

| Facility: ANO-2 | | Scenario No.: 3 (SPARE) | | Op-Test No.: 2000-1 | |
|--|----------------------|-------------------------|--|---------------------|--|
| Page 1 of 13 | | | | | |
| Examiners: | | | | Operators: | |
| | | | | | |
| | | | | | |
| Objectives: 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. | | | | | |
| Initial Conditions: 100%, MOL, All ESF systems in standby except 2P7B. | | | | | |
| Turnover: Continue 100% operations. Emergency feedwater pump 2P7B tagged for electricians to replace overcurrent relay. TS action started 0400 this morning. | | | | | |
| 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"> • Verify condensate pump area coolers 2VUC-14A and 14B running • Verify CCW aligned to 2P2A. 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. |

WCO report air leak on 2CV-4816 and has it isolated.

NOTE:

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)

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 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.

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>Auxiliary Operator reports seal water strainer plugged and unable to swap strainers.</p> <p>When examiners satisfied with reactivity manipulations for reactor power reduction, then increase value of vacuum leak malfunction.</p> <p style="text-align: center;">NOTE:</p> <p>Operators required to trip reactor if unable to maintain vacuum <5.0 inches Hg Abs and main turbine will trip at 7.8 inches Hg Abs.</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>Check reactivity control:</p> <p>Reactor power decreasing.</p> <p>All CEAs inserted.</p> |
| | CBOT | <p>Check maintenance of vital auxiliaries:</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>Check inventory control:</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>Check RCS pressure control:</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>Check core heat removal by forced circulation:</p> <p>RCP status</p> <p>Loop ΔT 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>Check RCS Heat Removal:</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>Check CNTMT parameters:</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"> CAMS (2K10-B6) Area radiation (2K11-B10) Process liquid (2K11-C10) <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. (3.0.3 and NUE)</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 TS 3.0.3.</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.