instrument fails low.

Time	Position	Applicant's Actions or Behavior
	CBOR	Announce annunciators: 2K04-A4 CH A RPS/ESF/PRETRIP/TRIP 2K04-B3 PPS Channel TRIP 2K12-K7 DEFAS Trouble
	CRS	Implement Annunciator Corrective Action AOP 2203.012D.
	CBOR	Report A SG level low pretrip/trip on PPS insert.
	CBOT	Compare all four channels and report 2LI-1031-2 indicates zero.
	CRS	Inform SS to refer to Tech Spec <b>3.3.1.1</b> and <b>3.3.2.1</b> .
	CBOT	Place the following channels in bypass on Channel B: A SG level low A SG level high A SG $\Delta$ P - EFAS 1
	CBOR	Verify annunciator 2K04-C3 PPS CHANNEL BYPASSED Verify correct channels in bypass.

Event Description: Steam generator level instrument fails low.

	CRS	Contact maintenance/PS liaison.
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Termination criteria: Affected channels placed in bypass or at examiner's discretion.

	CBOR	<p>Announce annunciators 2K10-C3 T41 TROUBLE, 2K11-G10 LOW LEVEL RAD WASTE BUILDING RADITION HIGH and 2K12-K2 AAC TROUBLE.</p> <p>(Loss of 161 KV causes a loss of power to Rad Waste Bldg. Rad Detector, Loss of 480 VAC to AAC Bldg., and T41 Controls)</p>
	CRS	Entered <b>Tech Spec 3.8.1.1</b>
	CRS	Brief crew on contingencies and Tech Spec.
<p><b>Simulator Operator Cue: Call as dispatcher of tornado warning issued for Pope, Yell and Johnson Counties for the next 2 hours. Report that 161 KV Lines have been damaged.</b></p>		
<p><b>When cued by the Lead Examiner -</b></p>		
<p><b>Simulator Operator Cue: Call as AO and report that a tornado is on the ground heading for the protected area.</b></p>		
	CRS	<p>Implement Natural Emergencies AOP 2203.008 and direct board operator actions.</p> <p>Inform SS to refer to EALs and monitor weather conditions.</p>
	CBOT	Verify at least one EDG not tied to grid and capable of auto start.

Termination criteria: Natural Emergencies AOP implemented or at the Examiner's Cue for next Malfunction.



Event Description: Tornado strikes 500 KV lines. Two CEAs fail to insert on reactor trip and a 200 gpm SGTR occurs. Both HPSI pumps fail to auto start on SIAS.

Time	Position	Applicant's Actions or Behavior
	CBOT	Announce loss of offsite power.
	CBOR	Announce reactor trip.
	CRS	<b>Implement Standard Post Trip Actions</b> , notify operators to monitor Exhibit 7 CBO Reactor Trip Checklist, track safety functions, and direct board operator actions.
	CBOR	<p><b>Check reactivity control:</b></p> <p>Reactor power decreasing.</p> <p>Reports CEAs 02 and 66 not inserted.</p> <p><b>*Perform Emergency Boration per Exhibit 1.*</b></p> <ul style="list-style-type: none"> <li>◆ Select Boration Flowpath (Gravity Feed, BAM Pumps, or RWT)</li> <li>◆ Close VCT Outlet Valve.</li> <li>◆ Verify at least 1 CCP running and flow &gt; 40 gpm.</li> </ul>
	CBOT	<p><b>Check maintenance of vital auxiliaries:</b></p> <p>Main turbine tripped.</p> <p>Generator output and exciter breakers open.</p> <p>Report no non-vital 4160v and 6900 v buses energized.</p> <p>Both 4160v and 480v vital AC bus energized by DGs.</p> <p>DG SW outlet valves open.</p> <p>Both 125v vital DC bus energized.</p>

Event Description: Tornado strikes 500 KV lines. Two CEAs fail to insert on reactor trip and a 200 gpm SGTR occurs. EFW pump 2P7A fails to auto start on EFAS.

Time	Position	Applicant's Actions or Behavior
	CBOR	<p><b>Check inventory control:</b>  PZR level 16 to 80%.  Trend from setpoint.  Report SIAS actuated or manually actuates and verify all PZR heaters off when PZR level less than 29%.</p>
	CBOR	<p><b>Check RCS pressure control:</b>  RCS pressure 1800 to 2250 psia.  Trend from setpoint  Verify SIAS when pressure less than 1717.4 psia.</p>
	CBOR	<p><b>Check core heat removal by forced circulation:</b>  RCP status (All RCPs secured)</p>
	CBOT	<p><b>Check RCS Heat Removal:</b>  Report SG levels and 2P7A failure to start.  *Manually opens 2CV-0340-2 to start 2P7A.*  Verify MFW in reactor trip override (Both MFPs tripped)  Report feedwater line intact.  *Report SG pressures (Close MSIVs due to steaming through MSRs)*  Use upstream ADVs to control SG pressure.</p>

Event Description: Tornado strikes 500 KV lines. Two CEAs fail to insert on reactor trip and a 200 gpm SGTR occurs. EFW pump 2P7A fails to auto start on EFAS.

Time	Position	Applicant's Actions or Behavior
	CBOR	RCS Tcold 540 to 555° F.
	CBOR	<p><b>Check CNTMT parameters:</b></p> <p>Temperature less than 140° F.</p> <p>Pressure less than 16 psia.</p> <p>Status of radiation alarms and trends:</p> <ul style="list-style-type: none"> <li>CAMS (2K10-B6)</li> <li>Area radiation (2K11-B10)</li> <li>Process liquid (2K11-C10)</li> <li>Secondary Sys Radiation Hi (2K11-A10) in alarm.</li> </ul>
	CBOT	Locally check Secondary Systems Radiation Monitors and report indication of B SG.
	CRS	<p>Notify SS to perform the following:</p> <p>SE report to control room.</p> <p>Announce reactor trip on plant page.</p> <p>Refer to Tech Specs and EALs.</p> <p>Chemist samples SGs for activity and monitor RDACS for offsite dose.</p> <p><b>Tech Spec 3.8.1.1, 3.0.3, 3.1.1.1 and in Alert Emergency Class</b></p>
	CRS	<p>Direct CBOs to acknowledge all control room annunciators and announce all significant alarms.</p> <p><b><u>Diagnose Steam Generator Tube Rupture.</u></b></p>

Event Description: Tornado strikes 500 KV lines. Two CEAs fail to insert on reactor trip and a 200 gpm SGTR occurs. EFW pump 2P7A fails to auto start on EFAS.

Time	Position	Applicant's Actions or Behavior
	CRS	<b>Implement Steam Generator Tube Rupture EOP</b> , open place keeping page, and direct board operator's actions.
	ALL	Perform crew brief and review floating steps.
	CBOR	Verify SIAS and CCAS actuated on PPS.
	CBOR	Check CCW not aligned to RCPs and perform Attachment 6. <ul style="list-style-type: none"> <li>• Verify RCPs secured with spray valves in manual closed.</li> <li>• Close RCP Bleedoff to VCT (2CV-4846-1)</li> <li>• Close RCP Bleedoff to VCT (2CV-4847-2)</li> <li>• Close RCP Bleedoff Relief to Quench Tank (2CV-4856)</li> </ul>
	CRS	Contact support operators to complete rest of Attachment 6.
	CBOT	Restore ESF/Non-ESF systems: <b>(Floating Step)</b> <ul style="list-style-type: none"> <li>• SW pump running on each loop.</li> <li>• DG SW outlet valves open.</li> <li>• SW pump suction aligned to Lake.</li> <li>• Report all non-vital buses not energized.</li> </ul>

Event Description: Tornado strikes 500 KV lines. Two CEAs fail to insert on reactor trip and a 200 gpm SGTR occurs. EFW pump 2P7A fails to auto start on EFAS.

Time	Position	Applicant's Actions or Behavior
	CBOT	Verify Safety Injection flow to RCS: <ul style="list-style-type: none"> <li>• Check HPSI flow using Exhibit 2.</li> <li>• Check LPSI flow using Exhibit 3.</li> </ul>
	CBOR	Check RCS pressure greater than 1400 psia. All RCPs off due to loss of power.
	CBOT	Check IA greater than 65 psig. Unit 1 has no IA for cross connecting.
	CBOT CBOR	Commence RCS cooldown to less than 520° F Thot. <b>(Floating Step)</b> <ul style="list-style-type: none"> <li>• Reset low SG pressure setpoints during cooldown.</li> <li>• Commence Aux Spray to maintain 30 to 45° F MTS.</li> <li>• Monitor and plot cooldown on Attachments 1 and 8.</li> <li>• Initiate cooldown using upstream ADVs.</li> <li>• Close ALL MFW block valves.</li> </ul>
	CBOR	Minimize primary to secondary break flow. <ul style="list-style-type: none"> <li>• Maintain RCS MTS 30 to 45° F.</li> <li>• Maintain RCS pressure within 50 psia above B SG pressure.</li> <li>• Depressurize RCS to less than 1000 psia (Continue aux spray and throttle HPSI if criteria met OR cycle PZR high point vents).</li> </ul>

Event Description: Tornado strikes 500 KV lines. Two CEAs fail to insert on reactor trip and a 200 gpm SGTR leak occurs. EFW pump 2P7A fails to auto start on EFAS.

Time	Position	Applicant's Actions or Behavior
	CBOT	Determine B SG ruptured by main steam line monitors and SG levels.
	CRS	Contact AO to perform local actions of Attachment 10 and 19 to minimize secondary contamination.
	CBOT	Isolate B SG main steam supply to 2P7A by closing (2CV-1050-2).
	CBOT	Align feedwater and SG blowdown: <ul style="list-style-type: none"> <li>•Close SG blowdown valves (2CV-1016-1) and (2CV-1066-1).</li> <li>•Verify 2P75 secured. (No power available)</li> </ul>
	CBOT	Check SG levels greater than 23%. <b>(Floating Step)</b>
	CBOT	Isolate B SG: <ul style="list-style-type: none"> <li>•Monitor RCS Thot.</li> <li>•When Thot less than 520° F, then perform Attachment 10.</li> <li>•Maintain B SG pressure less than 1050 psia using upstream ADV.</li> </ul>

Event Description: Tornado strikes 500 KV lines. Two CEAs fail to insert on reactor trip and a 200 gpm SGTR occurs. EFW pump 2P7A fails to auto start on EFAS.

Time	Position	Applicant's Actions or Behavior
	CBOR  CBOT	Override HPSI when termination criteria met: <b>(Floating Step)</b> <ul style="list-style-type: none"> <li>• RCS MTS 30° F or greater.</li> <li>• PZR level greater than 29% and controlled.</li> <li>• RVLMS LVL 03 or higher indicates WET.</li> <li>• At least one SG available – Level 10 to 90% with FW available OR level being restored with FW flow greater than 485 gpm.</li> </ul> Throttle HPSI flow OR place HPSI pump in PTL as needed to control RCS pressure, inventory, and heat removal.

Termination criteria: "B" SG isolated, cooldown in progress with HPSI throttled or at examiner's discretion.

Facility: ANO-2		Scenario No.: 2		Op-Test No.: 2000-1	
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Examiners:				Operators:	
<b>Objectives:</b> Evaluate AOP usage for pressurizer pressure transmitter failure and steam generator pressure transmitter failure. Use alternate means of indication with a Loss of SPDS. Evaluate AOP usage for RCP seal failures requiring plant shutdown and reactor trip. Evaluate EOP usage for Loss of Coolant Accident when vapor seal fails.					
<b>Initial Conditions:</b> 100%, MOL, All ESF systems in standby.					
<b>Turnover:</b> Maintain 100% power. Maintenance scheduled to clean service water pump strainers later in shift. Green Train Maintenance					
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	XSG2PT10411	I (CBOT)	Channel A SG pressure fails low.		
4 T = 15	RCP2P32BLOW RCP2P32BMID	C (CBOR) R (CBOR) N (ALL)	RCP seal failures requiring a plant shutdown.		
5 CUED	RCO2P32BUPP	C (CBOR)	Third RCP Failure results in a manual reactor trip and securing of "B" RCP		
6 Trip	RCSLOCATCB	M (ALL)	Loss of coolant accident after reactor trip due to vapor seal leakage.		
7 Trip	HPI2P89AFAL ESFK110A (New Malf)	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 Trip	416_2A406 (Remote)	C (CBOT)	B HPSI pump fails due to breaker fault.		

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



**Simulator Instructions for Scenario 2**

PZR level control HS-4628 in Channel A.

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	XSG2PT10411 Trigger = T3	0	Steam Generator pressure instrument fails low.
4	RCP2P32BLOW RCP2P32BMID Trigger = T4	True 3 min TD	2 RCP seal failures requiring a plant shutdown.
5	RCO2P32BUPP Trigger = T5	True	Failure of Upper Seal resulting in Manual Reactor Trip and securing of "B" 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 = T2	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 (Remote) Trigger = T2	True	B HPSI pump fails due to breaker fault.

Op-Test No.: 1    Scenario No.: 2    Event No.: 1    Page 3 of 14		
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 <b><u>PZR Systems Malfunctions AOP 2203.028</u></b> 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. Adjust letdown to match automatic and manual signals and place letdown flow controller in AUTO.
	CRS	Inform SS to refer to <b>TS 3.3.3.5</b> Remote Shutdown Instrumentation and <b>3.3.3.6</b> Post Accident Instrumentation.
Termination criteria: Unaffected PZR level channel selected and letdown in automatic or at examiners discretion.		

Op-Test No.: 1    Scenario No.: 2    Event No.: 2    Page 4 of 14		
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 SS to: <ul style="list-style-type: none"> <li>◆ Contact maintenance (CSG),</li> <li>◆ 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.</li> </ul>
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.		

Event Description: Steam generator pressure transmitter 2PT-1041-1 fails low, faulty instrument must be identified and affected PPS channels placed in bypass.

Time	Position	Applicant's Actions or Behavior
	CBOR	Announce annunciators: 2K04-A4 CH A RPS/ESF/PRETRIP/TRIP 2K04-E4 MSIS pretrip
	CRS	Implement <b><u>Annunciator Corrective Action AOP 2203.012D.</u></b>
	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 <b>Tech Spec 3.3.1.1, 3.3.2.1, and 3.3.3.5.</b>
	CBOT	Place the following channels in bypass on Channel A: A SG pressure low - RPS (Bistable 11) A SG $\Delta$ P - EFAS 1 (Bistable 19) B SG $\Delta$ P - EFAS 2 (Bistable 20)
	CBOR	Verify annunciator 2K04-C3 PPS CHANNEL BYPASSED Verify correct channels in bypass.
	CRS	Contact maintenance/PS liaison.
Termination Criteria: Affected channels bypassed or at examiners discretion.		

Event Description: Reactor Coolant Pump 2P32B 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 <b><u>RCP Emergencies AOP 2203.025</u></b> 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. <b><u>Refer to OP 2102.004 Power Operations</u></b> 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.

Event Termination: When examiners satisfied with reactivity manipulation.

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 B RCP and place spray valve in MANUAL and closed.
	CRS	<u><b>Implement Standard Post Trip Actions</b></u> , notify operators to monitor Exhibit 7 CBO Reactor Trip Checklist, track safety functions, and direct board operator actions.
	CBOR	<b>Check reactivity control:</b> Reactor power decreasing. All CEAs inserted.
	CBOT	<b>Check maintenance of vital auxiliaries:</b> 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. Report both DGs started and not tied to bus. Both 125v vital DC bus energized.
	CBOR	<b>Check inventory control:</b> PZR level 16 to 80%. Trend from setpoint. Secure all PZR heaters when less than 29%.

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

Time	Position	Applicant's Actions or Behavior
	CBOR	<p><b>Check RCS pressure control:</b>                      RCS pressure 1800 to 2300 psia.                      Trend from setpoint                      Trip one RCP in each loop when pressure less than 1400 psia.                      Place spray valve for secured RCP in manual closed.                      Verify SIAS when pressure less than 1717.4 psia.                      Secure ALL RCPs if NPSH requirements violated.</p>
	CBOR	<p><b>Check core heat removal by forced circulation:</b>                      RCP status                      Loop <math>\Delta T</math> less than 10° F.                      RCS MTS 30° F or greater.                      Component cooling water aligned to RCPs.                      Service water aligned to CCW.</p>
	CBOT	<p><b>Check RCS Heat Removal:</b>                      Report SG levels.                      2P7A and 2P7B feeding both SGs.                      MFW in RTO.                      Report feedwater line intact.                      Report SG pressures.</p>
	CBOR	<p>Report RCS Tc 540 to 555°F.</p>

Time	Position	Applicant's Actions or Behavior
	CBOR	<p><b>Check CNTMT parameters:</b>            Temperature less than 140° F.            Pressure less than 16 psia.            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.</p>
	CRS	<p>Notify SS to perform the following:            SE report to control room.            Announce reactor trip on plant page.            Refer to Tech Specs and EALs.            Chemist sample SGs for activity.  <b>Tech Specs 3.0.3, 3.6.3.1 and in Alert Emergency Class</b></p>
	CRS	<p>Direct CBOs to acknowledge all control room annunciators and announce all significant alarms.  <u><b>Diagnose Loss of Coolant Accident EOP 2202.003.</b></u></p>
	CRS	<p>Implement Loss of Coolant, open place keeping page, and direct board operators actions.</p>
	All	<p>Perform crew brief and review floating steps.</p>



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 <b>(Floating Step)</b>
	CBOR	Check RCS pressure greater than 1400 psia. <b>(Floating Step)</b> <ul style="list-style-type: none"> <li>•Secure one RCP in loop 2.</li> <li>•Secure ALL RCPs if MTS &lt;30°F.</li> </ul>
	CBOT	Restore ESF/Non-ESF systems: <b>(Floating step)</b> <ul style="list-style-type: none"> <li>•Verify at least one SW pump running in each loop.</li> <li>•Verify DG SW outlet valves open.</li> <li>•Verify SW suction aligned to Lake.</li> <li>•Check 4160v Non-vital buses energized from offsite power.</li> <li>•Start SW pumps as needed to maintain header pressure.</li> <li>•Restore SW to CCW and ACW per Exhibit 5.</li> <li>•Maintain SW header greater than 85 psig.</li> </ul>

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

	CBOT	<p>Verify SIAS flow to RCS:</p> <p>Report A HPSI pump failure to auto start and manually start.</p> <p>Report B HPSI breaker trip.</p>
	CRS	<p>Contact NLOs to align C HPSI pump to green bus.</p> <p>(This is a possible contingency but not required)</p>
	CBOT	<p>Start C HPSI when aligned to green bus.</p> <p>Verify ALL CNTMT Cooling Fans running in Emergency Mode.</p> <p>(This is a possible contingency but not required)</p>
	CBOT	<p>Verify SG levels greater than 23%. <b>(Floating Step)</b></p>
		<p>Align Feedwater:</p> <ul style="list-style-type: none"> <li>•Check EFW pump 2P7B running.</li> <li>•Secure EFW pump 2P7A.</li> <li>•Verify AFW pump 2P75 secured.</li> <li>•Secure running MFW pump and close ALL FW blocks.</li> </ul>
		<p>Check <b><u>LOCA not isolated per Attachment 17.</u></b></p>

Op-Test No.: 1    Scenario No.: 2    Event No.: 5, 6 & 7    Page 12 of 14  
 Event Description: Third RCP seal fails, manual reactor trip, vapor seal failure, and HPSI failures.

Time	Position	Applicant's Actions or Behavior
	CBOR	Check LOCA limited to CNTMT.
	CBOR	Check CNTMT Isolation parameters. <b>(Floating Step)</b> 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. <b>(Floating Step)</b> <ul style="list-style-type: none"> <li>• Verify CSAS actuated on PPS inserts.</li> <li>• Stop ALL RCPs, place spray valves in manual closed.</li> <li>• Verify spray pumps running with greater than 2300 gpm each.</li> </ul>
	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: <ul style="list-style-type: none"> <li>• CNTMT Bldg. Recirc fans (2VSF-31A-D)</li> <li>• Reactor Cavity fans (2VSF-34A&amp;B)</li> </ul> Three CEDM Shroud Cooling fans (2VSF-35s)

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. <b>(Floating Step)</b>
	CBOR	Check IA pressure greater than 65 psig. <b>(Floating Step)</b>
	CRS	Check <b><u>LOCA not isolated and proceed to Section 3</u></b>
	CBOR	Perform controlled cooldown to 275°F. <b>(Float Step)</b> <ul style="list-style-type: none"> <li>•Reset low PZR pressure and low SG pressure setpoints.</li> <li>•Record and plot cooldown on Attachments 1 and 8.</li> </ul> Initiate cooldown using SDBCS bypass valves.
	CBOT	Check Condensate pump in service.
	CBOT	Maintain SG levels 45 to 90%. Check CST level greater than 80%
	CBOR	Restore PZR level. <b>(Floating Step)</b> Maintain 29% to 80%
	CBOR	Verify Natural Circulation if RCPs secured: <ul style="list-style-type: none"> <li>•Loop <math>\Delta T</math> less than 50° F.</li> <li>•Thot and Tcold constant or lowering.</li> <li>•RCS MTS 30° F or greater.</li> <li>•<math>\Delta T</math> between Thot and average CETs less than 10° F.</li> </ul>

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 void free: <ul style="list-style-type: none"> <li>•PZR level stable using aux spray.</li> <li>•RVLMS LVL 01 indicates WET.</li> <li>•Upper head thermocouples indicate subcooled.</li> </ul>
	CBOR	Maintain RCS P-T limits and RCP NPSH per Attachment 1. Check uncontrolled RCS cooldown below 500° F Tcold has not occurred.
	CBOT CBOR	Override HPSI when termination criteria met: <b>(Floating Step)</b> <ul style="list-style-type: none"> <li>•RCS MTS 30° F or greater.</li> <li>•PZR level greater than 29% and controlled.</li> <li>•RVLMS LVL 03 or higher indicates WET.</li> <li>•At least one SG available – Level 10 to 90% with FW available OR level being restored with FW flow greater than 485 gpm.</li> </ul> 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 examiners discretion.

Facility: ANO-2		Scenario No.: 3 (SPARE)		Op-Test No.: 2000-1	
Page 1 of 13					
Examiners:				Operators:	
<p>Objectives:</p> <p>Evaluate usage of AOPs for condensate pump winding temperature high, letdown failure, vacuum pump trip, and pressurizer pressure transmitter failure. Evaluate AOP usage for loss of condenser vacuum and EOP usage for overcooling event and loss of emergency feedwater.</p>					
<p>Initial Conditions:</p> <p>100%, MOL, All ESF systems in standby except 2P7B.</p>					
<p>Turnover:</p> <p>Continue 100% operations. Emergency feedwater pump 2P7B tagged for electricians to replace overcurrent relay. TS action started 0400 this morning.</p>					
Event No.	Malf. No.	Event Type*	Event Description		
1 T = 0	CON2P2AWND	I (CBOT)	Condensate pump 2P2A winding temperature high.		
2 T = 5	2CV-4816	C (CBOR)	Letdown flow control valve 2CV-4816 fails closed.		
3 T = 15	XRCCHAPCNT	I (CBOR)	Pressurizer pressure control channel fails low.		
4 T = 20	CND2C5 (New Malf)	C (CBOT)	Vacuum pump trips and standby fails to auto start.		
5 T = 25	CNDVACUUM	R (CBOR) N (ALL)	Slow loss of vacuum, resulting in power reduction and reactor trip when vacuum reaches 5.0 inches.		
6	MS2P7ABEF	M (ALL)	Steam leak upstream 2P7A when pump starts.		

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

**Simulator Instructions for Scenario 3**

Place 2P7B HS in PTL and override green and white lights. Enter TS 3.7.1.2 on status board. Ensure letdown flow control 2HS-4817 selected to 2CV-4816.

Event No.	Malf. No.	Value/ Ramp Time	Event Description
1	CON2P2AWIND Trigger = T1	True	Condensate pump 2P2A winding temperature high. Alarm comes off chart recorder ~ 4 minute delay.
2	2CV-4816 Trigger = T3	0 30 sec ramp	Letdown flow control valve 2CV-4816 fails closed.
3	XRCCHAPCNT Trigger = T4	0	Pressurizer pressure control channel A fails low.
4	CNDVACPPA Trigger = T5 CND2C5 Trigger = T5	True  True	Vacuum pump 2C5A trips and 2C5B fails to auto start.
5	CNDVACUUM Trigger = T6	2 2 min TD  15min ramp	Slow loss of vacuum, resulting in power reduction and reactor trip when vacuum reaches 5.0 inches.
6	MS2P7ABEF Trigger = Cond	0.4 2 min TD	Steam leak upstream 2P7A when pump starts.

Conditional trigger = 2P7A start

Op-Test No.: 1    Scenario No.: 3    Event No.: 1    Page 3 of 13		
Event Description: Condensate pump 2P2A winding temperature high.		
Time	Position	Applicant's Actions or Behavior
	CBOT	Announce annunciator 2K03-F6 Condensate pump BRG/WDG Temperature high.
	CRS	Implement Annunciator 2K03 Corrective Action AOP 2203.012C and direct board operators' actions.
	CBOT	Check temperature recorder 2TRS-0610 point #1 and determine 2P2A winding temperature high.
	CRS	Contact AO: <ul style="list-style-type: none"> <li>• Verify condensate pump area coolers 2VUC-14A and 14B running</li> <li>• Verify CCW aligned to 2P2A.</li> </ul> Refer to OP 2106.016 for starting standby condensate pump.
	CBOT	Contact AO for prestart checks. Place condensate pump recircs 2FIC-0662 and 0663 in MANUAL Monitor SG levels and FWCS response. Start standby condensate pump. Check discharge pressure. Stop condensate pump 2P2A. Check discharge pressure on running pumps. Place condensate pump recircs in AUTO.
Termination criteria: Standby condensate pump started and 2P2A secured or at examiners discretion.		



Event Description: Letdown flow control valve 2CV-4816 fails closed.

Time	Position	Applicant's Actions or Behavior
	CBOR	Announce annunciator 2K12-E1 LD HX DISCH PRESS HI/LO. Report 2CV-4816 closed.
	CRS	Implement Annunciator corrective action 2203.012L and direct board operator actions. Contact WCO to investigate 2CV-4816. Refer to OP 2104.002 Chemical and Volume Control for placing 2CV-4817 in service.
	CBOR	Adjust backpressure 2PIC-4812 to maintain at least 100 psig saturation pressure above letdown temperature 2TI-4820. Place Letdown Flow Controller 2HIC-4817 in MANUAL with output of zero. Place 2HS-4817 to the 2CV-4817 position. Slowly raise letdown flow using 2HIC-4817. Verify Letdown Pressure Controller 2PIC-4812 controlling at setpoint of ~ 460 psig. Place 2HIC-4817 in AUTO when manual and auto signals match.
<b>WCO report air leak on 2CV-4816 and has it isolated.</b>		
<b>NOTE:</b> <b>If trouble shooting/restoring letdown is delayed, then charging should be secured prior to exceeding 67% PZR level to prevent entering T.S. 3.4.4. (See night order 10-8-99)</b>		
Termination criteria: Letdown restored or at examiners discretion.		

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 <b>TS 3.2.8</b> 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.

Event Description: 2C5A Vacuum pump trip with failure of 2C5B to auto start.

Time	Position	Applicant's Actions or Behavior
	CBOT	Announce annunciator 2K03-D3 Vacuum Pump 2C5A Trip. Report Vacuum pump 2C5B not running.
	CRS	Refer to Annunciator Corrective Action AOP 2203.012C and direct board operator actions.
	CBOT	Start Condenser Vacuum Pump 2C5B. Monitor condenser vacuum trend.
	CRS	Contact Auxiliary Operator to investigate cause of 2C5A trip.

Termination Criteria: Vacuum Pump 2C5B started or at examiners discretion.

Event Description: Loss of condenser vacuum requiring a power reduction and degrading to the point a manual reactor trip is required.

Time	Position	Applicant's Actions or Behavior
	CBOT	Report degrading condenser vacuum. Announce annunciators: 2E11A/B PRESSURE HI 2K03-A3/A4 2E11A/B TURB HOOD PRESS HI 2K03-B3/B4
	CRS	Refer to Loss of Condenser Vacuum AOP 2203.019 and direct board operators' actions.
	CBOT	Report vacuum pump 2C5B running. Verify condenser vacuum breakers closed. Verify seal header > 1.5 psig. Verify both Circ Pumps 2P3A/B running. Reduce turbine load to maintain < 5.0 inches Hg Abs.
	CBOR	Reduce reactor power to maintain Tave within 2°F of Tref. Maintain RCS pressure 2025 to 2275 psia. Maintain Tc 542 to 554.7°F Maintain ASI -0.27 to +0.27. Maintain Group 6 CEAs above 112.5 inches and Group P above 135 inches. Maintain PZR level within 5% of setpoint.

Event Description: Loss of condenser vacuum requiring a power reduction and degrading to the point a manual reactor trip is required.

Time	Position	Applicant's Actions or Behavior
	CRS	Contact Auxiliary Operator: Check vacuum pump seal water pump. Check seal water cooler outlet less than 120°F. Check separator tank level. Check flow on steam inlet expansion joints sightglasses.
<p><b>Auxiliary Operator reports seal water strainer plugged and unable to swap strainers.</b></p> <p><b>When examiners satisfied with reactivity manipulations for reactor power reduction, then increase value of vacuum leak malfunction.</b></p> <p style="text-align: center;"><b>NOTE:</b></p> <p><b>Operators required to trip reactor if unable to maintain vacuum &lt;5.0 inches Hg Abs and main turbine will trip at 7.8 inches Hg Abs.</b></p>		
	CRS	Order manual reactor trip and perform Standard Post Trip Actions.
	CBOR	Manually trip reactor.

Event Description: Steam leak on supply to Emergency Feedwater pump 2P7A.

Time	Position	Applicant's Actions or Behavior
	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	<p><b>Check reactivity control:</b></p> <p>Reactor power decreasing.</p> <p>All CEAs inserted.</p>
	CBOT	<p><b>Check maintenance of vital auxiliaries:</b></p> <p>Main turbine tripped.</p> <p>Generator output and exciter breakers open.</p> <p>Both 4160v and 6900 v non-vital buses energized.</p> <p>Both 4160v and 480v vital AC bus energized.</p> <p>Both DGs secured.</p> <p>Both 125v vital DC bus energized.</p>
	CBOR	<p><b>Check inventory control:</b></p> <p>PZR level 16 to 80%.</p> <p>Trend from setpoint.</p> <p>Secure all PZR heaters when less than 29%.</p>

Event Description: Steam leak on supply to Emergency Feedwater pump 2P7A.

Time	Position	Applicant's Actions or Behavior
	CBOR	<p><b>Check RCS pressure control:</b></p> <p>RCS pressure 1800 to 2300 psia.</p> <p>Trend from setpoint</p> <p>Trip one RCP in each loop when pressure less than 1400 psia.</p> <p>Place spray valve for secured RCP in manual closed.</p> <p>Verify SIAS when pressure less than 1717.4 psia.</p>
	CBOR	<p><b>Check core heat removal by forced circulation:</b></p> <p>RCP status</p> <p>Loop <math>\Delta T</math> less than 10° F.</p> <p>RCS MTS 30° F or greater.</p> <p>Component cooling water aligned to RCPs.</p> <p>Service water aligned to CCW.</p>
	CBOT	<p><b>Check RCS Heat Removal:</b></p> <p>Report SG levels.</p> <p>2P7A feeding both SGs.</p> <p>MFW tripped on vacuum.</p> <p>Report feedwater line intact.</p> <p>Report SG pressures slowly lowering.</p>
	CBOR	Report RCS Tc 540 to 555°F and slowly lowering.

Event Description: Steam leak on supply to Emergency Feedwater pump 2P7A.

Time	Position	Applicant's Actions or Behavior
	CBOR	<p><b>Check CNTMT parameters:</b></p> <p>Temperature less than 140° F.</p> <p>Pressure less than 16 psia.</p> <p>Status of radiation alarms:</p> <ul style="list-style-type: none"> <li>CAMS (2K10-B6)</li> <li>Area radiation (2K11-B10)</li> <li>Process liquid (2K11-C10)</li> </ul> <p>Report trends on radiation monitors stable.</p> <p>Status of SEC SYS RADIATION HI (2K11-A10)</p> <p>Report trends on secondary system radiation monitors stable.</p>
	CRS	<p>Notify SS to perform the following:</p> <p>SE report to control room.</p> <p>Announce reactor trip on plant page.</p> <p>Refer to Tech Specs and EALs. <b>(3.0.3 and NUE)</b></p>
	CRS	<p>Direct CBOs to acknowledge all control room annunciators and announce all significant alarms.</p> <p>Diagnose Overcooling Event.</p> <p>Conduct crew brief.</p>
	CRS	<p>Implement Overcooling Event AOP 2203.011.</p> <p>Direct board operators in performing the following actions.</p>



Event Description: Steam leak on supply to Emergency Feedwater pump 2P7A.

Time	Position	Applicant's Actions or Behavior
	CBOT	<p>Report SG pressure greater than MSIS setpoint.</p> <p>Report ALL SDBCS valves closed.</p> <p>Verify SDBCS upstream ADV isolation valves closed (2CV-1002 and 2CV-1052).</p> <p>Close SG blowdown isolation valves(2CV-1016-1 and 2CV-1066-1)</p> <p>Report MSR steam supply valves (2CV-0400 and 2CV-0460) closed.</p>
	CBOT	<p>Check RCS overcooling event not due to excessive SG feed rate.</p> <p>Report only 2P7A feeding SG.</p>
	CRS	<p>Checks overcooling event not stopped.</p>
	CBOT	<p>Close steam supply valves to 2P7A (2CV-1000-1 and 2CV-1050-2)</p> <p>Inform SS to refer to <b>TS 3.0.3</b>.</p> <p>May close MSIVs if not recognize overcooling stopped.</p>

Event Description: Steam leak on supply to Emergency Feedwater pump 2P7A.

CBOR

Report Tave and SG pressures recovering.

**NOTE:**

**Stopping overcooling event results in no feedwater available to SG. Crew may rediagnose event and enter Loss of Feedwater or Functional Recovery EOP, but the next step in AOP requires checking SG levels greater than 23%. Contingency step is to verify greater than 485 gpm FW flow and they will start AFW pump 2P75 to feed SGs.**

CBOT

Control SG pressure using upstream ADVs if MSIVs closed or down stream ADVs.

CBOT

Start AFW pump 2P75 and feed SGs.

Event Termination: Steam leak isolated and feed restored to SG or at examiners discretion.