Draft Submittal
(Pink **Paper)**

1. Operating Test Simulator Scenarios

# OCONEE JUNE 2004 EXAM
# 50-26912004-301,
# 50-270/2004-301, &
# 50-28712004-301
# JUNE 14 - 18 & 25,2004

Facility: **Oconee** Scenario No.: **1 R0** Op-Test No.: **1**

Examiners: _____ Operators: _____

Initial Conditions:
- 45% Reactor Power (Snap 201)

Turnover:
- Startup in progress after adding oil to 1B1 RCP
- 1A Main FDW pump operating
- **SASS** in MANUAL for I&E troubleshooting
- 1B MDEFDW Pump OOS
- After turnover, the crew should start 1B1 RCP

| Event No. | Malf. No. | Event Type* | Event Description |
|---|---|---|---|
| 0a | Pre-Insert | | SASS in manual |
| 0b | Pre-Insert MSS270 | | 1B M E FDW Pu OOS |
| 0c | Pre-Insert MPI290 | | Block All Turbine Trips Except Manual |
| 0d | Re-Insert MPS350 | | " A RBCU fails to receive ES signal |
| 1 | | N, BOP, **SRO** | Start 1B1 RCP |
| 2 | Override 2342481 | C, BOP, SRO | AC Oil Lift pump will not develop adequate discharge pressure |
| 3 | MPS120 Override | C, BOP, SRO | 1A HPI pump sheared shaft, (TS) Standby HPI Pump fails to start |
| 4 | MPI050 MPI080 | I, OATC, SRO | RC Loop B Flow fails LOW |
| 5 | Override | C, ALL | BWST rupture (TS) |
| 6 | MPS110 | R, OATC, SRO | Manual unit shutdown due to BWST level |
| 7 | MSS010 MSS020 | C, OATC, SRO | 1A Main FDW pump trips Main Turbine Fails to trip (Lockout EHC Pumps) |
| 8 | MPS400 | M, ALL | RCS leak to SBLOCA (ramp over 10 ) |
| 9 | Quickstrike | | " I C HPI pump trips requiring rapid RCS C/D due to degraded HPI |
| | | | |

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

| Op-Test No.: _____ | Scenario No.: **1** | Event No.: 1 | Page 1 of 1 |
|---|---|---|---|
| Event Description: | **Start 1B1 RCP: (N, BOP)** | | |

| Time | Position | Applicant's Actions or Behavior |
|---|---|---|
| | BOP | **Crew response:**<br>The BOP should use the in progress procedure OP/1/A/1103/006 (RCP Operation) Enclosure 4.1 (RCP Start) to start the 1B1 RCP.<br>• Open 1LPSW-9&10 (1B1 RC PUMP MTR CLR IN & OUT) and verify both valves open by using the OAC indications.<br>• Review Limit and Precautions<br><br>Note:<br>• No more than two RCP(s) may be operated when RCS is < 250 °F.<br>• Either AC or DC Oil Lift Pump may be used<br>• AC Oil Lift Pump may take > 2 minutes to develop adequate discharge pressure<br>• AC and DC Oil Lift Pumps will automatically trip after 3 minutes<br>• Oil Lift Pump may **NOT** start unless switch has been placed to "OFF" after last start<br><br>• Announce "Starting 1B1 RCP" via plant page.<br>• Start AC Oil Lift Pump on 1B1 RCP. |
| | | **When the 1B1 RCP AC Oii Lift Pump has been started this event *is* completed.** |

| Op-Test No.:_____ | Scenario No.: 1 | Event No.: 2 | Page 1 of 1 |
|---|---|---|---|
| Event Description: | 1B1 RCP AC Oil Lift pump will not develop adequate discharge pressure: (C, BOP) | | |

| Time | Position | Applicant's Actions or Behavior |
|---|---|---|
| | BOP | Note: The AC Oil Lift Pump will not develop adequate discharge press to clear the Low Press indication prior to tripping off. The operator will have to determine that the AC Oil Lift Pumped tripped and start the DC Oil Lift Pump.<br>• Monitor the status of AC Oil Lift Pump low discharge pressure on the OAC and when it clears, start 1B1 RCP. (will not clear)<br>• IF AC Oil Lift Pump automatically trips after 3 minutes, start DC Oil Lift Pump.<br>• Monitor the status of DC Oil Lift Pump low discharge pressure on the OAC and when it clears, start 1B1 RCP.<br>• After RCP is at full speed, ensure Oil Lift Pump stopped.<br>• Position any Oil Lift Pump switch(s) that were operated to "OFF".<br>• Use the OAC to monitor RCP parameters for proper operation. |
| | | This event is complete when the 1B1 RCP is started or when directed by the lead examiner. |

| Op-Test No.: _____ | Scenario No.: 1 | Event No.: 3 | Page 1 of 2 |
|---|---|---|---|
| Event Description: | " A HPI Pump sheared shaft and the standby HPI pump fails to auto start: (C, BOP) (TS) | | |

| Time | Position | Applicant's Actions or Behavior |
|---|---|---|
| | | Plant response:<br>Statalarms:<br>• 1SA-2/B-2 (HP RCP Seal Injection Flow High/Low)<br>• 1SA-2/C-2 (HP Injection Pump Disch. Header Pressure High/Low)<br>Board indications:<br>• RC Makeup Flow = 0 gpm<br>• 1A HPI Pump = 0 amps<br>• PZR level will begin to decrease and LDST level will begin to increase. |
| | BOP | Crew response:<br>4. Refer to ARG for above Statalarms |
| | SRO | 2. SRO should refer to AP/014 (Loss of Normal Makeup and/or RCP Seal Injection) |
| | BOP | • Verify no HPI pump operating<br>• Close 1HP-5 (Letdown Isolation)<br>• Place 1HP-120 (RC Volume Control) in HAND and closed<br>▪ Place 1HP-31 (RCP Seal Flow Control) in HAND and closed<br>▪ Start standby HPI pump (1B HPI pump)<br>▪ Slowly open 1HP-31 in small increments until ≈ 8 gpm/RCP is achieved.<br>• Re-establish normal makeup through 1HP-120.<br>▪ Reduce 1HP-7 demand to 0%.<br>▪ Close 1HP-6<br>• Ensure the following open:<br>➢ 1HP-1<br>➢ 1HP-2<br>➢ IHP-3<br>➢ 1HP-4 |

| Op-Test No.: _____ | Scenario No.: **1** | Event No.: 3 | Page 2 of 2 |
|---|---|---|---|
| Event Description: | **"A" HPI Pump sheared shaft and the standby HPI pump fails to i to start: (C, BOP)** | | |

| Time | Position | Applicant's Actions or Behavior |
|---|---|---|
| | SRO | • Open 1HP-5<br>• Throttle open 1HP-7 for ≈ 20 gprn letdown flow.<br>• Open 1HP-6<br>• Adjust 1HP-7 for desired letdown flow<br>• Place 1HP-31 in auto.<br>3. Refer to Tech Spec 3.5.2 High Pressure Injection<br>• Condition " A<br>• Required Action: Restore HPI pump to OPERABLE status<br>• Completion Time: 72 hours<br><br>**Note: Due to sequence *of* events, SRO may not review the TS during the scenario. Follow-up questions may be required to ensure knowledge of this competency.** |
| | | **Event is complete when normal makeup and letdown is established or when directed by the lead examiner.** |

| Op-Test No.: _____ | Scenario No.: 1 | Event No.: 4 | Page 1 of 1 |
|---|---|---|---|
| Event Description: | **RC Loop B Flow fails LOW (I, OATC)** | | |

| Time | Position | Applicant's Actions or Behavior |
|---|---|---|
| | | **Plant response:**<br>1. Statalarms:<br>• 1SA-2/A-4, RC Loop B Flow Low<br>• 1SA-2/A-5, RC Total Flow Low<br>• 1SA-1/A-1, RP Channel A Trip<br>• 1SA-1/A-3, RP Channel A Flux/Imb/Flow Trip<br>2. Control beard indications:<br>• RCS Flow meter shows Loop B flow at zero.<br>• RPS Channel A trips.<br>• B S/G FDW Flow instrument shows a reduction in FDW, and the A S/G FDW Flow indicates increasing flow or off-scale High.<br>• DELTA Tc meter indicates a large Delta Temp |
| | OATC<br><br>SRO | **Crew response:**<br>• The crew should stabilize the unit by using the "Plant Transient Response" process.<br>• Take the Diamond and BOTH FDW Masters to MANUAL and stabilize the unit.<br>• The SRO should refer to AP/28, ICS Instrument Failures and notify SPOC to have the instrument repaired.<br>• AP/28, ICS Instrument Failures (Case 4E RCS Flow Failure) will:<br>➢ Ensure DIAMOND and BOTH FDW Masters in MANUAL.<br>➢ Notify SPOC lo select a valid WCS flow input to ICS and investigate and repair the failed RCS flow instrumentation.<br>➢ Ensure any associated requirements of PT/1/A/0600/001 (Periodic Instrument Surveillance) *are* met for the failed instniment.<br>➢ **WHEN** notified by SPOC that *a* valid RCS flow input has been restored to ICS, **THEN GO TO** Encl 5.1 (Placing ICS in AUTO).<br>**Note: Crew may refer to PT/600/001 (Periodic Instrument Surveillance) and TS 3.3.1 (RPS Instrumentation) due to "A" RPS Channel trip and may choose to place "A" RPS to manual Bypass.** |
| | | **Event is complete when the SRO has reached the WHEN step in AP/28 or when directed by the Lead Examiner.** |

| Op-Test No.: _____ | Scenario No.: **1** | Event No.: 5 | Page 1 of 1 |
|---|---|---|---|
| Event Description: | Borated Water Storage Tank (BWST) **rupture: (C,** ALL) **(TS)** | | |

| Time | Position | Applicant's Actions or Behavior |
|---|---|---|
| | **BOP**<br><br>SRO | Plant response:<br>Statalarms:<br>• 1SA-3/D-8, BWST level High/Low<br><br>Control board indications:<br>• BWST level decreases to = 40 feet.<br><br>Simulator operator cue: After the BWST low level **alarm** actuates and **NEO** will call the Control **Room** via the Emergency line and communicate to the control room that the "Hi-Dye" crane has struck the Unit 1 BWST with its mast and has penetrated the tank. Water is pouring out of the break.<br><br>Crew response:<br>1. Refer to **ARG** for 1SA-3/D-8, BWST level High/Low<br><br>2. Refer to TS 3.5.4 (BWST)<br>• Determine TS 3.5.4 Condition "B" met. Restore BWST to Operable Status in 1 hour.<br>• If this time cannot be met TS 3.5.4 Conditions "C" will apply. Be is Mode 3 in 12 hours.<br>3. Determine a unit shut down is required.<br>4. Initiate a unit shutdown in accordance with OP/1/A/1102/004 (Operation At Power).<br><br>Note: The unit shutdown will be performed in manual due to the previous failure of **RCS** flow. |
| | | Event is complete when a unit shutdown is directed by the SRO **or** when directed by the Lead Examiner. |

| Op-Test No.:_____ | Scenario No.: 1 | Event No.: 6 | Page 1 of 1 |
|---|---|---|---|
| Event Description: | **Manual unit shutdown due to BWST level: (R, OATC)** | | |

| Time | Position | Applicant's Actions or Behavior |
|---|---|---|
| | SRO<br><br>OATC | **Crew response:**<br>Direct unit shutdown per OP/1/A/1102/004 (Operation At Power) Encl. 3.2, Power Reduction<br>1. Review Limits and Precautions<br>2. Notify OSM to contact NRC if required.<br>3. Refer to OP/1106/001 (Turbine Generator) to ensure operating limits are NOT exceeded during shutdown.<br>4. Notify System Operations Center (SOC) or lead reduction.<br>5. Reduce reactor power in manual by inserting control rods with the Diamond. controlling FDW flow with the FDW Masters, and controlling turbine header pressure with the Turbine Master. |
| | | **Event is complete when reactor power has been reduced 5% OF when directed by the Lead Examiner.** |

| Op-Test No.: _____ | Scenario No.: 1 | Event No.: 7 | Page 1 of 1 |
|---|---|---|---|
| Event Description: | 1A Main FDW pump trip:<br>Main Turbine Fails to trip (Lockout EHC Pumps) (C, OATC) | | |

| Time | Position | Applicant's Actions or Behavior |
|---|---|---|
| | | Plant response:<br>• 1A Main FDW pump trips resulting in a reactor trip.<br>• The Main Turbine should trip but does not. This will result in a reduction of steam pressure in both SGs until actions are taken to trip the turbine. The will result in RCS overcooling until the turbine is tripped.<br><br>Crew response: |
| | SRO | 1. SRO will enter the EOP. |
| | OATC | 2. OATC will perform Immediate Manual Actions<br>• Depress REACTOR TRIP pushbutton<br>• Verify reactor power < 5% FP and decreasing<br>• Depress turbine TRIP pushbutton.<br>• Verify all turbine stop valves closed<br>Note: The OATC should diagnose that the turbine did not trip and then perform the RNO step which will stop and lock out both EHC pumps. This will cause the turbine to trip. (CT-18)<br>• Verify RCP seal injection available. |
| | BOP | 3 BOP will perform a symptom check and Rule 3 (Loss of Main or Emergency Feedwater). |
| | | Event is complete when EHC pumps have been tripped or when directed by the lead examiner. |

Event Description: **RCS leak to Small Break LOCA (ramp over 10 minutes): (M,** ALL)

| Time | Position | Applicant's Actions or Behavior |
|---|---|---|
| | | **Plant response:**<br>1. Statalarms:<br>• 1SA-9/A-6, RB Reactor Bldg Norm Sump Level High/Low<br>• 1SA-8/B-9, Process Radiation Monitor High<br>2. Control board indications:<br>• RBNS level increases<br>• PZR level will decrease very slowly due *to* the leak and 1HP-5 being closed. |
| | | **Crew response:** |
| | BOP | 1. Refer to ARG for 1SA-9/A-6, RB Reactor Bldg Norm Sump Level High/Low |
| | SRO | 2. Refer to AP/002, Excessive RCS Leakage<br>3. Close 1HP-5 (Letdown Isolation)<br>4. Initiate Encl. 5.1 (Leak Rate Determination)<br>5. IAAT LDST level is ≤ 40, ensure open 1HP-24 and 1HP-25 (1A/1B BWST Suction)<br>6. Ensure OSM, SPA, RP are notified<br>7. Monitor trend of "T6 AP02" for increases (OAC)<br>8. Verify NO leakage through PORV and dose 1RC-4<br>9. Identify leak is in the RB and GO TO Step 4.20<br>10. Place standby CC pump switch to OFF.<br>11. Close 1CC-1/1HP-1 and 1CC-2/1HP-2<br>12. Verify leakage has stopped **(has not)**<br>13. Verify re-establishing LD is desired **(it is not due size of leak)**<br>14. Ensure **RB** isolation valves are closed.<br>15. Use Enci. 5.5 (PZR and LDST Level Control) to try and maintain PZR inventory and LDST inventory.<br>• Start standby HPI pump<br>• Throttle 1HP-26 open<br>• Start 1C HPI pump<br>**Note: The RCS will eventuaily saturate with ail HPI injecting.** |

Event Description: **RCS leak to Small Break LOCA (ramp over 10 minutes): (M, ALL)**

| Time | Position | Applicant's Actions or Behavior |
|---|---|---|
| | SRO<br><br>BOP | **Plant response:**<br>• RCS subcooling margin will = 0°F.<br><br>**Crew response:**<br>1. SRO should direct the OATC to perform a symptoms check.<br>2. The **BOP** should inform the SRO that the RCS has saturated and obtain SRO concurrence to perform Rule **#2,** boss of **SCM.**<br>▪ Verify that reactor power is < 1%.<br>• Trip RCPs within 2 min of LOSCM **(CT-1)**<br>• Verify that HPI is performing as required.<br>• Verify that LPI flow in any header is < 1000 ggm.<br>e Verify that TBVs are available.<br>▪ Disable AFIS in non-actuated channels.<br>▪ Establish EFDW to the OTSGs to feed to LOSCM SP per Rule 7 (SG Feed Control). **(CT-10)**<br>▪ Verify both MDEFDWPs operating. (**1B MDEFDWP is off)**<br>▪ Ensure TDEFDWP is in PULL TO LOGK. **(Not performed due 1B MDEFDWP not operating)**<br>e Trip both MFDWPs and close the FDW block valves.<br>▪ Notify SRO of ***SG*** feed status.<br>▪ Maintain SG pressure < RCS pressure.<br>▪ Ensure Rules 3 & 8 done or in progress |

Event Description: **RCS leak *to* Small Break LOCA (ramp over 10 minutes): (M, ALL)**

| Time | Position | Applicant's Actions or Behavior |
|---|---|---|
| | OATC | 3. When **ES** Channels 1 and 2 actuate, an operator should inform the SRO that **ES** Channels 1 and 2 have actuated. The SRQ should initiate EOP Encl. 5.1, ES Actuation per the parallel actions page of Subsequent Actions section or of the LOSCM Tab. When running Encl. 5.1, the operator will:<br>• Determine which ES channels should have actuated and verify all "Blue Lights" and "White Lights" are lighted for the appropriate channels.<br>**Note: "A" RBCU will not receive an ES signal and will remain in HIGH speed. The operator should diagnose this and place the "A" RBCU in LOW speed.**<br>▪ Place HPI in Manual.<br>• Verify SCMs > 0°F and proceed to the HPI flow check when he determines that the RCS has saturated.<br>• The operator should determine HPI flow.<br>e Open 1BS-1 and 1BS-2<br>▪ Place LPI pumps in manual control.<br>▪ At SRO direction secure LPI pumps.<br>• Ensure A and B and 3A and 3B Outside Air Booster Fans are operating. **(CT-27)**<br>• Dispatch an operator to perform Encl. 5.2 (Placing RB Hydrogen Analyzers In Service)<br>▪ Notify Chemistry *to* prepare for caustic addition.<br>▪ The operator must get SRQ approval *to* exit this enclosure. |
| | | |

Event Description: **RCS leak to Small Break LOCA (ramp over 10 minutes): (M, ALL)**

| Time | Position | Applicant's Actions or Behavior |
|---|---|---|
| | SRO | 4. The SRO should **GO TO** the LOSCM Tab per the Parallel Actions page of the EOP Subsequent Actions section. LOSCM Tab will:<br>Ensure that Rule #2 is in progress or complete.<br>Verify that station ASW is not feeding any SG.<br>Verify that the LOSCM is not caused by excessive heat transfer.<br>• Verify transfer *to* LOCA CD tab not required due to no LPI flow.<br>• Verify all the following conditions exist:<br>➢ NO RCPs are operating<br>➢ HPI flow exists in both HPI headers<br>➢ Adequate Total HPI flow per figure 1 (Total Required HPI flow)<br>Open 1AS-40 while closing 1MS-47.<br>• Control steaming and feed rates on all intact SGs to maintain cooldown rate within Tech Spec limits:<br>➢ Tc ≥ 280°F ≤ 50°F/ ½ hour<br>➢ Tc < 280°F ≤ 25°F/ ½ hour<br>• **GO TO** Step 91.<br>• Close 1RC-4<br><br>**Note: When 1RC-4 is closed 1C HPI pump will trip.** |

| Qp-Test No.: _____ | Scenario No.: 1 | Event No.: 9 | Page 1 of 1 |
|---|---|---|---|
| Event Description: | **"IC" HPI pump trips requiring rapid RCS C/D due to degraded HPI** | | |

| Time | Position | Applicant's Actions or Behavior |
|---|---|---|
| | BOP<br><br>SRQ | **Plant response:**<br>• No flow in the "B" HPI header<br>**Crew response:**<br>1. **BOP** should indicate to the SRO that the I C HPI pump has tripped.<br>2. SRO should recognize that "conditions have changed" and transfer to the beginning of the LOSCM tab.<br>• Ensure that Rule #2 is in progress or complete.<br>• Verify that station ASW **is** not feeding any SG.<br>• Verify that the LOSCM is NOT caused by excessive heat transfer.<br>• Verify transfer to LQCA CD tab NOT required due to no LPI flow.<br>• Verify all the following conditions exist:<br>➢ NO RCPs are operating<br>➢ HPI flow exists in both HPI headers **(No flow in the "B" header)**<br>➢ Adequate Total HPI flow per figure 1 (Total Required HPI Flow)<br>• GO TO Step 13<br>• Start both MDEFDW pumps and the TDEFDW pump. (**1B MD EFDWP NOT available)**<br>• Establish 300 gpm to each SG<br>• Initiate full depressurization of both SGs utilizing TBVs or ADVs.<br>• Initiate feed to all available SGs to LOSCM setpoint at maximum allowable rate (per Table 3 (Emergency FDW Pump and Header Maximum Flow Limits) of Rule 7 (SG Feed Control)).<br>• **WHEN** SCM is > 0°F,<br>**OR** all the following conditions exist:<br>➢ **NO** RCPs operating<br>➢ HPI flow in both HPI headers<br>➢ Adequate total HPI flow per Figure 1 (Total Required HPI Flow)<br>**THEN** maintain SG pressure < RCS pressure utilizing one of the following:<br>➢ TBVs<br>➢ ADVs<br>**Note: Will wait at this WHEN step until IAAT (6) is met on LPI flow.** |
| | | **Event and exam is complete when SG depressurization is in progress or when directed by the Lead Examiner.** |

## CRITICAL TASKS

1. CT-18, Turbine Trip
2. CT-1, Trip All RCPs
3. CT-10, Establish FW Flow and Feed SGs
4. CT-27, Implementation of Control Room Habitability Guidance

Facility: **Oconee** Scenario No.: **2 RO** Op-Test No.: **1**

Examiners: _____ Operators: _____

Initial Conditions:
- 35% Reactor Power, startup in progress (Snap-202)

Turnover:
- AMSAC/DSS bypassed for I&E testing
- NI-9 OOS, to be replaced next outage
- **"1A" SG** AFIS Digital Channel 1 circuit OOS
- "A" Condensate Booster Pump OOS, breaker to be replaced
- Keowee Unit **2** OOS for unplanned reasons
- Keowee Unit 1 aligned to underground
- Operability test of Keowee Unit 1 is to be performed per PT/620/009 (Keowee Hydro Operation) after turnover and before startup continues, ONS to perform remote Keowee start

| Event No. | Malfunction No. | Event Type* | Event Description |
|---|---|---|---|
| 0a | Pre-Insert | | AMSAC/DSS bypassed |
| 0b | Pre-Insert MNI082 | | NI-9 OOS |
| 0c | Pre-Insert AOR | | " A AFIS circuit disabled<br>"B" AFIS circuit disabled |
| Od | Pre-Insert MEL180 | | Keowee Unit 2 Emergency Lockout |
| 0e | Pre-Insert | | ES channels 7 and 8 fail to actuate |
| 1 | | N, BOP, SRO | Operability test Keowee Unit 1 |
| 2 | Override | C, BOP, SRO | Keowee Unit 1 Gen Field Flashing Breaker fails to OPEN automatically |
| 3 | MPS090 | C, OATC, SRO | 1HP-120 (RC Volume Control) fails closed |
| 4 | MNI032 | I, OATC, SRO | Controlling NI fails LOW (TS) |
| 5 | Override | C, BOP, SRO | Seismic event (PRA)<br>1A RBCU rupture (TS) |
| 6 | MPS020 | C, ALL | 1B **SG** Tube leak, **50** gpm (TS) |
| 7 | | R, OATC | Unit Shutdown |
| 8 | MSS360,50 | M, ALL | 1A Main Steam line break in RB |

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

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

Event Description: **Operability test Keawee Unit 1 (N, BOP/SRO)**

| Time | Position | Applicant's Actions or Behavior |
|---|---|---|
| | SRO | Direct BOP to perform PT/620/009 (Keowee Hydro Operation) to operability test unit 1 Keowee underground. |
| | BOP | Use OP/1106/019 (Keowee Hydro At Oconee) to perform an "Automatic Startup" of Keowee Unit **1**<br>Initial Conditions<br>1. Verify applicable Statalarms and breaker positions<br>2. Notify Keowee operator to give Oconee control of Keowee # 1.<br>3. Review Limits and Precautions<br>Procedure<br>1. Place UNIT 1 LOCAL MASTER switch to "START AND hold until Keowee Unit starts.<br>**2.** Verify the following:<br>• GEN 1 FIELD BREAKER closes<br>• GEN 1 SUPPLY BREAKER closes<br>• GEN **1** FIELD FLASHING BREAKER closes |
| | | **Event is complete when operability test is in progress.** |

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

Event Description: **Keowee Unit 1 Gen Field Flashing** Breaker **fails to OPEN automatically (C, BOPISRO)**

| Time | Position | Applicant's Actions or Behavior |
|---|---|---|
| | BOP | 3. Ensure GEN 1 FIELD FLASHING BREAKER trips.<br>• Candidate should diagnose that the breaker did not open automatically and should open the breaker manually and initiate a work request or contact SPOC. |
| | SRO | **SRO** should direct the BOP to continue with the startup.<br>**Note: GEN FIELD FLASHING BREAKER automatically trips ≤ 45 seconds after receiving close signal. Failure of breaker *to* trip automatically does NOT make the KHU inoperable. Startup procedure may continue.** |
| | BOP | 4. Determines KHU #1 *is* operable when test complete<br>5. Verify ACB-1, Keowee 1 Generator Breaker, closed.<br>6. Verify Unit 1 EMER FDR ACB 4 closed<br>7. Verify ≈ 4.16 KV on CT4 Volts (2AB3)<br>8. Close SK1 and SK2 (CT4 STBY BUS 1/2 FEEDER)<br>9. Shutdown Keowee #1. |
| | | **Event is complete when operability test is complete or when directed by the lead examiner.** |

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

Event Description: **1HP-120 (RC Volume Control) Fails closed (C, OATC/SRO)**

| Time | Position | Applicant's Actions or Behavior |
|---|---|---|
| | OATC | 1HP-120 fails closed during Keowee #1 operability test. This will allow OATC diagnoses of failure.<br>1. Diagnose 1HP-120 (RC Volume Control) Failed closed:<br>• RCS makeup flow goes to zero.<br>• PZR level begins to decrease.<br>• LDST level begins to increase.<br>• Valve position demand for IHP-120 begins to increase to the 100% demand value and valve position indication will indicate closed (green light). |
| | SRO | 2. Refer to AP/14 (Loss of Normal Makeup and/or RCP Seal Injection.<br>• Determine Seal Injection is not lost<br>• Determine loss of suction *to* HPI pumps has not occurred.<br>• Verify any HPI pump operating.<br>• Verify RCP seal injection flow exists.<br>• Verify RCP RCP seal injection or HPI makeup line leak is **not** indicated.<br>• Verify 1HP-120 has failed and GO TO Step 4.167.<br>• Perform the following as necessary *to* maintain Pzr level > 200:<br>▪ Close 1HP-6 (Letdown Qrifice Stop)<br>▪ Throttle 1HP-7 (Letdown Control)<br>▪ Throttle 1HP-26 (1A HP Injection)<br>• 1HP-120 *to* HAND and closed<br>3. Contact SPOC *to* repair 1HP-120.<br>**Note: 1HP-120 will remain failed for the duration of the scenario.** |
| | | **When PZR level Is being controlled manually or when directed by the lead examiner this event *is* completed.** |

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

Event Description: **Controlling NI fails LOW (I, OATC/SRO) (TS)**
**When directed by the lead examiner the controlling NI will fail low.**

| Time | Position | Applicant's Actions or Behavior |
|---|---|---|
| | OATC<br><br>SRO | **Plant response:**<br>• 1SA-02/A-12, ICS Tracking, will actuate.<br>• Diamond will transfer to manual on NI flux < 1.5%.<br>• FDW will decrease due to reactor cross limit.<br>• RCS pressure and temperature will increase,<br>**Crew response:**<br>1. When the ICS TRACKING alarm is received, the candidates should utilize the "Plant Transient Response" to stabilize the plant and recognize that the controlling NI has failed. RX will trig on high pressure with no operator action.<br>2. Verify reactor power.<br>3. Place the FDW Masters in manual and stabilize the plant. Adjust $T_{ave}$ using control rods and FDW and stabilize the plant<br>4. The SRO should direct the NCOs to check OAC and the control board NI meters to determine the status of the NI signals that can be used in the ICS.<br>• Refer to AP/28, ICS Instrument Failures<br>• SPOC should be contacted to repair NI-5.<br>**Note: The ICS will remain in manual for the remainder of the scenario.** |
| | | **When the plant is stable or when directed by the lead examiner this event is completed.** |

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

Event Description: **Seismic event (PRA)**
**1A RBCU rupture (C, BOPISRO) (TS)**

| Time | Position | Applicant's Actions or Behavior |
|---|---|---|
| | BOP | **Cue: Call the Control Room (4911) to report a seismic event but no plant damage.**<br>1. 1SA-9/B-9, LPSW RBCU A Cooler Rupture will actuate and RB normal sump level will increase.<br>• The BOP should refer to ARG for 1SA-9/B-9<br>• Verify alarm is valid by checking RBCU 1A Inlet Flow and RBCU 1A delta flow.<br>• Verify LPSW-18 (RBCU 1A Outlet) open<br>• Verify adequate LPSW flow is available; check LPSW pump operation<br>• Monitor RBNS bevel for any unexplained increase (Notify Chemistry to sample RBNS for boron to determine if a cooler rupture has occurred. |
| | **SRO** | • Diagnose a Cooler Rupture is indicated and isolate the 1A RBCU Cooler.<br>• Enter appropriate TS for RBCU inoperable **(TS 3.6.5 Condition B)**.<br>• Ciose 1LPSW-16 (1A RBCU INLET)<br>• Perform TS 3.6.3 Condition C for closed containment system.<br>• Open vent or drain.<br>• Close ILPSW-18 (1A RBCU OUTLET)<br>• Refer to SLC 16.9.12 (Additional LPSW and Siphon Seal Water System Operability Requirements) |

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

Event Description: **Seismic event (PRA)**
**I A RBCU rupture (C, BOPISRO) (TS)**

| Time | Position | Applicant's Actions or Behavior |
|---|---|---|
| | SRO<br><br>SRO | The control room will receive a phone call from security that indicates that a tremor has been felt but no damage has been noted.<br>2. The SRQ may refer to AP/05, Earthquake.<br>• Dispatch operators to perform plant inspections<br>**Note: No damage will be reported.**<br>• *Notify SPOC to develop the Strong Motion Accelerometer tape.<br>• *Verify NO fuel handling activities in progress.<br>***These** items **may not be completed depending on how soon the next event is started.** |
| | | **When the Earthquake AP has been initiated, the RBCU has been Isolated, or at the direction of the Lead Examiner this event *is* completed.** |

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

Event Description: **1B SG Tube leak (50 gpm) (C, ALL) (TS)**

| Time | Position | Applicant's Actions or Behavicr |
|---|---|---|
| | | 15SG tube leak occurs following RBCU isolation and initiation of AP/5, Earthquake, or when directed by the lead evaluator. |
| | | **Plant response:** |
| | | 1. The following alarms actuate: |
| | | • 1SA-8/B-9, RM PROCESS MONITOR RADIATION HIGH |
| | | • 1SA-8/D-10, RM CSAE EXHAUST RADIATION HIGH |
| | | • 1SA-8/A-9, RM Area Monitor Radiation High |
| | | • 1SA-8/D-10, RM CSAE Exhaust Radiation High |
| | ALL | 2. PZR level will decrease and RC makeup flow will increase |
| | BOP | **Crew response:** |
| | | 1. Diagnose and take actions for a Tube leak in the 1B SG: |
| | | 2. Refer to the ARG for the following alarms: |
| | SRO | • 1SA-8/B-9, RM PROCESS MONITOR RADIATION HIGH |
| | BOP | • 1SA-8/D-10, RM CSAE EXHAUST RADIATION HIGH |
| | SRO | 3. Refer to AP/1/A/1700/31 (Primary to Secondary Leakage) |
| | | 4. Open and white Tag TB Sump pump breakers. |
| | | 5. Monitor primary parameters; PZR Level and LDST level to determine that gross leakage exist and transfer to step 4.65. |
| | BOP | |
| | SRO | 6. Determine OTSG tube leak size is greater than 25 gpm and will require entering the EOP. |
| | | 7. Log RIA readings (a rough log is adequate) |
| | | 8. Initiate a Unit shutdown to met requirements of Encl. 5.1 (Unit Shutdown Requirements). |
| | | 9. Primary inventory should be monitored and when the leak rate is determined to be > 25 gpm transfer to the SGTR tab of the EOP. |
| | | **Note: The team may determine the leak is initially greater than 25 gpm and go directly to the EOP.** |

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

Event Description: **1B SG Tube leak (50 gpm) (C, ALL) (TS)**

| Time | Position | Applicant's Actions or Behavior |
|---|---|---|
| | SRO | 10. EOP SGTR tab will perform the following:<br>• Determine that the Reactor is not tripped.<br>• Maintain PZR level ≥ 220 inches using Enclosure 5.5 (Pzr and LDST Level Control).<br>• Estimate SGTR Leakrate. **(leak is ≈ 50 gpm)** |
| | BOP | • Monitor RIA-16 ("A" MS Header) and 17 ("B" MS Header) to identify all SGs with tube ruptures. |
| | SRO | 11. Determine ICS is NOT in AUTO and direct the OATG to initiate a manual power reduction to < 15%.<br>12. initiate Encl. 5.19 (Control of Plant Equipment During Shutdown for SGTR) |
| | BOP | **Note: A shutdown with the ICS in manual is required.**<br>**Note: This event will remain in progress for the remainder of the scenario.** |

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

Event Description: **Unit Shutdown (R, OATC)**

| Time | Position | Applicant's Actions or Behavior |
|---|---|---|
| | OATC/SRO | The OATC will use the FDW Masters and the Diamond to reduce power while monitoring Reactor Power, Tave, and other plant parameters.<br>If the reactor trips automatically the team must return to IMAs |
| | BOP | The BOP will utilize Enclosure 5.19 (Control of Plant Equipment During Shutdown for SGTR).<br>**Note: With the unit at ≈ 25% power only applicable steps will be performed.**<br>Notify WCC SRO to make notifications<br>Transfer electrical auxiliaries<br>• Place ITA AUTO/MAN transfer switch in MAN<br>• Place 1TB AUTO/MAN transfer switch in MAN<br>• Close ITA SU 6.9 KV FDR<br>• Close 1TB SU 6.9 KV FDR<br>• Place MFB1 AUTO/MAN transfer switches in MAN<br>• Place MFB2 AUTO/MAN transfer switches in MAN<br>• Close E1, MFB1 STARTUP FDR<br>• Close E2, MFB2 STARTUP FDR |
| | | **When a unit shutdown of > 5% has occurred or when directed by the lead examiner this event is concluded.** |

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

Event Description: **1A Main Steam line break in RB (M,ALL)**
**1A main steam line break will occur following event 7 as directed by the lead examiner.**

| Time | Position | Applicant's Actions or Behavior |
|---|---|---|
| | ALL | **Plant response:**<br>Statalarm 1SA-02/A-9, MS Press High/Low, actuates<br>" A and "B" main steam (MS) pressure decreases<br>Reactor trips:<br>• " B MS line pressure stops decreasing<br>• " A **MS** line pressure continues to decrease<br>RCS may saturate<br>**Crew response:** |
| | SRO<br><br>O A K | 1. The OATC will perform IMAs.<br>➢ Depress REACTOR TRIP pushbutton<br>➢ Verify reactor power < 5% FP and decreasing<br>➢ Depress TURBINE TRIP pushbutton<br>➢ Verify all turbine stop valves closed<br>➢ Verify RCP seal injection available |
| | OATC | 2. The OATC will verify the performance of IMAs while the BOP performs ***a*** symptoms check.<br>3. The SRO will "Parallel Action" to transfer to the Excessive Heat Transfer (EHT) tab and direct the Crew's actions as follows:<br>**4.** If SCM = 0°F then the OATC will perform Rule #2 (Loss of SCM) after receiving concurrence from the SRO.<br>• Trip ALL RCPs within 2 minutes **(CT-1)**<br>• Ensure open 1HP-24 and 1HP-25<br>• Ensure ALL HPI pumps operating<br>• Ensure open 1HP-26 and 1HP-27<br>• Verify required HPI flow per header<br>• Verify TBVs available |

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

Event Description: **1A Main Steam line break in RB (M,ALL)**

| Time | Position | Applicant's Actions or Behavior |
|---|---|---|
| | BOP | • Feed all intact SGs<br>• Control EFDW as required to raise level to intact SGs to proper setpoint per RULE 7 (SG Feed Control)<br>• Trip both Main FDWPs<br>• Place FDW block valve switches (1FDW-33, 31, 42, 40) in CLOSE:<br>• Maintain SG pressure < RCS pressure |
| | BOP | **5.** If SCM = 0°F then the SRO with transfer to LOSCM tab which will:<br>• Ensure Rule 2 **(boss** of SCM) is in progress or complete.<br>• Verify Station ASW feeding any SG. **(it is not)**<br>• Verify LOSCM caused by excessive heat transfer **(it was)**<br>• **GO** TO EHT tab. |
| | BOP | 6. The BOP will perform Rule #5 (Main Steam Line Break) after receiving concurrence from the SRO.<br>• Stop 1A MDEFDW Pump (**CT-17**)<br>• Initiate AFIS 1A SG Digital Channels 1 and 2<br>• Ensure both Main FDW pumps tripped<br>• Steam 1B SG *to* maintain CETCs constant (**CT-11**)<br>7. Enclosure 5.1 (ES Actuation) will **be** performed.<br>• ES Channels **7** and 8 will not actuate on high RB pressure and will require manual actuation. |
| | | |

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

Event Description: **I A Main Steam line break in RB (M, ALL)**

| Time | Position | Applicant's Actions or Behavior |
|---|---|---|
| | SRO | 8. Excessive Heat Transfer (EHT) tab will:<br>• Verify excessive heat transfer stopped<br>• Throttle HPI to stabilize RCS pressure and maintain PZR level > 80" (180" acc)<br>• Verify letdown in service<br>• Feed and steam all intact SGs to stabilize RCS P/T. **(CT-11)**<br>• Minimize SCM using the following methods **as** necessary: **(CT-7)**<br>➢ De-energizing all PZR heaters<br>➢ Using PZR spray<br>➢ Throttling HPI<br>• Initiate Enclose 5.16 (SG Tube-to-Shell A T Control)<br>• ***GO* TO** Steam Generator Tube Rupture (SGTR) tab. |
| | | **When the SRO has transferred to the SGTR tab or when directed by the Lead Examiner the event and scenario** is **completed.** |

# CRITICAL TASKS

1. CT-17, Isolate Overcooling SG
2. CT-I 1, Control SG pressure to Maintain RC Temperature Constant.
3. CT-7, Minimize SCM

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

Event Description: **Place 1B MFDWPT on Handjack (N, BOP/SRO)**

| Time | Position | Applicant's Actions or Behavior |
|---|---|---|
| | SRO<br><br>BOP | ***Crew* response:**<br>The SRO will direct the OATC to perform Enclosure 4.9 (Placing 1B FDWPT on Handjack).<br>• Place 1B MAIN FDW PUMP (ICS) in "HAND" located on 1UB1.<br><br>**NOTE:**<br>• Control of 15 FDWPT with 1B FDWPT Motor Speed Changer indicated when 1B FDWPT speed and/or suction flow decreases.<br>• Two successful decreases should be achieved to ensure control.<br><br>• Run 1B FDWPT Motor Speed Changer down to control 1B FDWPT.<br>• Turn FWT 1B HANDJACK switch to "ON". |
| | | **Event *is* complete when operability test is complete or when directed by the lead examiner.** |

| Op-Test No.: _____ | Scenario No.: **3** | Event No.: **2** | Page I of 1 |
|---|---|---|---|
| Event Description: | " A **LPSW pump suction valve closes and standby pump does not auto start: (C, BOP) (TS)** | | |

| Time | Position | Applicant's Actions or Behavior |
|---|---|---|
| | BOP<br>SRO<br>BOP<br>SRO | **Plant response:**<br>Statalarms:<br>• 1SA-9/A-9, LPSW Header A/B Press Low<br>Control board indications:<br>• LPSW-2 ( "ALPSW Pump Suction) indicates closed (also an OAC aiarm)<br>• " ALPSW pump amps are cycling<br>• LPSW Header A/B Pressure Low<br>**Crew response:**<br>1. Refer to ARG for 1SA-9/A-9, LPSW Header A/B Press Low<br>2. Refer to AP/24 (Loss of LPSW)<br>• Ensure LPSW pump suction valves are open.<br>**Note: LPSW-2 ( "ALPSW pump suction valve) will indicate closed. The team may dispatch an NEO to open LPSW-2. The valve will not be able to be opened locally.**<br>• Verify LPSW pumps are cavitating<br>➢ Pump amps erratic<br>➢ LPSW header pressure fluctuating<br>• Ensure the Unit 1/2 STANDBY LPSW PUMP AUTO START CIRCUIT is DISABLED.<br>• Stop the affected pump. Stop " ALPSW pump.<br>• Ensure all available (NOT previously cavitating) LPSW pumps operating. Start " C LPSW pump.<br>• Verify normal LPSW System operation is restored.<br>• The SRO should call SPOC to troubleshoot the reason for the suction valve closing, the Auto Start failure and determine if the "A" LPSW pump was damaged due loss of suction.<br>• The SRO should refer to TS:<br>➢ TS 3.7.7 (Low Pressure Service Water System) Condition "A" applies. Restore required LPSW pump to operable status. 72 hours completion time.<br>➢ ***TS*** 3.3.28 (LPSW pump Auto-Start Circuitry) Condition "A". Restore Auto-Start Circuitry to operable. 7 day completion time.<br>**Note: TS 3.3.28 may be addressed as a follow up question.** |
| | | **Event is complete when SRO has referred to TS 3.7.7 or when directed by the Lead Examiner.** |

| | | | |
|---|---|---|---|
| Op-Test No.: _____ | Scenario No.: 3 | Event No.: 3 | Page 1 of 1 |
| Event Description: | **PZR Level # 1 Fails LOW (I, OATC) (TS)** | | |

| Time | Position | Applicant's Actions or Behavior |
|---|---|---|
| | OATC<br><br>SRO | **Note: While the BOP is involved with Event 2, this event will start to ensure the OATC takes the required actions.**<br><br>**Plant response:**<br>Statalarms<br>• 1SA-2/C-3, RC Pressurizer Level High/Low<br>• 1SA-2/C-4, RC Pressurizer Level Emerg High/Low<br><br>Front board (1UB1) indications:<br>• PZR bevel 1 indicates 0"<br>• 1HP-120 (RC Volume Control) throttles open<br>• Makeup flew increases to = 160 gpm.<br><br>**Crew response:**<br>• Refer to ARG<br>➢ Check alternate PZR level indications (1UB1 and OAC) and determine that PZR level 1 has failed low.<br>➢ Check for proper Makeup/Letdown flows and adjust to restore proper level.<br>➢ Select an alternate PZR level channel on 1UB1.<br>• SRO should direct the OATC to take actions to restore normal PZR level.<br>• SRO should direct the OATC to refer to PT/600/001 (Periodic Instrument Surveillance) SASS Manual Operation and have the OATC select an alternate PZR level channel on 1UBI.<br>• SRO should refer to TS 3.3.8 (PAM Instrumentation) Table 3.3.8-1.<br>➢ Two PZR level channels are required. No action required. |
| | | **When an alternate PZR level channel has been selected and PZR level is stable or when directed by the lead evaluator this event is completed.** |

Qp-Test No.: _____ Scenario No.: 3 Event No.: 4 Page 1 of 1

Event Description: **Controlling Tave fails HIGH: (I, OATC)**

| Time | Position | Applicant's Actions or Behavior |
|---|---|---|
| | OATC<br><br>SRO | **Plant response:**<br>• 1SA-02/A-12, ICS Tracking, will actuate due to neutron and feedwater cross-limits.<br>• Controlling Tave will indicate ≈ 596.4" F.<br>• Actual loop A & B Tave will decrease until operator stops transient.<br>• RCS pressure and temperature will decrease.<br>**Crew response:**<br>• When the ICS TRACKING alarm is received: the candidates should utilize the "Plant Transient Response" process to stabilize the plant and recognize that the controlling Tave has failed. RX will trip on variable low pressure with no operator action.<br>• Verbalize to the SRO reactor power level and direction of movement.<br>• Place the FDW Masters in manual and stabilize the plant. Use control rods and FDW to stabilize the plant<br>• The SRO should:<br>  • Refer to AP/28, ICS Instrument Failures<br>  • Contact SPOC to repair controlling Tave.<br>**Note: The ICS will remain in manual for the remainder of the scenario.** |
| | | **When the plant *is* stable or when directed by the lead examiner this event is completed.** |

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

Event Description: **TCC notifies crew of grid disturbance: (C, BOP)**

| Time | Position | Applicant's Actions or Behavior |
|---|---|---|
| | BOP | **Plant response:**<br>• Computer alarms for 230 KV Red and Yellow Bus voltage low<br>• SA-16/C-1, 230 KV SWYD ISOLATEES PERMIT actuates<br>• MVARs on the generator increases<br>**Crew response:**<br>BOP should refer to ARG for SA-16/C-1. ARG will:<br>• Notify the System Operating Center (SOC) of Low Voltage Condition and instruct the System Operating Center (SOC) to take corrective action to raise the Switchyard 230 KV Yellow Bus voltage to > 229.468 KV. |
| | | **NOTE:** Components which are out of service in this condition are the "Required Offsite Sources" as specified in ***TS*** 3.8.1 and 3.8.2. |
| | SRO | • **IF** the 230 KV Switchyard voltage remains < 227.468 KV for > 10 minutes, enter TS Condition 3.8.1.J or 3.8.2.A on all three units.<br>• Verify the Underground Feeder path, through Transformer CT-4; and both Standby Buses are operable.<br>• Within 1 hour, provide BACKUP POWER from bee Steam Station per OP/0/A/1107/003 (100 KV Power Supply).<br>**Note: If asked, Unit 2 will perform this procedure.**<br>• Notify Unit 2 and 3 Control Room personnel of the impending conditions.<br>• Refer to AP/1/A/1700/034 (Degraded Grid). |

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

Event Description: **TCC notifies crew of grid disturbance: (C, BOP)**

| Time | Position | Applicant's Actions or Behavior |
|---|---|---|
| | SRO | SRO should direct AP/34 which will:<br>• Notify the **O§M** and STA.<br>• Verify Unit 2 is performing AP/34.<br>• Verify generator output within limits of the appropriate capability curve based on generator voltage.<br>**Note: Generator voltage will be ≈ 19 KV and enclosure 5.1 should be used.** |
| | SRO/BOP | • SRO should direct the **BOP** to verify generator output within limits of enclosure 5.1 (Capability Curve).<br>• The BOP should determine that the generator output is outside of the limits of enclosure 5.1 and inform the SRO.<br>• SRO should direct the BOP the adjust MVARs to maintain generator output within limits of the capability curve.<br>• The BOP should adjust MVARs using EXCITER VOLTAGE ADJUSTER to maintain generator output within limits of the appropriate capability curve. |
| | | **When MVARS have been adjusted or when directed by the lead examiner this event is completed.** |

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

Event Description: **"B"** LPSW **pump trips: (C,** ALL) **(TS)**

| Time | Position | Applicant's Actions or Behavior |
|---|---|---|
| | | **Plant response:**<br>Statalarms:<br>• 1SA-9/A-9, LPSW Header *N B* Press Low<br>Control board indications:<br>• "B" LPSW pump indicates tripped<br>• LPSW Header A/B Pressure Low<br>**Crew response:** |
| | BOP | Refer to ARG for 1SA-9/A-9, LPSW Header A/B Press Low |
| | SRQ | Refer to AP/24 (Loss of LPSW) which will:<br>• Ensure LPSW pump suction valves are open:<br>• Verify NO LPSW pumps are cavitating and **GO TO** Step 4.6.<br>• Ensure all available **(NOT** previously cavitating) LPSW pumps operating.<br>• Verify normal LPSW System operation has NOT been restored and **GO TO** Step 4.9.<br>• Dispatch an operator to perform Encl 5.1 (Local Operator Actions).<br>• **IAAT** conditions permit,<br>**THEN** start the LPSW pumps that were stopped in Step 4.5 due to cavitation.<br>• SRO should refer TS 3.7.7 (Low Pressure Service Water) and determine that LCO 3.0.3 applies and commence ***a*** unit shutdown. |
| | | **When a unit shutdown has been commenced or when directed by the lead examiner this event is completed.** |

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

Event Bescription: **Unit Shutdown (R, OATC)**

| Time | Position | Applicant's Actions or Behavior |
|---|---|---|
| | OATC/SRO | The OATC will use the FDW Masters and the Diamond to reduce power while monitoring Reactor Power, Tave, and other plant parameters. |
| | | **When a unit shutdown of > 5% has occurred or when directed by the lead examiner this event is concluded.** |

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

Event Description: **Large Break LOCA and Switchyard Isolation: (M, ALL)**

| Time | Position | Applicant's Actions or Behavior |
|---|---|---|
| | ALL | **Plant response:**<br>Control board indications:<br>• ES 1-6 actuate<br>• A Switchyard Isolation will occur due to degraded system voltage in conjunction with an ES signal.<br>• RCS subcooling margin will indicate 0°F.<br>• Power will be lost and then regained from Keowee #1 via the underground. |
| | | **Crew response:** |
| | OATC | 1. The OATC perform IMAs the OATC to perform a symptom check. |
| | BOP | 2. The BOP should report symptoms and inform the SRO that the RCS has saturated and obtain SRO concurrence to perform Rule 2, Loss of SCM.<br>• Verify that reactor power is < 1%.<br>• Trip RCPs within 2 min of LOSCM (**CT-1**)<br>▪ Notify SRO of KCP status.<br>▪ Verify any HPI pump is available.<br>• Open 1HP-24/25 (1A/1B BWST Suction) open<br>• Start all available HPI pumps operating.<br>• Open 1HP-26/27 (1A/1B HP Injection) open<br>▪ Verify at least two HPI pumps are operating using two diverse indications. (**i.e. pump amps and flow)**<br>• **IAAT** HPI flow in any header is in the Unacceptable Region of Figure 1<br>**THEN** perform Steps 10 -12. **(flow is acceptable)**<br>• Throttle "B" HPI flow to < 475 gpm.<br>• IAAT either of the following exist:<br>➢ LPI FLOW TRAIN A plus LPI FLOW TRAIN B ≥ 3300 GPM **(LPI flow** will **be met)**<br>➢ Only one LPI header operating, AND flow in that header is ≥ 2850 gpm. ***GO* TO** Step 14.<br>▪ **WHEN** directed by **the** CR SRO<br>▪ **THEN EXIT** this rule. |
| | OATC | 3. OATC will perform Enclosure 5.1 (ES actuation) (**CT-10**) |

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

Event Description: **barge Break LOCA and Switchyard Isolation: (M,ALL)**

| Time | Position | Applicant's Actions or Behavior |
|---|---|---|
| | SRO | **4.** The SRO should refer to the Parallel Actions and transfer to the LOSCM tab.<br>5. The LOSCM tab will:<br>• Refer to Parallel Actions and:<br>➢ Direct an RO to Initiate AP/11 (Recovery from Loss of Power)<br>**Note: AP/11 can not be implemented until an RO completes either Rule 2 or Enclosure 5.2.**<br>➢ Direct an RO to announce plant conditions,<br>• Ensure Rule 2 (Loss of SCM) is in progress or complete.<br>• Verify Station ASW feeding any SG.<br>• **IAAT** either of the following exists:<br>➢ LPI FLOW TRAIN A plus LPI FLOW TRAIN B = 3300 gpm<br>➢ Only one LPI header in operation with header flow = 2850 gpm<br>• **THEN GO TO** LOCA CD tab.<br>The LOCA CB tab will:<br>• **IAAT** BWST level is = 19',<br>**THEN** initiate Encl 5.12 (ECCS Suction Swap to RBES).<br>• Verify ES actuated.<br>• Perform the following:<br>➢ Ensure all RBCUs in low speed.<br>➢ Open 1LPSW-18.<br>➢ Open ILPSW-21.<br>➢ Open 1LPSW-24.<br>➢ Close 1LPSW-565. |
| | | **When the SRO transfers to LOCA CD tab or when directed by the lead examiner this event is concluded.** |

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

Event Description: **Keowee 1 and CT-1 lockout (blackout):**

| Time | Position | Applicant's Actions or Behavior |
|---|---|---|
| | SRO | **When directed by the Lead Examiner Keowee 1 will trip and CT-1 will lock out.**<br><br>**Plant response:**<br>• **Loss** of power to the Main Feeder Buses (Blackout) will occur.<br>• The unit will remain in a Blackout condition until actions are taken by the operators per Enclosure 5.38 (Restoration Of Power).<br>• The TD EFDW pump will be **feeding** the SG to remove **decay** heat.<br><br>**Crew response:**<br>The ***SRO*** will transfer to the Blackout tab which will:<br>• Verify two ROs available to perform Control Room actions. |
| | OATC | **NOTE**<br>During performance of Encl 5.38 (Restoration of Power), progression through the Blackout tab should continue.<br><br>• Notify one RO to perform Encl 5.38 (Restoration of Power).<br><br>• **IAAT** power is restored to any of the following:<br>➢ 1TC<br>➢ 1TD<br>➢ 1TE<br>**THEN GO TO** Step **4.**<br><br>• Verify any SG is being fed.<br><br>• Feed and steam available SGs as necessary to stabilize RCS P/T.<br><br>• **IAAT NO** SGs are being fed<br>**AND** any source of EFDW (Unit 1 or another unit) becomes available,<br>**THEN** perform Steps 9 - 11.<br>***GO* TO** Step 12.<br><br>• **IAAT** EFDW from any source is insufficient to maintain stable RCS P/T,<br>**THEN** notify SSF operator that feeding SGs with SSF ASW is required<br><br>• Verify Encl 5.38 (Restoration of Power) in progress or complete. |

Op-Test No.: _____ Scenario No.: 3 Event No.: 9 Page 2 of 2

Event Description: **Keowee 1 and CT-1 lockout (blackout):**

| Time | Position | Applicant's Actions or Behavior |
|---|---|---|
| | BOP | The BOP will perform Encl 5.38 (Restoration of Power) which will:<br>• Place 1HP-31 in HAND and reduce demand to 0.<br>• Close 1HP-21.<br>• Verify either MFB energized (**MFBs are de-energized)**<br>• Verify CT-1 indicates 4160 volts. **(CT-1 has no voltage)**<br>•<br>• Verify both Standby Bus #1 and Standby Bus #2 are de-energized.<br>• Verify all Keowee units operating. **(Keowee 1 is locked out)**<br>• Emergency start both Keowee units<br>• Notify Keowee Operator to place all operating Keowee units in Oconee Control.<br>• Close UNIT **2** EMER FDR ACB **4 (power will be restored) (CT-8)** |
| | | **When the Main Feeder Buses are energized or when directed by the Lead Examiner the event and scenario is completed.** |

## CRITICAL TASKS

1. CT-27, Implementation of Control Room Habitability Guidance
2. CT-8, Electrical power alignment

Facility: **Oconee** Scenario No.: **4 R0** Op-Test No.: **1**

Examiners: _____ Operators: _____

Initial Conditions:
- 100% Reactor Power (Snap 204)

Turnover:
- AMSAC/DSS bypassed for I&E testing
- LDST pressure is LOW
- Unit 1 TDEFDWP has been out of service for bearing replacement for about 16 hours. Expect it to be returned to service within the next 2 hours.

| Event NO. | Malf. No. | Event Type* | Event Description |
|---|---|---|---|
| Oa | Pre-Insert | | AMSAC/DSS bypassed |
| Ob | Pre-insert MSS330 | | TDEFWP fails to start |
| oc | Pre-insert MSS260 | | 1A MDEFBWP fails to start |
| 1 | | N, BOP, SRO | Pressurize LDST with H2 |
| 2 | Override | C, BOP, SRO | 1H-1, LDST Supply, fails open (TS) |
| 4 | MPS290 Override | C, BOP, SRO | 1A CC Pump trips (B CC Pump fails to auto start) |
| **4** | MPI171, 100 MPI500, 100 | I, OATC, SRO | $T_h$ Fails HIGH **(TS)** |
| 5 | | C, ALL | 1D1 Heater Drain Pump oil leak |
| 6 | | R, OATC, SRO | Manual reactor power decrease |
| 7 | | C, OATC, SRO | Turbine trip ATWS |
| *8* | MSS010 MSS020 | C, ALL | Loss of Main Feedwater |
| 3 | MSS270 | M, ALL | Loss of Main & Emergency Feedwater, 1B (CBP Feed)... |
| 10 | MSS330 Reset | | TDEFWP returned (CBP recovery) |
| | | | |
| | | | |

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

Op-Test No.: _____ Scenario No.: **4** Event No.: 1 Page 1 of 1

Event Description: **Pressurize the LDST with H2: (N, BOP)**

| Time | Position | Applicant's Actions or Behavior |
|---|---|---|
| | | **Plant response:**<br>• 1SA-02/D-2 (Approaching LDST Operating Limits) is in alarm<br>**Crew response:**<br>1. Refer to ARG |
| | BOP | • Add hydrogen to establish desired LDST pressure per OP/1/A/1106/017 (Hydrogen System)<br>• Refer to LDST Pressure vs. Level enclosure in OP/0/A/1108/001 (Curves and General Information. |
| | SRO | 2. Direct the OATC to use OP/1/A/1106/017 (Hydrogen System) Encl. 3.5 (Unit 1 LDST H2 Addition) to add H2 to the LDST. |
| | BOP | • Review Limits and Precautions<br>• Immediately prior to pressurization determine lowest reading of diverse LDST level indications: _____ inches.<br>• For existing LDST level determine LDST Pressure allowable **per** LDST Pressure vs. Level curve: _____ psig.<br>• Notify Operator at H2 Cage to pressurize primary hydrogen. |
| | | **NOTE:** Operator should be in constant communication with CR to close 1H-26 if 1H-1 fails open. |
| | | • Direct Operator to open 1H-26 (LDST Block).<br>• Cycle 1H-1 (LDST SUPPLY) as required to pressurize LDST per LDST Pressure vs Level curve.<br>• **WHEN** complete, ensure closed 1H-1 (LDST SUPPLY).<br><br>**Note: 1H-1 (LDST SUPPLY) will fail open.** |
| | | **When 1H-1 (LDST SUPPLY) is opened this event is complete.** |

| Op-Test No.: _____ | Scenario No.: **4** | Event No.: 2 | Page 1 of 1 |
|---|---|---|---|
| Event Description: | 1H-1 fails OPEN: (C, BOP) (TS) | | |

| Time | Position | Applicant's Actions or Behavior |
|---|---|---|
| | BOP<br><br>SRO | Plant response:<br>• 1H-1 (LDST SUPPLY) will indicate open<br>• LDST pressure will continue to increase<br><br>Crew Response:<br>• Monitor LDST Pressure and 1H-1 (LDST SUPPLY) indication and determine that 1H-1 (LDST SUPPLY) has failed open.<br>• Direct Operator to close 1H-26 (LDST Block).<br>• Ensure LDST pressure within LDST Pressure vs. Level curve.<br><br>Note: **LDST** pressure **will NOT** be within the **LDST** Pressure **vs.** Level curve.<br><br>• Refer to ARG for 1SA-02/D-2 (Approaching LDST Operating Limits) actuates.<br>• Determine that LBST pressure is not within LDST Pressure vs. Level curve and declare BOTH trains of HPI inoperable. Direct the OATC to take actions to reduce LDST pressure to within the proper operating region of the LDST Pressure vs. Level curve.<br>• Vent LDST to GWD per OP/1/A/1104/002 (HPI System).<br>Note: The crew will not have time **to** vent the **LDST.**<br>• SRO should refer to TS 3.5.2 (HPI) and determine that Condition H is met. The required action is to enter LCO 3.0.3 immediately. |
| | | When the SRO has declared BOTH trains **of** HPI inoperable **or** when directed **by** the lead examiner this event **is** complete. |

Event Description: **1A CC Pump trips: (C, BOP)**

| Time | Position | Applicant's Actions or Behavior |
|---|---|---|
| | | **Plant response:**<br>1. Statalarms:<br>• 1SA-SIB-1, CC CRD RETURN FLOW LOW<br>• 1SA-9/C-1, CC COMP COOLING RETURN FLOW LOW<br>• 1SA-2/C-1, LETDOWN TEMPERATURE HIGH<br>**2.** Control Board indications:<br>• 1HP-5 (Letdown Isolation) will close due to high letdown temperature |
| | BOP<br>SRO | **Crew Response:**<br>1. Refer to ARGs<br>2. Initiate AP/020 (Less of Component Cooling)<br>• **IAAT** both of the following are lost:<br>➢ CC to RCPs<br>➢ RCP seal injection<br>**THEN** perform the following:<br>➢ Trip RX<br>➢ Step all RCPs<br>➢ Initiate AP/25 (SSF EOP) |
| | BOP | • **IAAT** ≥ two CRD stator temperatures ≥ 180°F.<br>**THEN** trip RX.<br>• Open 166-7 and 1CC-8<br>• Verify CC Surge Tank level ≥ 12".<br>• Manually start the Standby CC Pump<br>3. Verify CC TOTAL FLOW > 575 gpm<br>4. Verify both of the following:<br>• Letdown in service<br>• LETDOWN TEMP ≤ 130°F<br>5. Step not met. Perform **RNO**, Initiate AP/032 (Loss of Letdown) |
| | | |

Event Description: **1A CC Pump trips: (C, BOP)**

| Time | Position | Applicant's Actions or Behavior |
|---|---|---|
| | BOP<br><br>OATC | **Crew Response:**<br>6. AP/032 (Loss of Letdown) will:<br>• Ensure 1HP-120 in HAND and reduce demand to zero.<br>e Initiate makeup to LDST with boron concentration ³ RCS boron concentration as required.<br>•<br>• Notify Chemistry of the following:<br>➢ Current RCS boron sample is needed for possible unit shutdown.<br>➢ Normal letdown line is isolated.<br>• **IAAT** Pzr level 5 260",<br>**AND** letdown **CANNOT** be established,<br>**THEN** initiate unit shutdown at » 20%/min per AP/29 (Rapid Unit Shutdown).<br><br>**IAAT** Pzr level 5 375".<br>**THEN** trip **Rx.**<br>• Verify CC system in operation.<br>• Position the standby HPI pump switch *to* OFF.<br>• Throttle 1HP-31 to establish 12 - 15 gpm SEAL INLET HDR FLOW.<br>e Verify loss of letdown is NOT due *to* letdown valve or interlock failure and then **GO TO** Step **4.29.**<br>• **WHEN** letdown can be re-established,<br>**THEN** ensure proper operation of the CC System.<br><br>Close 1HP-6 and 1HP-7.<br>• Ensure the following are open:<br>*3* 1HP-1<br>➢ 1HP-2<br>➢ IHP-3<br>➢ 1HP-4 |
| | | |

Event Description: **1A CC Pump trips: (C, BOP)**

| Time | Position | Applicant's Actions or Behavior |
|---|---|---|
| | BOP | **Crew Response:**<br>▪ Verify letdown temperature < 135°F **(it *is* not)**<br>e Open 1HP-13.<br>e Ensure the following are closed:<br>➢ 1HP-8<br>➢ 1HP-9&11<br>e Select LETDOWN HI TEMP INTLK BYP switch to BYPASS.<br>• Open 1HP-5.<br>• Throttle open 1HP-7 to establish » 20 gpm.<br>▪ **WHEN** letdown temperature < 130°F,<br>**THEN** ensure LETDOWN HI TEMP INTLK BYP switch in NORMAL.<br>• Open 1HP-6.<br>▪ Adjust 1HP-7 to control desired (70 gpm) letdown flow.<br>• Re-establish normal makeup through 1HP-120.<br>• Verify SEAL INLET HDR FLOW 12 - 15 gpm.<br>▪ Re-establish normal RCP seal injection flow.<br>▪ Position the standby HPI pump switch to AUTO. |
| | | **This event is complete when Seal Flow is returned to normal (32 gpm) or when directed by the lead examiner.** |

| op-Test No.: _____ | Scenario No.: **4** | Event No.: **4** | Page 1 of 1 |
|---|---|---|---|
| Event Description: | **$T_{hot}$ fails HIGH: (I,OATC) (TS)** | | |

| Time | Position | Applicant's Actions or Behavior |
|---|---|---|
| | OATC<br><br>SRO | **Plant response:**<br>• Loop A Thot Dixson meter reading goes to 620°F<br>• Thot recorder ≈612°F<br>• Tave recorder and digital meter increases to ≈583°F<br>• Loop A Delta T meter increases to ≈65°F<br>• Loop A Tave meter increases to ≈588°F<br>• Statalarm 1SA-2/B-3, RC Hot Leg Temp High, alarms<br><br>**Crew response:**<br>• The crew should use Plant Transient Response to stabilize the unit. Reactor Diamond and the FDW Master should be taken to manual to stabilize the plant.<br>• Depending on when ICS is taken to manual, FDW flow may be greater than 100%. If this is true, taking ICS to hand will allow **NI** Power to begin to increase to match FDW flow. When this occurs, the OATC will be required to decrease FDW flows to stop the power increase.<br>• SRO should refer to AP/28 (ICS Instrument Failures) and TS 3.3.1 RPS Instrumentation. |
| | | **When the ICS has been taken to manual and the plant is stable or when directed by the lead examiner this event is complete.** |

| Bp-Test No.:_____ | Scenario No.: 4 | Event No.: 5 | Page 1 of 1 |
|---|---|---|---|
| Event Description: | 1D1 Heater Drain Pump oil leak: (C, All) | | |

| Time | Position | Applicant's Actions or Behavior |
|---|---|---|
| | SRO | When directed by the Lead Examiner an NEO will inform the control room that the 1D1 HDP has a severe oil leak.<br><br>Crew Response:<br>• Refer to OP/1/A/1106/02D, (Shutdown of the 1D1 HDP)<br>• SRO should determine that reducing power to < 87% is required and direct unit shutdown in accordance with one of the following:<br>➢ AP/29 (Rapid Unit Shutdown)<br>➢ OP/1/A/1102/004 (Operation At Power)<br>Note: A manual shutdown is required because the ICS is in manual due to the previous Thot failure. |
| | | Event is complete when a unit shutdown is directed by the SRO or when directed by the Lead Examiner. |

| Op-Test No.: _____ | Scenario No.: 4 | Event No.: 6 | Page 1 of 1 |
|---|---|---|---|
| Event Description: | **Manual reactor power decrease: (R, OATC)** | | |

| Time | Position | Applicant's Actions or Behavior |
|---|---|---|
| | SRO | **Crew Response:**<br>1. SRO will direct the unit shutdown and continue in the AP/29 (Rapid Unit Shutdown) or OP/1/A/1102/004 (Operation At Power).<br>2. OATC will reduce FDW flow with the FDW Masters and insert the control rods manually to reduce reactor power. |
| | | **Event *is* complete when reactor power has been reduced 5% or when directed by the lead examiner.** |

Event Description: **Turbine Trip, ATWS: (C, OATC)**

| Time | Position | Applicant's Actions or Behavior |
|---|---|---|
| | OATC | Recognize that the Reactor should have tripped and begin performing Immediate Manual Actions.<br>• Depress REACTOR TRIP pushbutton<br>• Verify reactor power < 5% FP and decreasing |
| | | The OATC should recognize that Power Range NIs are not < 5% FP and perform Rule 1. **(CT-24)**<br>• Verify that at least one Power Range NI is ≥5% FP.<br>• Initiate manual control rod insertion to the IN LIMIT.<br>• Open 1HP-24 & 1HP-25 (1A and 1B BWST Suction)<br>• Ensure 1A or 1B HPIP is operating.<br>• Start 1C HPIP.<br>• Open 1HP-26 & 1WP-27 (1A and 1B HP Injection)<br>• Dispatch operators to the Cable Room and to the 600V Load Centers 1X9 and 2X1 to de-energize the CRD System.<br>• Notify the SRO to GO **TO** UNPP tab. |
| | BOP | Performs a Symptoms Check and then may adjust FDW to match reactor power and maintain Tave near setpoint. |
| | SRO | Transfer to the UNPP tab from **IMAs** and direct the following actions:<br>• Announce plant conditions<br>• Ensure Rule 1 is in progress or complete.<br>• Verify Main FDW available.<br>• **IAAT** <u>all</u> power range NIs are <5% FP, **THEN** trip the turbine-generator.<br>• Verify <u>any</u> wide range NIs ≥1% FP.<br>• Open 1RC-4 and 1HP-5<br>• Maximize letdown.<br>• Verify Main FDW available. |

Event Description: **Turbine Trip, ATWS: (C, OATC)**

| Time | Position | Applicant's Actions or Behavior |
|---|---|---|
| | SRO | • Adjust Main FDW flow as necessary to control RCS temperature.<br>• Verify overcooling **NOT** in progress.<br>• Secure makeup to the LDST.<br>o **WHEN** all NIs are <1% FP, **AND** decreasing, **THEN** continue in this tab.<br>• Adjust SG pressure **as** necessary to stabilize RCS temperature using TBVs.<br>• Throttle HPI per Rule 6 (HPI).<br>• Adjust letdown flow **as** desired.<br>• Verify RCP seal injection available.<br>▪ **GO TO** Subsequent Actions tab. |
| | | **This event *is* complete when the SRO transfers Subsequent Actions tab or when directed by the lead examiner.** |

Event Description: Loss of Main Feedwater: (C, ALL)

| Time | Position | Applicant's Actions or Behavior |
|---|---|---|
| | SRO | When directed by the Lead Examiner BOTH Main FDW pumps will trip.<br>Plant response:<br>• Reactor trip<br>• "A" MDEFDW Pump will not start<br>• "B" MDEFDW Pump will start<br>• No EFW flow the A SG and level will decrease to ≈ 15" XSUR<br><br>Crew response:<br>SRO will direct the OATC to perform Immediate Manual actions and the BOP to perform a Symptom Check.<br>SRO should transfer Subsequent Actions after IMAs are complete.<br>Subsequent Actions will:<br>• Verify all control rods fully inserted.<br>• Verify Main FDW in operation and controlling properly<br>➢ No Main FDW pumps are operating. Perform RNO. Ensure Rule 3 (boss of Main or Emergency FDW) in progress or complete.<br>• Verify TBVs controlling SG pressure ≈ 1010 psig.<br>• Verify 1RIA-40 operable.<br>• Dispatch an operator with Encl 5.29 (MSRV Locations) to verify all MSRVs have reseated.<br>• Verify ES is NOT required and initiate Encl 5.5 (Pzr and LDST Level Control).<br>• Open PCB 20 and PCB 21<br>• Open Generator Field Breaker and Exciter Field Breaker<br>• Verify A5 and TB Instrument Air pressure ≥ 90 psig.<br>• Verify ICS/NNI power available.<br>• Verify all 4160V switchgear (1TC, 1TD, ITE) energized.<br>• Verify both SGs > 550 psig. |

Event Description: **Lose of Main Feedwater: (C, ALL)**

| Time | Position | Applicant's Actions or Behavior |
|---|---|---|
| | **SRO** | Verify Main FDW operating.<br>➢ No Main FDW pumps operating perform RNO Ensure Rule 3 (Loss of Main or Emergency FDW) in progress or complete. |
| | OATC | • Ensure SG levels approaching proper setpoint. (Rule 7)<br>• Verify all SCMs > 0°F.<br>**Note: There will be not feed to the "A" SG at this time.** |
| | | **This event is complete when SCM has been verified > 0°F or when directed by the lead examiner.** |

Event Description: **Loss of Main and Emergency Feedwater, 1B MDEFDWP trips (CBP Feed): (M, ALL)**

| Time | Position | Applicant's Actions or Behavior |
|---|---|---|
| | SRO<br><br>OATC | **When directed by the Lead Examiner 1B MDEFDW pump will trip.**<br>**Plant response:**<br>• No EFW flow to either SGs<br>• RCS temperature and pressure will increase<br><br>**Crew response:**<br>• The SRO should direct the OATC and the BOP to perform a symptom check.<br>• The OATC should determine no Main or Emergency Feedwater is feeding the SGs and with SRO concurrence re-start RULE 3 (Loss of Main and Emergency Feedwater).<br>RULE 3 (Loss of Main and Emergency Feedwater) will:<br>• **IAAT NO** SGs can be fed with FDW (Main/Emergency),<br>**AND** any of the following conditions exists:<br>RCS pressure reaches 2300 psig **OR** NDT limit<br>Pzr level reaches 375 [340" acc]<br>**THEN PERFORM** Rule **4** (Initiation of HPI Forced Cooling)<br>• Ensure any EFDWP operating.<br>• **RNO** step, ***GO* TO** Step **4.**<br>• Verify Main FDW **NOT** operating.<br>• Place the following in MANUAL and close:<br>➢ 1FDW-315 (1A EFDW Control)<br>➢ 1FDW-316 (1**B** EFDW Control) |
| | | |

Event Description: **Loss of Main and Emergency Feedwater, 1B MDEFDWP trips (CBP Feed): (M, ALL)**

| Time | Position | Applicant's Actions or Behavior |
|---|---|---|
| | OATC | • Verify all the following available:<br>➢ Any CBP<br>➢ TBVs<br>• Disable both Digital Channels 1&2 of AFIS on both headers A and B:<br>➢ A Header DIG. CH. 1 and 2 OFF<br>➢ B Header DIG. CH. 1 and 2 OFF<br>• Place Startup Block valve control switch for 1FDW-33 (1A SG) and 1FDW-42 (1B SG) in OPEN:<br>• Position Startup Control valve 10 - 20% open on all available SGs: 1FDW-35 on 1A SG and 1FDW-44 on 1B SG.<br>• Close the following:<br>➢ 1FDW-32 (1A Main FDW Control)<br>➢ 1FDW-41 (1B Main FDW Control)<br>➢ 1FDW-31 (1A Main FDW Block)<br>➢ 1FDW-40 (1B Main FDW Block)<br>• Lower SG pressure in available SGs to ≈ 500 psig<br>• Control FDW flow to stabilize RCS P/T by throttling the following as necessary: **(CT-26)**<br>➢ Startup Control valves<br>➢ TBVs<br>• Notify CR SRO that CBP feed is in progress.<br>• Dispatch an operator to perform Encl 5.26 (Manual Start of TDEFDWP). |
| | | |

Event Description: Loss of Main and Emergency Feedwater, 1B MDEFDWP trips (CBP Feed): (M, ALL)

| Time | Position | Applicant's Actions or Behavior |
|---|---|---|
| | SRO | • SRO should transfer to the "boss of Heat Transfer" (LOHT) tab of the EOP.<br>The LOHT tab will:<br>• Ensure Rule 3 (Loss of Main or Emergency FDW) is in progress or complete.<br>• **IAAT** core SCM = 0°F,<br>THEN GO **TO** Step 4.<br>• **IAAT NO** SGs can be fed with FDW (Main/Emergency),<br>AND any of the following conditions exists:<br>➢ RCS pressure reaches 2300 psig OR NDT limit<br>➢ Pzr level reaches 375" [340" acc]<br>THEN **GO** TO Step 4.<br>Perform RNO step:<br>[ NOTE: 1A1 RCP provides the best Pzr spray.<br>• Reduce operating RCPs to one pump/loop.<br>• WHEN any of the following conditions exists:<br>➢ Unit 1 EFDW available<br>➢ EFDW aligned from another unit<br>➢ Main FDW pump available AND reset<br>THEN GO TO Step 53<br>Note: The SRO should wait at this WHEN step until a Feedwater source is aligned or conditions are met to go into Forced HPI Cooling. |
| | | This event is complete when CBP **flow** has been established and the plant is stable or when directed by the lead examiner. |

| Op-Test No: _____ | Scenario No.: **4** | Event No.: 10 | Page 1 of 1 |
|---|---|---|---|
| Event Description: | TDEFDWP returned (**CBP** feed recovery) | | |

| Time | Position | Applicant's Actions or Behavior |
|---|---|---|
| | SRO | Note: **When** directed by the lead examiner SPOC will call the control room and inform them that the TDEFDWP has been repaired and can be used.<br>• The SRO should transfer to Step 53.<br>• Verify MFDW or Unit 1 EFDW available.<br>• Verify Encl 5.27 (Alternate Methods For Controlling EFDW Flow) is NOT in progress.<br>• Verify Main FBW pump available and reset. (FDW pumps are not reset) Perform RNO<br>• **GO TO** Step 56<br>• Verify Main FDW pump available and reset. (it is not)<br>• Verify one of the following:<br>➢ Both MDEFDWPs operating<br>➢ TDEFDWP operating<br>• Verify all the following:<br>➢ Tcold > 500°F<br>➢ TBVs available<br>Verify Tcold ≤ 547°F.<br>➢ Perform RNO step:<br>Ensure THP setpoint at ≈885 psig.<br>GO TO Step 66.<br>Ensure TBVs in AUTO for available SGs.<br>• Initiate feed *to* available SGs per Rule **7** *(SG* Feed Control) **(CT-26)**<br>• **IAAT** heat transfer is established in any SG,<br>THEN ***GO*** TO Step 79.<br>• Control feeding and steaming of available SGs to maintain SG **level** at setpoint and cooldown rate within Tech Spec limits:<br>• Tcold > 280°F: ≤ 50°F / ½ hr |
| | | This event and the exam is complete when TDEFDWP flow to the SGs have been established and the plant is stable or when directed by the lead examiner. |

## CRITICAL TASKS

1. CT-24, Shutdown Reactor - **ATWS**
2. CT-26, Restore Feed To A Dry SG

## SCENERIO ATTRIBUTES

| Scenario # | 1 | 2 | 3 | 4 |
|---|---|---|---|---|
| Total malfunctions (5-8) | 8 | 8 | 8 | 8 |
| Malfunctions after EOP (1-2) | 2 | 1 | 2 | 2 |
| Abnormal Events (2-4) | 2 | 3 | 3 | 2 |
| Major Transients (1-2) | 1 | 1 | 1 | 1 |
| EOPs Entered (1-2) | 2 | 2 | 2 | 1 |
| EOP Contingencies (0-2) | 2 | 2 | 2 | 2 |
| Critical Tasks (2-3) | 4 | 4 | 3 | 2 |

## CRITICAL TASKS

**Scenario 1:**

1. CT-18, Turbine Trip
2. CT-1, Trip All RCPs
3. CT-10, Establish FW Flow and Feed SGs
4. CT-27, Implementation of Control Room Habitability Guidance

**Scenario 2:**

1. CT-I7, Isolate Overcooling SG
2. CT-I1, Control SG pressure to Maintain RC Temperature Constant.
3. CT-7, Minimize SCM
4. CT-27, Implementation of Control Room Habitability Guidance

**Scenario 3:**

1. CT-1, Trip All RCPs
2. CT-27, Implementation of Control Room Habitability Guidance
3. CT-8, Electrical power aiignment

**Scenario 4:**

1. CT-24, Shutdown Reactor - ATWS
2. CT-26, Restore Feed T A Dry SG (intact or trickle feed)

Facility: **Oconee** Scenario No.: **1 R0** Op-Test No.: ___

Examiners: _____ Operators: _____

Initial Conditions:
- 45% Reactor Power

Turnover:
- Startup in progress after adding oil to 1B1 RCP
- I A Main FDW pump operating
- SASS in MANUAL for I&E troubleshooting
- 1B MDEFDW Pump OOS
- After turnover, the crew should start 1B1 RCP

| Event No. | Malf. No. | Event Type* | Event Description |
|---|---|---|---|
| 0a | Pre-Insert | | SASS in manual |
| 0b | Pre-Insert MSS270 | | 1B MBEFDW Pump OOS |
| Oc | Pre-Insert MPI290 | | Block All Turbi Trip Except Manual |
| 0d | Pre-Insert MPS350 | | " A RBCU fails to receive ES signal |
| 1 | | N, BOP, SRO | Start 1B1 RCP |
| 2 | Override Z3424D1 | C, BOP, SRO | AC Oil Lift pump will not develop adequate discharge pressure |
| 3 | MPS120 Override | C, BOP, SRO | 1A HPI pump sheared shaft, (TS) Standby HPI Pump fails to start |
| 4 | MPI050 MPI080 | I, OATC, SRO | RC Loop B Flow fails LOW |
| 5 | Override | C, ALL | BWST rupture (TS) |
| 6 | MPS110 | R, OATC, SRO | Manual unit shutdown due to BWST level |
| 7 | MSS010 MSS020 | C, OATC, SRO | 1A Main FDW pump trips Main Turbine Fails to trip (Lockout EHC Pumps) |
| 8 | MPS400 | M, ALL | RCS leak to SBLOCA (ramp over 10 minutes) |
| 9 | MPS400, Reset | | "IC" HPI pump trips requiring rapid RCS C/D due to degraded HPI |
| | | | |

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

# Scenario #1 Overview R0

**Initial Conditions:** Unit 1: 45% power - EOL, Unit 2: 100%, Unit 3: 100%

**Turnover:**

- Startup in progress after adding oil to 1B1 RCP
- 1A Main FDW pump operating
- **SASS** in **MANUAL** for I&E troubleshooting
- 1B MDEFDW Pump OOS
- After turnover, the crew should start 1B1 RCP

**1) Start 1B1 RCP: (N, BOP)**

**a)** Reactor power was reduced so oil could be added to the 1B1 RCP. The oil addition has been completed and the crew is directed to start the 1B1 RCP per OP/1/A/1103/006.

TIME = 5 minutes

**2) 1B1 RCP AC Oil Lift pump will not develop adequate discharge pressure: (C, BOP)**

**a)** Prior to starting the 1B1 RCP, the RCP AC Oil Lift pump will be started. The OAC should be monitored and the RCP started after the low oil pressure alarm clears. The low pressure condition will not clear and the AC Oil Lift pump will stop after three minutes. The operator should follow procedural guidance and use the DC Oil Lift pump and complete starting the 1B4 RCP.

TIME = 5 minutes, TOTAL 10 min.

**3) "A" HPI Pump sheared shaft and the standby HPI pump fails to auto start: (C, BOP) (TS)**

a) The 1A HPI Pump shaft will shear. This will cause low RCP seal injection flow and the standby HPI pump will not auto start. This will require entry into AP/014 (Loss of Normal M/U and/or RCP SI). The standby HPI will be started and RCP seal injection re-established.

b) The SRO should refer to Tech Spec 3.5.2 (High Pressure Injection) for the failed HPI pump.

TIME = 15 minutes. TOTAL 25 min.

**4) RC Loop B Flow fails LOW: (I, OATC)**

**a)** The failure will cause Main FDW to re-ratio. The crew should utilize "Plant Transient Response" and take the Diamond and BOTH FDW Masters to MANUAL to stabilize the plant.

b) The SRO should refer to AP/28 (ICS Instrument Failures).

TIME = 5 minutes, TOTAL 30 min.

5) **BWST rupture: (C, ALL) (TS)**

a) A crane will damage the BWST resulting in level rapidly decreasing to ≈24 feet.

b) The SRO shouid refer to TS 3.5.4 and determine that a unit shutdown is required.

TIME = 10 minutes, TOTAL 40 min.

6) **Manual unit shutdown: (R, QATC)**

a) The ICS will be in manual because of a previous instrument failure. FDW and Control Rods will be controlled to manually shutdown the unit.

TIME = 10 minutes. TOTAL 50 min.

7) **1A Main FDW pumps trip and Main Turbine Fails to trip (Lockout EHC Pumps): (C, QATC)**

a) 1A Main FDW pump will trip resulting in a reactor trip. The Main Turbine should trip but does not. This will result in a reduction in steam pressure in both SGs until actions are taken to trip the turbine. The will result in RCS overcooling until the Main Turbine is tripped.

b) Whiie performing IMAs, the OATC should diagnose that the turbine did not trip and then perform the RNO step which will stop both EHC pumps. This will cause the turbine to trip.

TIME = 1 minutes, TOTAL 51 min.

E) **RCS leak to SBLQCA (ramp over 10 minutes): (M, ALL)**

a) The RCS leak will require entry into AP/2 (Excessive RCS Leakage). The leak will increase causing a loss of SCM.

b) RULE 2 (Loss of SCM) will be implemented and the SRO will transfer to the boss of Subcooling Margin (LOSCM) tab of the EOP. The SRO will then transfer to the LOCA Cooldown (LOCA CD) tab of the EOP.

c) EOP Enclosure 5.1 (ES Actuation) will be implemented. The " A RBCU will not receive an ES signal and will not go bo LOW speed. The RO should diagnose this and place the " A RBCU in LOW speed.

TIME = 20 minutes, TOTAL 71 min.

9) **"1C" HPI pump trips requiring rapid RCS C/D due to degraded HPI :**

a) When the RCS saturates the 1C HPI pump will trip. This will require a rapid RCS C/D.

TIME = 10 minutes. TOTAL 81 min.

Facility: **Oconee** Scenario No.: **2 RO** Op-Test No.: **1**

Examiners: _____ Operators: _____

Initial Conditions:
- 35% Reactor Power, startup in progress (IC-45)

Turnover:
- **AMSAC/DSS** bypassed for I&E testing
- NI-9 OOS, to he replaced next outage
- "A" **AFIS** circuit OOS
- "A" Condensate Booster Pump OOS, breaker to be replaced
- Keowee Unit 2 OOS for unplanned reasons
- Keowee Unit 1 aligned to underground
- Operability test of Keowee Unit 1 is to be performed per PT/620/009 (Keowee Hydro Operation) after turnover and before startup continues, ONS to perform remote Keowee start

| Event No. | ti No. | Event Type* | Event Description |
|---|---|---|---|
| Oa | Insert | | AMSAC/DSS bypassed |
| Ob | Pre-Insert MNI082 | | NI-9 OOS |
| oc | Pre-Insert AOR | | " A **AFIS** circuit disabled<br>"B" AFIS circuit disabled |
| Od | Pre-Insert MEL180 | | Keowee Unit 2 Emergency Lockout |
| Oe | Pre-Insert | | ES channels **7** and 8 fail to actuate |
| 1 | | N, BOP, SRO | Operability test Keowee Unit 1 |
| 2 | Override | C, BOP, SRO | Keowee Unit 1 Gen Field Flashing Breaker fails to OPEN automatically |
| 3 | MPS090 | C, **OATC, SRO** | 1HP-120 (RC Volume Control) fails closed |
| 4 | MNI032 | I, OATC, SRO | Controlling NI fails LOW (TS) |
| 5 | Override | C, BOP, SRO | Seismic event (PRA)<br>1A RBCU rupture (TS) |
| 6 | MPS020 | C, ALL | 1B SG Tube leak, 50 gpm (TS) |
| 7 | | R, OATC | Unit Shutdown |
| 8 | MSS360,50 | M, ALL | 1A Main Steam line break in RB |

(N)orm (R)eactivi , (I)nstrument, (C)omponent, (M)ajor

# Scenario #2 Overview

**Initial Conditions:** Unit 1: **35%** power - 430 EFPD, Unit 2: 100%. Unit 3: 100%

**Turnover:**

- Unit **1** TD EFDW Pump OOS to repair oil leak
- AMSAC/DSS bypassed for I&E testing
- NI-9 OQS, to be replaced next outage
- "A" AFIS circuit OOS
- "A" Condensate Booster Pump QOS, breaker to be replaced
- Keowee Unit 2 OQS for unplanned reasons
- Keowee Unit **1** aligned to underground
- Operability test of Keowee Unit 1 is to be performed per PT/620/009 (Keowee Hydro Operation) after turnover and before startup continues, ONS to perform remote Keowee start

**1) Operability test Keowee Unit 1 with failure of Gen Field Flashing Breaker: (N, BOP; C, BOP)**

a) Keowee Unit **1** will be started from the control room as part of the operability test.

TIME = 10 minutes

**2) Operability test Keowee Unit 1 with failure of Gen Field Flashing Breaker: (N, BOP; C, BOP)**

a) During startup the Gen Field Flashing Breaker fails to open automatically. This should be recognized and the breaker should be opened manually. This does not make the Keowee unit inoperable.

TIME = 5 minutes. TOTAL 15

**3) 1HP-120 (RC Volume Control) Fails CLOSED: (C, OATC)**

a) 1HP-120 (RC Volume Control) Fails CLOSED due to a ruptured diaphragm. This should be diagnosed and AP/14, Loss of Normal HPI Makeup and/or RCP Seal Injection, should be followed. The AP will give guidance on maintaining PZR level and instruct the crew to call SPOC to repair the valve. **1**HP-I20 (RC Volume Control) will remain broken for the remainder of the scenario.

NOTE: Events **1** and **2** will occur at about the same time.

TIME = 10 minutes, TOTAL 25 min.

**4) Controlling NI fails LOW:** (I, **QATC)**

a) The crew should utilize the "plant stabilization process" to stabilize the plant and recognize that the controlling NI has failed. The ICS will be placed in manual to stabilize the unit. The ICS will remain in manual for the remainder of the scenario.

TIME = 5 minutes. TOTAL 30 min.

# Scenario #2 Overview

**5) Seismic event (PRA) and 1A RBCU rupture: (C, BOP) (TS)**

a) A seismic event will occur which will cause the 1A RBCU to rupture. AP/5, Earthquake, will be entered. RBCU rupture should be diagnosed and subsequently isolated to prevent diluting the RB sump.

TIME = 5 minutes. TOTAL 35 rnin.

**6) 1B SG Tube leak (50 gpm): (C, ALL) (TS)**

a) The seismic event will also cause a 50 gpm tube leak in the 1B Steam Generator. The team may enter AP/31, Primary to Secondary Leakage. After determining the leak **is** greater than 25 gpm the SRO will transfer to the Steam Generator Tube Rupture tab of the EOP. This tab will direct a unit shutdown.

TIME = 20 minutes. TOTAL 55 min.

**7) Unit Shutdown: (R, OATC)**

a) **As** a result of the previous instrument failure the unit shutdown will be conducted with the ICS in manual. If the crew did not return 1HP-120 (RC Volume Control) to auto, primary inventory will also require manual control during the shutdown.

TIME = 5 minutes, TOTAL 60 min.

**8) 1A Main Steam line break in RB: (M, ALL)**

a) A main steam line break will occur in the 1A main steam line. This will require the use of RULE 5, Main Steam Line Break to isolate the leak. RULE 2, boss of SCM will be required if the RCS saturates. The CRSRO will transfer to the Excessive Heat Transfer tab of the EOP to ensure excessive heat transfer has been stopped and the plant stabilized. Transfer will then be made back to the Steam Generator Tube Rupture tab of the EOP. The scenario will be completed when the 1A main steam line **has** been isolated and a transfer to the Steam Generator Tube Rupture tab of the EOP ahs been made.

TIME = 15 minutes, TOTAL 75 min.

Facility: **Oconee** Scenario No.: **3 R0** Op-Test No.: **1**

Examiners: _____ Operators: _____

Initial Conditions:
- 100% Reactor Power (IC-41)

Turnover:
- AMSAC/DSS bypassed for I&E testing
- SASS in MANUAL for I&E testing
- Problems noted with 1B MFDWP control, after turnover place 1B MFDWP on handjack

| Event No. | Malfunction No. | Event Type* | Event Description |
|---|---|---|---|
| 0a | Pre-Insert MSS330 | | TDEFDWP fails to start |
| 0b | Pre-Insert | | SASS in Manual |
| 0c | Pre-Insert | | AMSAC/DSS bypassed |
| 1 | | N, OATC, SRO | Place 1B MFDWPT on Handjack |
| 2 | 121 | I, BOP, SRO | PZR Level #1 Fails LOW (TS) |
| 3 | Override | C, BOP, SRO | " A LPSW pump suction valve closes and Standby pump does not auto start (TS) |
| 4 | MCS004 | I, OATC, SRO | Controlling Tave fails HIGH |
| 5 | | C, BOP, SRO | TCC notifies crew of grid disturbance (Implement AP/34) |
| 6 | Override | C. ALL | "B" LPSW pump trips (TS) |
| 7 | | R, OATC, SRO | Manual plant shutdown |
| 8 | MPS400 | M, ALL | Large Break LOCA<br>Switchyard isolation |
| 9 | | | Keowee 1 lockout (blackout) |
| | | | |

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

# Scenario #3 Overview

**Initial Conditions:** Unit I: 100% power - 430 EFPD, Unit 2: Z00%, Unit 3: 100%

**Turnover:**

- AMSAC/DSS bypassed for I&E testing
- SASS in MANUAL for I&E testing
- Problems noted with 1B MFDWP control, after turnover place 1B MFDWP on handjack

**1) Place 1B MFDWPT on Handjack: (N, OATC)**

a) 1B MFDWP hand/auto station will be planed in manual and then the pump will be placed on Handjack.

TIME = 10 minutes

**2) PZR Level # 1 Fails LOW: (I, BOP)**

a) 1HP-120 opens and RCS makeup flow will increase. The crew should determine that PZR level 1 has failed low and refer to ARGs.

b) The SRO should refer to PT/600/001 (Periodic Instrument Surveillance) SASS Manual Operation and have the OATC select an alternate PZR level channel on 1UB1.

TIME = 10 minutes, TOTAL 20 min.

**3) "A" LPSW pump suction valve closes and standby pump does not auto start: (C, BOP) (TS)**

a) The crew should refer to ARG and AP/24 (Lass of LPSW). AP/24 will direct the crew to stop the pump with the closed suction valve and start the standby LPSW pump.

b) The SRO should refer to TS 3.7.7 (Low Pressure Service Water System).

TIME = 10 minutes, TOTAL 30 min.

**4) Controlling Tave fails HIGH: (I, OATC)**

a) The crew should utilize the "plant stabilization process" to stabilize the plant and recognize that controlling Tave has failed. The ICS will be placed in manual to stabilize the unit. The ICS will remain in manual for the remainder of the scenario.

TIME = 10 minutes, TOTAL 40 min.

# Scenario #3 Overview

**5) TCC notifies crew of grid disturbance: (C, BOP)**

a) The crew should implement AP/34 (Degraded Grid) and verify that the generator is operating within the capability curve. MVARs will require adjustment to meet the capability curve.

TIME = 10 minutes. TOTAL 50 min.

**6) "B" LPSW pump trips: (C, ALL) (TS):**

a) After MVARs have been adjusted the "B" LPSW pump will trip. The crew should restart AP/24 (Loss of LPSW). AP/24 will direct the crew to cross-tie Unit 1&2 LPSW to Unit 3. The SRO should determine that with only 1 LPSW pump operable on Unit 1 & 2 entry into TS 3.0.3 and a unit shutdown is required.

TIME = 10 minutes, TOTAL 60 min.

**7) Unit Shutdown: (R, QATC)**

a) As a result of the previous instrument failure the unit shutdown will be conducted with the ICS in manual. If the crew did not return 1HP-120 (RC Volume Control) to auto, primary inventory will also require manual control during the shutdown.

TIME = 10 minutes. TOTAL 70 min.

**8) Large Break LOCA and Switchyard Isolation: (M, ALL)**

a) A large break LOCA will occur. Due to the degraded switchyard volatage a Switchyard Isolation will occure when ES actuates. The crew will enter the EOP. Power will automatically return via Keowee 1 and CT-4. The SRO will utilize the LOSCM and the LOCA CD tabs to mitigate the event.

TIME = 5 minutes, TOTAL 75 min.

**9) Keowee 1 lockout (blackout):**

a) After the SRO transfers to the LOCA CD tab, Keowee Unit 1 will Emergency Lockout which results in a Unit Blackout. This will cause the SWO to transfer to the Blackout tab of the EOP for guidance on manually restoring power to Unit 1's Main Feeder Busses by swapping the Keowee underground feeder. The scenario will be completed after power has been restored to the Main Feeder Buses and AP/11 has been restarted.

TIME = 10 minutes. TOTAL 85 min.

Facility: **Oconee** Scenario No.: **4 R0** Op-Test No.: **1**

Examiners: _____ Operators: _____

Initial Conditions:
- 100% Reactor Power

Turnover:
- AMSACIDSS bypassed for I&E testing
- LDST pressure is LOW
- Unit 1 TDEFDWP has been out of service For bearing replacement for about 16 hours. Expect it to be returned to service within the next 2 hours.

| Event No. | Malf. No. | Event Type* | Event Description |
|---|---|---|---|
| 0a | Pre-Insert | | AMSAC/DSS bypassed |
| 0b | Pre-insert MSS330 | | TDEFWP fails to start |
| 0c | Pre-insert MSS260 | | 1A MDEFDWP fails to start |
| 1 | | N. BOP. SRO | Pressurize LDST with H2 |
| 2 | Override | C. BOP, SRO | 1H-1, LDST Supply, fails open (TS) |
| 3 | MPS290 Override | C, BOP, SRO | 1A CC Pump trips (1B CC Pump fails to auto start) |
| 4 | MPI171, 100 MPI500, 100 | I, QATC, SRO | $T_h$ Fails HIGH **(TS)** |
| 5 | | C, ALL | 1D1 Heater Drain Pump oil leak |
| 6 | | R, OATC, SRO | Manual reactor power decrease |
| 7 | | C, OATC, SRO | Turbine trip ATWS |
| 8 | MSS010 MSS020 | C, ALL | Loss of Main Feedwater |
| 9 | MSS270 | M, ALL | Loss of Main and Emergency Feedwater, 1B MDEFDWP trips (CBP Feed) |
| 10 | MSS330 Reset | | TDEFWP returned (CBP recovery) |
| | | | |
| | | | |

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

# Scenario 4 Overview R0

**Initial Conditions:** Unit 1 100% power - EOL, Unit 2: 100%, Unit 3: 108%

**Turnover:**

- AMSAC/DSS bypassed for I&E testing
- LDST pressure is LOW
- Unit 1 TDEFDWP has been out of service for bearing replacement for about 16 hours. Expect it to be returned to service within the next 2 hours.

**1) Pressurize the LDST with $H^2$: (N, BOP)**

Crew should refer to the "LDST Pressure vs Level" curve. The crew should then add $H^2$ to the LDST.

TIME = 10 minutes

**2) 1H-1 fails OPEN: (C, BOP) (TS)**

During the $H^2$ addition to the LDST, 1H-1 (LDST Supply) will fail OPEN requiring the OATC to direct the primary NEQ to close the isolation valve to stop the $H^2$ addition. Isolation by the NEO will be delayed and BOTH trains of HPI must be declared inoperable due to operation outside of permissible Operating Region on the "LDST Pressure vs Level" curve.

TIME = 5 minutes, TOTAL 15 min

**3) 1A CC Pump trips: (C, BOP)**

a) The crew should refer to ARG and to AP/020 (Loss of Component Cooling). The OATC should manually start the standby CC pump.
b) The crew should initiate investigation and repair of 1A CC pump and 1B CC auto start failure.

TIME = 5 minutes. TOTAL 20 min.

**4) $T_{hot}$ fails HIGH: (I, OATC)**

a) The crew should diagnose the failure and stabilize the plant by using the "Plant Transient Response" process.
b) The OATC should place both FDW Masters and the Diamond Panel to manual to mitigate the transient and stabilize the plant.
c) This failure will not be repaired and the ICS will remain in manual.
d) The SRO should refer to AP/28 (ICS Instrument Failures).

TIME = 5 minutes, TOTAL 25 min

**5) 1D1 Heater Drain Pump oil leak: (C, All)**

a) The basement NEO will notify the control room that the 1D1 HDP has a severe oil leak. Crew should refer to OP/1//1106/002D (Shutdown of the 1D1 HDP). The SRO should direct the crew to reduce CTP to < 87% and secure the 1D1 HDP.

TIME = 10 minutes. TOTAL 35 min.

**6) Manual reactor power decrease: (R, QATC)**

a) The OATC should seduce power with the control rods and the FDW Masters in manual.

TIME = 15 minutes. TOTAL 50 min.

**7) Turbine Trip, ATWS: (C, QATC)**

a) The turbine will trip **but** the reactor will not trip. The OATC will perform IMAs and determine that the reactor has not tripped. The OATC will perform Rule 1 (ATWS/Unanticipated Nuclear Power Production). The SRO will enter the EOP and transfer to the **UNPP** tab.

TIME = 10 minutes. TOTAL 60 min.

**8) Loss of Main Feedwater: (C, ALL)**

a) After the reactor has been shutdown and the SRO transfers back to Subsequent Actions both main FDW pumps will trip. Rule 3 (boss of Main or Emergency Feedwater) should be implemented. The failure of 1A MDEFDWP should be diagnosed and the 1B MDEFDWP should be aligned to feed both headers.

TIME = 10 minutes. TOTAL 70 min.

**9) Loss of Main and Emergency Feedwater, 1B MDEFDWP trips (CBP Feed): (M, ALL)**

a) After flow has been estabiished through both headers the 1B MDEFDWP will trip This results in a total loss of Main and Emergency Feedwater. The SRO should transfer to the Loss of Heat Transfer (LOHT) tab of the EOP. The QATC should feed the OTSGs using the CBPs per the guidance in Rule 3 **(Loss** of Main or Emergency Feedwater).

TIME = 10 minutes, TOTAL 80 min.

**10) TDEFDWP returned (CBP feed recovery)**

a) After the plant is stable, the crew will be notified that the TBEFBWP has been repaired and is now available. The SRO will direct the crew to recover from CBP feed by using the TDEFDWP to feed the SGs per EOP guidance. When the TDEFDWP is feeding the SGs and the unit is stable the scenario may be stopped.

TIME = 10 minutes, TOTAL 90 min.