

# **SIMULATOR OPERATOR INSTRUCTIONS FOR 2021 NRC RE-EXAM SCENARIO #1**

## ***GENERAL REQUIREMENTS***

- Recorders will be rolled prior to the scenario and paper from selected recorders will be retained for the examination team as requested.
- All procedures, flow charts, curves, graphs, etc. will be in their normal storage places.
- All markable procedures, boards, etc. will be erased.
- All paper used by the Crew will be retained for the examination team as requested.
- The simulator operators will keep a log of all communications during the scenario as requested by the examination team.

## ***SCENARIO SOURCE HISTORY***

- This scenario is a new scenario written for the 2021 NRC re-exam.

## ***INITIAL SETUP***

### **Initial Conditions**

- Reset to IC-14, 100% power
- Lower Reactor Power to 95%
- 'B' Loop of RHR is in Torus Cooling with the 'D' RHR and HPSW Pumps
- Insert Control Rods 38-07 and 34-07 to position 34
- Load Batch File: ATWS\_JAV
- Print a copy of SO 10.1.D-2 and placekeep up to step 4.12.3
- Develop a Rod Pull Sheet for Control Rods 34-07 and 38-07

### **Blocking Tags**

- None

### **Event Triggers**

- None

## Malfunctions

### INSERTED

- **HPO04TO**, Includes K27, K28, K36, K57 Relays - **Override**
- **CRM023807**, Control Rod (38-07) Stuck

### TRG 2

- **HPC07**, HPCI Steam Supply Line Break – **3% SV**

### TRG 3

- **MFS02B**, Reactor Feedwater Pump B High Vibes – **50% SV, 10 Min Ramp**

### TRG 4

- **PCS07**, Break in Torus Water Space – **100%, 25 Min Ramp, Initial SV 10%**

## Overrides

### TRG 1

- **ANO201RB13**, Inner Screen or Pump – **ALARM\_ON**

## Trip Overrides

None

## Remote Functions

### TRG 5

- **RHR25**, MO-176 Power Supply Breaker - **CLOSE**

### TRG 6

- **T221\_1**, Remove Low PRV Level GP1 Isolation - **DEFEAT**

### TRG 7

- **T214** – Venting Scram Air Header - **VENT**

## Turnover Procedures

None

## **SIMULATOR OPERATOR DIRECTIONS**

### **EVENT 1**      **Secure Torus Cooling**

Support crew actions for securing Torus cooling.

When directed to open HV-2-10-70B, wait 1 minute and toggle remote function **RHR02B, LPCI Line B Stayfull Valve HV-70B**, to **OPEN**.

### **EVENT 2**      **Fire in 'D' HPSW Pump**

Prior to the crew securing the 'D' HPSW pump and when directed by the Lead Examiner, insert **TRG 1** and verify the following override activates:

- **ANO201RB13**, Inner Screen or Pump – **ALARM\_ON**

When the Fire Brigade is dispatched, acknowledge as all required responders. Wait 1 minute and report as the Fire Brigade Leader that the 'D' HPSW Pump is on fire.

When the crew reports the 'D' HPSW pump has been secured, wait 1 minute and report the fire is out.

### **EVENT 3**      **Withdrawal of Control Rods**

Support crew actions for withdrawing control rods.

### **EVENT 4**      **Stuck Control Rod**

Support crew actions for withdrawing control rods.

When the crew raises drive water pressure, delete malfunction **CRM023807**.

### **EVENT 5**      **HPCI Steam Leak**

When directed by the Lead Examiner, insert **TRG 2** and verify that the following events activate:

- **HPC07**, HPCI Steam Supply Line Break – **3% SV**

When directed to investigate high temperature in the HPCI room, report that steam is in the HPCI room.

If dispatched as the Fire Brigade, acknowledge as the fire brigade members.

When directed to remove power from the closed HPCI Steam Supply Valve, wait 2 minutes and insert malfunction **VED01\_02 (HPCI MO-16)** or **VED01\_03 (HPCI MO-15)**, as appropriate.

**EVENT 6**      **High Vibes on 'B' RFP**

When directed by the lead examiner, insert **TRG 3** and verify the following event activates:

- **MFS02B**, Reactor Feedwater Pump B High Vibes – **50% SV, 10 Min Ramp**

Support crew actions for securing the 'B' RFP.

If dispatched to investigate high vibrations on the 'B' RFP, wait 3 minutes and report the pump is vibrating slightly.

**EVENT 7**      **Torus Water Leak**

When directed by the Lead Examiner, insert **TRG 4** and verify that the following events activate:

- **PCS07**, Break in Torus Water Space – **100%, 25 Min Ramp, Initial SV 10%**

If directed to investigate lowering Torus water level, wait 3 minutes, and report you hear rushing water at the Torus Room door. When directed to close MO-2-10-176 supply breaker, wait 2 minutes, and insert **TRG 5** and verify the following event activates:

- **RHR25** – MO-176 Power Supply Breaker - **CLOSE**

When directed to close HV-2-10-70A, wait 2 minutes and toggle remote function **RHR02A, LPCI Line A Stayfull Valve HV-70A**, to **CLOSE**, and report completion.

**EVENT 8**      **Electric ATWS**

When directed to perform T-221, wait 3 minutes and insert **TRG 6**, and verify the following remote activates:

- **T221\_1**, Remove Low PRV Level GP1 Isolation - **DEFEAT**

When directed to perform T-214, wait until directed by the Lead Examiner and insert **TRG 7** and verify the following remote activates:

- **T214** – Venting Scram Air Header – **VENT**

Report completion of T-214 and T-221 to the Control Room.

**TERMINATION** The scenario may be terminated once 5 ADS valves are open and RPV Water Level is being restored to the normal band.

## **SHIFT TURNOVER**

### **PLANT CONDITIONS:**

Unit 2 is at 95% power with no equipment out of service. HPCI has been secured from a test run and is aligned for autostart. 'B' loop of RHR is in Torus Cooling with the 'D' HPSW and RHR Pumps. Control Rods 34-07 and 38-07 have been inserted to position 34 for a required retest.

### **INOPERABLE EQUIPMENT/LCOs:**

None

### **SCHEDULED EVOLUTIONS:**

Secure Torus Cooling  
Withdraw control rods 34-07 and 38-07.

### **SURVEILLANCES DUE THIS SHIFT:**

None

### **ACTIVE CLEARANCES:**

None

### **GENERAL INFORMATION:**

None

## CRITICAL TASKS

1. **Isolate the steam leak prior to a second area maximum safe temperature being exceeded in the Secondary Containment.**
  - a. Safety Significance – Failure to isolate the steam leak will result in secondary containment temperature exceeding design limits and ultimately a loss of secondary containment.
  - b. Cue – Rising temperatures in the HPCI Room and failure of the HPCI Steam Isolation valves to automatically close.
  - c. Measurable Performance Indicators – Placing the control switch for the HPCI Steam Inboard or Outboard Isolation valve to CLOSE.
  - d. Performance Feedback - HPCI Steam Isolation valves indicating closed and lowering temperatures in the HPCI Room.
  
2. **Begin to lower RPV Water Level to < -60” within 5 minutes of a failure to scram condition.**
  - a. Safety Significance – Failure to lower RPV water level will result in thermal/hydraulic instabilities and ultimately damage to the fuel cladding.
  - b. Cue – Control Rods not inserting following a valid scram signal.
  - c. Measurable Performance Indicators – Stopping Feedwater and HPCI injection sources.
  - d. Performance Feedback – Lowering RPV water level.
  
3. **When the ATWS is terminated, open 5 ADS valves prior to Torus Water Level reaching 7’.**
  - a. Safety Significance – Failure to do so will result in a loss of suppression function of the Primary Containment and containment failure upon initiation of a blowdown.
  - b. Cue – Torus Water Level lowering.
  - c. Measurable Performance Indicators – Operating DEHC to lower RPV pressure to 350 psig.
  - d. Performance Feedback – RPV Pressure lowering.

**Operator Actions**

**ES-D-2**

**Op Test No.:** 2                      **Scenario No.:** 1                      **Event No.:** 1

**Event Description:** Secure Torus Cooling

**Cause:** N/A

**Effects:** N/A

<u>Time</u>	<u>Position</u>	<u>Applicant's Actions or Behavior</u>
	CRS	Direct the PRO to secure Torus Cooling on the B RHR loop per SO 10.1.D-2, Residual Heat Removal System Torus Cooling, and SO 32.2.A-2, HPSW System Shutdown.
	PRO	<ol style="list-style-type: none"><li>1. Obtains a copy of SO 10.1.D-2 and performs the following:<ol style="list-style-type: none"><li>a. Close MO-2-10-034B, Full Flow Test.</li><li>b. Secure the 'D' RHR Pump.</li><li>c. Close MO-2-10-039B, Torus Hdr</li><li>d. Verify both white lights are lit for CV-2-10-2677D.</li><li>e. Verify alarm 219 G-5, RHR CV-2677D Not Aligned for LPCI, is clear.</li></ol></li> <li>2. Obtains a copy of SO 32.2.A-2 and performs the following:<ol style="list-style-type: none"><li>a. Shutdown the 'D' HPSW Pump.</li><li>b. Close MO-2-10-089D, RHR Hx 2D</li><li>c. Verifies CHK-2-32-502D, HPSW 2D P042 Discharge Check Valve, is closed.</li></ol></li></ol>

## Operator Actions

ES-D-2

Op Test No.: 2

Scenario 1  
No.:

Event No.: 2

**Event Description:** Fire in 'B' HPSW Pump

**Cause:** Short in 'B' HPSW pump motor.

**Effects:** Fire alarm in the Inner Screen Pump Area

<u>Time</u>	<u>Position</u>	<u>Applicant's Actions or Behavior</u>
	PRO	1. Recognize and report alarm 008 B-7A, Inner Screen or Pump Structure Heat/Smoke Det., alarm is in.
	CRS	1. Directs dispatching the Fire Brigade per the Rapid Response Card. 2. Updates and enters ON-114, Actual Fire Reported in the Power Block, Diesel Generator Building, Emergency Pump, Inner Screen or Emergency Cooling Tower Structures.
	PRO	1. Obtains RRC FF-01, Dispatch of Fire Brigade. 2. Sounds the Station Alert Tone. 3. Announces for Fire Brigade to respond to a fire alarm in the Inner Screen House. 4. Acknowledges reports of the Fire Brigade manning stations. 5. Acknowledges and reports that the fire is in the 'D' HPSW Pump.
	CRS	1. Directs PRO to secure the 'D' HPSW pump and report completion to the Fire Brigade Leader.
	PRO	1. Places the control switch for the 'D' HPSW Pump in STOP. 2. Reports to the Fire Brigade leader that the 'D' HPSW Pump has been secured. 3. Acknowledges and reports that the fire is out.
<b>TS</b>	CRS	1. Acknowledges report that the fire is out. 2. Declares the HPSW pump inoperable and enters a 7-day LCO per T.S. 3.7.1.A. 3. Declares the 'B' Torus Cooling subsystem inoperable and enters a 7-day LCO per TS 3.6.2.3. 4. Declares the 'B' Torus Spray subsystem inoperable and enters a 7-day LCO per TS 3.6.2.4. 5. Declares the 'B' Drywell Spray subsystem inoperable and enters a 7-day LCO per TS 3.6.2.5.



**Operator Actions**

**ES-D-2**

**Op Test No.:** 2      **Scenario No.:** 1      **Event No.:** 3

**Event Description:**      Withdrawing Control Rods to Full Out Position

**Cause:**      None

**Effects:**      None

<u>Time</u>	<u>Position</u>	<u>Applicant's Actions or Behavior</u>
	CRS	1. Directs URO to restore control rods 34-07 and 38-07 to the full out position.
	URO	1. Obtains a copy of SO 62.1.A-2, Withdrawing/Inserting a Control Rod, and performs the following for rod 34-07 and 38-07. a. Places the Rod Select Power Switch in ON. b. Depresses the pushbutton for rod 34-07. c. Verify rod 34-07 is selected on the Full Core Display and the Four Rod Display. d. Verifies the Rod Withdraw Permissive Light is lit. e. Places and holds the Emergency In/Notch Override Switch to the NOTCH OVERRIDE position. f. Places and holds the Rod Control Switch to the OUT NOTCH position. g. Releases both switches when the control rod reaches position 48. h. Performs a coupling check for the control rod.
	PRO	1. Provides a peer check for rod withdrawal.

**Operator Actions**

**ES-D-2**

**Op Test No.:** 2      **Scenario No.:** 1      **Event No.:** 4

**Event Description:** Stuck Control Rod

**Cause:** Stuck Control Rod Blade

**Effects:** Cannot withdraw or insert control rod.

<u>Time</u>	<u>Position</u>	<u>Applicant's Actions or Behavior</u>
	URO	<ol style="list-style-type: none"><li>1. Recognizes and reports that control rod 38-07 is stuck.</li><li>2. Throttles closed MO-2-03-022, Drive Water Press, to raise drive water pressure by 50 psig.</li><li>3. Attempts to withdraw the control rod.</li><li>4. Recognizes and reports the control rod is moving.</li><li>5. Throttles open MO-2-03-022 to return drive water pressure to between 260 psid and 280 psid.</li></ol>
	PRO	<ol style="list-style-type: none"><li>1. Provides peer checks for the component manipulations.</li></ol>
	CRS	<ol style="list-style-type: none"><li>1. Acknowledges report from the URO.</li></ol>

## Operator Actions

ES-D-2

Op Test No.: 2 Scenario No.: 1 Event No.: 5

Event Description: HPCI Steam Leak

Cause: Rupture in HPCI Steam Supply Line

Effects: Rising temperatures in the HPCI room

<u>Time</u>	<u>Position</u>	<u>Applicant's Actions or Behavior</u>
	URO	1. Recognize and Report alarm 210 J-3, High Area Temp Alarm in.
	PRO	1. Investigates the cause of the high temperature alarm. 2. Recognizes and reports that HPCI room temperatures are above the alarm setpoint. 3. Updates the crew on entry into T-103, Secondary Containment Control, due to high area temperatures. 4. Recognizes and reports fire alarms in the Reactor building. 5. Dispatches the Fire Brigade to the HPCI Room. 6. Acknowledges report from the Fire Brigade Leader of steam in the HPCI room. 7. Recognizes and reports HPCI failed to isolate on high temperature.
<b>CT1</b>		8. <b>Manually isolates HPCI by closing either the HPCI MO-15 or the HPCI MO-16 valve.</b> 9. Reports that secondary containment temperatures are lowering. 10. Dispatches EO to open the circuit breaker for the closed HPCI Steam Isolation Valve.
	CRS	1. Directs URO to dispatch the Fire Brigade to the HPCI room. 2. Acknowledges report of steam in the HPCI room. 3. Acknowledges report of HPCI failing to isolate on high temperature.
<b>TS</b>		4. Directs PRO to manually isolate HPCI. 5. <b>Declares HPCI inoperable and enters a 14 day LCO per T.S. 3.5.1.C.</b> 6. Directs PRO to open the circuit breaker for the closed HPCI Steam Isolation Valve.

## Operator Actions

ES-D-2

Op Test No.: 2      Scenario No.: 1      Event No.: 6

**Event Description:** 'B' RFP High Vibrations

**Cause:** Clog in 'B' RFP Oil line

**Effects:** Rising vibrations on the 'B' RFP

<u>Time</u>	<u>Position</u>	<u>Applicant's Actions or Behavior</u>
	PRO	<ol style="list-style-type: none"><li>1. Recognize and report alarm 202 E-2, B RFPT Vibration High, is in.</li><li>2. Checks the vibration monitoring screen of PPC to determine vibration levels.</li><li>3. Reports that both vibration probes have exceeded 5 mils and the B RFP is required to be secured.</li></ol>
	CRS	<ol style="list-style-type: none"><li>1. Acknowledges the report of high vibrations on the B RFP.</li><li>2. Determines that feedwater flow must be lowered below 85%.</li><li>3. Directs URO to perform GP-9 to lower RFP vibrations.</li><li>4. Directs URO to secure the B RFP per SO 6D.2.A-2, Reactor Feedwater Pump Shutdown.</li><li>5. Acknowledges that the B RFP has been secured.</li></ol>
	URO	<ol style="list-style-type: none"><li>1. Depresses the A and B Recirc Pump Speed pushbuttons as necessary to lower reactor power.</li><li>2. Report reactor power is below 85% and feedwater flow is less than 85%.</li><li>3. Performs SO 6D.2.A-2 as follows:<ol style="list-style-type: none"><li>a. Notifies Chemistry of securing B RFP.</li><li>b. Opens AO-2139B, Feed Pump B Recirc.</li><li>c. Closes AO-2147B, Feed Pump B Check.</li><li>d. Places B RFP M/A Station in Manual.</li><li>e. Closes MO-2149B, Feed Pump B Disch and verifies remaining RFPs respond.</li><li>f. Lowers RFP speed demand to 0 rpm or Emergency Stops the B RFP.</li><li>g. Depresses the Turbine Trip B pushbutton.</li></ol></li><li>4. Reports that the B RFP is secured.</li></ol>

## Operator Actions

ES-D-2

Op Test No.: 2                      Scenario No.: 1                      Event No.: 7/8

**Event Description:** Torus Water Leak/ATWS

**Cause:** Unisolable rupture in the Torus

**Effects:** Lowering Torus water level and rising Torus Room level.

<u>Time</u>	<u>Position</u>	<u>Applicant's Actions or Behavior</u>
	PRO	<ol style="list-style-type: none"><li>1. Recognize and report alarm 226 A-4, Torus Water Level out of Normal Range.</li><li>2. Reports Torus water level is lowering.</li><li>3. Directs EO to investigate lowering Torus water level.</li><li>4. Recognizes and reports alarm 224 E-5, Torus Room Flood.</li></ol>
	CRS	<ol style="list-style-type: none"><li>1. Acknowledges report of lowering Torus water level.</li><li>2. Updates and enters T-102, Primary Containment Control, and T-103, Secondary Containment Control.</li><li>3. Directs PRO to perform T-231, HPSW Injection into the Torus, and T-233, CST Makeup to the Tours via HPCI Minimum Flow Line.</li><li>4. Directs a GP-15 Evacuation of the Torus Room.</li></ol>
	PRO	<ol style="list-style-type: none"><li>1. Performs the following for T-233:<ol style="list-style-type: none"><li>a. Verifies open MO-2-23-017, Cond Tank Suction.</li><li>b. Throttles open MO-2-23-025, Min Flow.</li></ol></li><li>2. Performs the following for T-231:<ol style="list-style-type: none"><li>a. Dispatches an EO to close breaker E324-R-B for MO-2-10-176.</li><li>b. Verifies closed MO-2-10-154B, Outboard Disch.</li><li>c. Verifies RHR pumps are secured.</li><li>d. Verifies HPSW pumps are secured.</li><li>e. Verifies MO-2-10-89A and C are closed.</li><li>f. Opens MO-2-32-2344 HPSW Loop Cross Tie.</li><li>g. Opens MO-2-10-174 and 176.</li><li>h. Opens MO-2-10-39B, Torus Hdr.</li><li>i. Starts the A or C HPSW pump.</li><li>j. Throttle open MO-2-10-034B, Full Flow Test.</li><li>k. Starts the second HPSW pump (A or C).</li><li>l. Establishes 10,600 gpm flowrate on HPSW.</li></ol></li><li>3. Reports that HPSW is injecting into the Torus.</li><li>4. Reports that Torus water level is still lowering.</li></ol>

**Operator Actions****ES-D-2**

**Op Test No.:** 2                      **Scenario No.:** 1                      **Event No.:** 7/8 (cont'd)

**Event Description:** Torus Water Leak/ATWS

<u>Time</u>	<u>Position</u>	<u>Applicant's Actions or Behavior</u>
	CRS	<ol style="list-style-type: none"> <li>1. Updates the crew on performing a GP-4 Shutdown.</li> <li>2. Directs URO and PRO to perform a GP-4 Shutdown.</li> <li>3. Updates and enters T-101, RPV Control.</li> <li>4. Acknowledges that power is not downscale.</li> <li>5. Updates and enters T-117, ATWS RPV Control.</li> <li>6. Directs ROs to perform their ATWS Rapid Response Cards.</li> <li>7. Directs ROs to perform T-221, Main Steam Isolation Valve Bypass, T-213, Scram Solenoid De-energization, T-214, Isolating and Venting the Scram Air Header, and T-220, Driving Control Rods during a Failure to Scram.</li> <li>8. Directs URO to inject SBLC and report SBLC tank level.</li> </ol>
	URO	<ol style="list-style-type: none"> <li>1. Depresses the Scram Pushbuttons.</li> <li>2. Places the Mode Switch in Shutdown.</li> <li>3. Emergency stops feedwater pumps as necessary to maintain RPV water level below the Main Turbine Trip setpoint.</li> <li>4. Reports control rods are not inserting, and power is not downscale.</li> <li>5. Manually initiates ARI.</li> <li>6. Reports that ARI has failed to initiate.</li> <li>7. Verifies that Recirc Pumps are at minimum.</li> <li>8. Trips the Recirc Pumps 10 seconds apart.</li> <li>9. Report reactor power and ready to inject SBLC.</li> <li>10. When directed, starts the A or B SBLC Pump and reports SBLC Tank Level.</li> <li>11. Closes AO-039 and AO-040, Recirc Sample Valves.</li> <li>12. Verifies RWCU has isolated.</li> <li>13. Verify SDV vents and drains are closed.</li> </ol>
	PRO	<ol style="list-style-type: none"> <li>1. Places ADS keylock switches in INHIBIT. Report to CRS that ADS is inhibited and ready to perform T-240.</li> </ol>
	CRS	<ol style="list-style-type: none"> <li>1. Directs PRO to perform T-240, Attachment 1, Figure 1.</li> <li>2. Directs PRO to establish a control band of -70" to -130".</li> </ol>

**Operator Actions****ES-D-2**

**Op Test No.:** 2                      **Scenario No.:** 1                      **Event No.:** 7/8 (cont'd)

**Event Description:** Torus Water Leak/ATWS

<u>Time</u>	<u>Position</u>	<u>Applicant's Actions or Behavior</u>
CT2	PRO	<ol style="list-style-type: none"> <li>1. Places HPCI Aux Oil Pump control switch in PTL.</li> <li>2. Emergency Stops All feedwater pumps.</li> <li>3. Places all feedwater pump discharge valve control switches in CLOSE.</li> <li>4. Stops the 'C' feedwater pump discharge valve when RPV water level is &lt; -60".</li> <li>5. Raises speed on the 'C' Feedwater Pump to establish injection.</li> <li>6. Stabilizes level within a band of -70" to -130".</li> <li>7. Places DFWC in ATWS Mode.</li> <li>8. Places the 'C' Feedwater Pump control station in AUTO.</li> <li>9. Verifies Group II and III isolations.</li> <li>10. Verifies HWC is isolated.</li> <li>11. Reports Instrument Air pressure is greater than Drywell pressure.</li> <li>12. Bypasses and restores Drywell Instrument Nitrogen as follows:               <ol style="list-style-type: none"> <li>a. Place AO-2969A and B control switches in CLOSE.</li> <li>b. Place D/W Inst. N2 keylock switches in BYPASS.</li> <li>c. Verifies alarm 219 G-1, Drywell Inst. N2 Valves Isolation Bypass is in.</li> <li>d. Place AO-2969A and B control switches in AUTO/OPEN.</li> </ol> </li> </ol>
	CRS	<ol style="list-style-type: none"> <li>1. Updates that Torus water level continues to lower.</li> <li>2. Updates and enters T-112, RPV Blowdown.</li> <li>3. Directs PRO to terminate and prevent uncontrolled RPV injection per T-240, Attachment 1, Figure 3.</li> <li>4. Directs URO to lower RPV pressure to 350 psig using DEHC.</li> </ol>
	PRO	<ol style="list-style-type: none"> <li>1. Verifies automatic control of feedwater.</li> <li>2. Directs EO to perform T-240, step 4.5. (not required to be completed before blowdown)</li> <li>3. Reports that T-240, Attachment 1, Figure 3 is complete.</li> </ol>
	URO	<ol style="list-style-type: none"> <li>1. Enters 350 psig setpoint in DEHC.</li> <li>2. Establishes a rate of pressure change on DEHC.</li> <li>3. Depresses GO and lowers RPV pressure to 350 psig.</li> </ol>

**Operator Actions**

**ES-D-2**

**Op Test No.: 2**

**Scenario 1  
No.:**

**Event No.: 7/8 (cont'd)**

**Event Description:** Torus Leak/ATWS

<u>Time</u>	<u>Position</u>	<u>Applicant's Actions or Behavior</u>
	URO	<ol style="list-style-type: none"><li>1. Reports that Scram Air Header pressure is lowering.</li><li>2. Reports that control rods are inserting and APRMs are downscale.</li><li>3. Verifies and reports that all control rods are fully inserted.</li><li>4. When directed, raises RPV water level to between +5" and +35"</li></ol>
	CRS	<ol style="list-style-type: none"><li>1. Updates exit of T-117, ATWS RPV Control, and enters T-101, RPV Control.</li><li>2. Directs URO to establish and maintain RPV water level between +5 and +35".</li><li>3. Verifies Torus water level is above 7'.</li><li>4. Directs PRO to open all ADS valves.</li></ol>
	<b>CT3</b> PRO	<ol style="list-style-type: none"><li>1. <b>Opens all 5 ADS valves.</b></li></ol>

**TERMINATION CRITERIA:**

The scenario may be terminated once 5 ADS valves are open and RPV Water Level is being restored to the normal band.



## **SIMULATOR OPERATOR INSTRUCTIONS FOR 2021 NRC RE-EXAM SCENARIO #2**

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- All markable procedures, boards, etc. will be erased.
- All paper used by the Crew will be retained for the examination team as requested.
- The simulator operators will keep a log of all communications during the scenario as requested by the examination team.

### ***SCENARIO SOURCE HISTORY***

- This scenario is a new scenario written for the 2021 NRC re-exam.

### ***INITIAL SETUP***

#### **Initial Conditions**

- Reset to IC-9, 4% power
- Develop partial procedure of ST-O-003-450-2 to test AO-2-03-032A only.
- Placekeep Rod Withdraw Sequence book to Step 7.
- Placekeep SO 62.1.A-2 up to step 4.8.

#### **Blocking Tags**

- None

#### **Event Triggers**

- None

## Malfunctions

### INSERTED

- **HPC01**, Failure of HPCI to Autostart

### TRG 4

- **APR01D**, APRM Ch 4 Failure – **130%**

### TRG 2

- **DCW02A**, DW Chilled Water Chiller A Trip

### TRG 5

- **APR01A**, APRM Ch 1 Failure – **130%**

### TRG 6

- **MCS05C**, Condensate Pump C Trip
- **RRS20**, Recirculation Loop Rupture – **3% SV, 5 Min Ramp**

### TRG 7

- **RVI11A**, Sensing Line Break – Narrow Range Level
- **RVI11B**, Sensing Line Break – Narrow Range Level
- **RVI12A**, Sensing Line Break – Wide Range Level
- **RVI12B**, Sensing Line Break – Wide Range Level
- **RVI13A**, Sensing Line Break – Active Core Level
- **RVI13B**, Sensing Line Break – Active Core Level

## Overrides

### TRG 1

- **ZGI02A4S03**, Emerg In Notch Override Switch – **OFF**
- **ZGI02A4S09**, Rod Movement Control Switch – **OFF**
- **ANO205RF5**, RWM Rod Block – **ALARM\_ON**

### TRG 3

- **ZGI13A2S80B**, RCIC Man Initiation Pushbutton – **ARMED**
- **ZGI13A2S80A**, RCIC Man Initiation Pushbutton – **ON, 1 Min Delay, 1 Min 5 Sec Delete Time**
- **ANO204CA2**, RCIC Turb or Logic in Test – **ALARM\_OFF**
- **ANO309LF2**, SMS System Triggered – **ALARM\_ON**
- **ANO309LG2**, OBE Exceeded – **ALARM\_ON**

### TRG 7 (done later in scenario)

- **ANO309LF2**, SMS System Triggered – **ALARM\_ON**
- **ANO309LG2**, OBE Exceeded – **ALARM\_ON**

## Trip Overrides

None

## Remote Functions

- None

## Turnover Procedures

None

## **SIMULATOR OPERATOR DIRECTIONS**

### **EVENT 1**      **Scram Discharge Volume Vent and Drain Surveillance**

Support crew actions for testing the SDV Vents and Drains.

### **EVENT 2**      **Withdrawing Control Rods**

Support crew actions for withdrawing control rods.

### **EVENT 3**      **Rod Worth Minimizer Rod Block**

After the crew has withdrew 2 control rods and at the direction of the lead examiner, insert **TRG 1** and verify that the following events activate:

- **ZGI02A4S03**, Emerg In Notch Override Switch – **OFF**
- **ZGI02A4S09**, Rod Movement Control Switch – **OFF**
- **ANO205RF5**, RWM Rod Block – **ALARM\_ON**

When the crew attempts to initialize the RWM, delete the above malfunctions.

### **EVENT 4**      **APRM D Fails Upscale**

When directed by the Lead Examiner, insert **TRG 4** and verify that the following events activate:

**APR01D**, APRM Ch 4 Failure – **130%**

### **EVENT 5**      **A Drywell Chiller Trip**

When directed by the Lead Examiner, insert **TRG 2** and verify that the following events activate:

- **DCW02A**, DW Chilled Water Chiller A Trip

Support crew activities for starting the B or C Drywell Chiller.

If directed to investigate the trip of the 'A' Drywell Chiller, wait 2 minutes and report there is an acrid odor coming from the chiller and no fire or smoke.

**EVENT 6**      **Earthquake/RCIC Spurious Start**

When directed by the lead examiner, insert **TRG 3** and verify that the following events activate:

- **ZGI13A2S80B**, RCIC Man Initiation Pushbutton – **ARMED**
- **ZGI13A2S80A**, RCIC Man Initiation Pushbutton – **ON, 1 Min Delay, 1 Min 5 Sec Delete Time**
- **ANO204CA2**, RCIC Turb or Logic in Test – **ALARM\_OFF**
- **ANO309LF2**, SMS System Triggered – **ALARM\_ON**
- **ANO309LG2**, OBE Exceeded – **ALARM\_ON**

When dispatched to the Cable Spread Room to check for indications of an Earthquake, wait 2 minutes and report the yellow triggered lights are lit and the red OBE light is lit. After the report, delete the following overrides and reassign them to **TRG 7**:

- **ANO309LF2**, SMS System Triggered – **ALARM\_ON**
- **ANO309LG2**, OBE Exceeded – **ALARM\_ON**

When directed to investigate RCIC spurious start, wait 5 minutes and report no obvious indications of why RCIC started.

**EVENT 7**      **A APRM Fails Upscale**

When directed by the Lead Examiner, insert **TRG 5** and verify that the following events activate:

**APR01A**, APRM Ch 1 Failure – **130%**

**EVENT 8**      **Loss of Condensate/Recirc Leak**

When directed by the Lead Examiner, insert **TRG 6** and verify that the following events activate:

- **MCS05C**, Condensate Pump C Trip
- **RRC20**, Recirculation Loop Rupture – **3% SV, 5 Min Ramp**

If directed to investigate trip of the C Condensate Pump, wait 5 minutes and report overcurrent flags are in.

**EVENT 9**      **HPCI/RCIC Fails to Autostart**

Support crew actions for starting HPCI and RCIC.

## **EVENT 10**

### **Aftershock/Loss of Level Indication**

When directed by the Lead Examiner, insert **TRG 7** and verify the following events activate:

- **RVI11A**, Sensing Line Break – Narrow Range Level
- **RVI11B**, Sensing Line Break – Narrow Range Level
- **RVI12A**, Sensing Line Break – Wide Range Level
- **RVI12B**, Sensing Line Break – Wide Range Level
- **RVI13A**, Sensing Line Break – Active Core Level
- **RVI13B**, Sensing Line Break – Active Core Level
- **ANO309LF2**, SMS System Triggered – **ALARM\_ON**
- **ANO309LG2**, OBE Exceeded – **ALARM\_ON**

## **TERMINATION**

The scenario may be terminated when an RPV blowdown is performed and the RPV is flooded to the Main Steam Lines.

## **SHIFT TURNOVER**

### **PLANT CONDITIONS:**

Unit 2 is at 4-5% power with no equipment out of service during a reactor startup.

### **INOPERABLE EQUIPMENT/LCOs:**

None

### **SCHEDULED EVOLUTIONS:**

Scram Discharge Vent and Drain Valve Functional Test of AO-2-03-32A.  
Continue Reactor Startup

### **SURVEILLANCES DUE THIS SHIFT:**

ST-O-003-450-2, Scram Discharge Vent and Drain Valve Functional Test

### **ACTIVE CLEARANCES:**

None

### **GENERAL INFORMATION:**

None

## **CRITICAL TASKS**

- 1. Manually initiate HPCI and/or RCIC prior to RPV water level reaching TAF.**
  - a. Safety Significance – Failure to establish injection will result in uncovering the fuel and ultimately lead to damage to the fuel cladding.
  - b. Cue – RPV water level lowering and failure of HPCI and RCIC to automatically initiate.
  - c. Measurable Performance Indicators – Manually starting HPCI and RCIC and aligning them for injection into the RPV.
  - d. Performance Feedback – HPCI and RCIC speed and discharge pressure rising with rising RPV water level.
  
- 2. Perform an RPV Blowdown within 5 minutes of a complete loss of RPV Water Level Indication.**
  - a. Safety Significance – Failure to reduce pressure will prevent low pressure injection sources from injecting into the RPV and result in uncovering the fuel and ultimately lead to damage to the fuel cladding.
  - b. Cue – Loss of all level indications.
  - c. Measurable Performance Indicators – Opening 5 ADS valves.
  - d. Performance Feedback – Lowering RPV pressure.
  
- 3. Maintain core cooling by flooding the RPV to the Main Steam Lines within 10 minutes of completing the Emergency Blowdown.**
  - a. Safety Significance – Failure to flood the RPV will result in uncovering the fuel and ultimately lead to damage to the fuel cladding.
  - b. Cue – RPV pressure below the shutoff head pressure of LP ECCS Pumps.
  - c. Measurable Performance Indicators – Starting RHR and Core Spray Pumps and initiating Injection until indications of RPV flooding are observed.
  - d. Performance Feedback – Lowering SRV Tailpipe temperatures and rising RPV pressure.

**Operator Actions**

**ES-D-2**

**Op Test No.:** 2                      **Scenario No.:** 2                      **Event No.:** 1

**Event Description:** SDV Functional Test

**Cause:** N/A

**Effects:** N/A

<u>Time</u>	<u>Position</u>	<u>Applicant's Actions or Behavior</u>
	CRS	Direct the URO to perform the functional test of AO-2-03-032A, Scram Disch Vol Isolation Vent.
	URO	1. Obtains a copy of ST-O-003-450-2 and performs the following: a. Places the Inboard Scram Disch Vol Isolation Switch in CLOSE and records the closure time of AO-2-03-032A. b. Verifies AO-2-03-032A is closed. c. Places the Inboard Scram Disch Vol Isolation Switch in OPEN. d. Verifies AO-2-03-032A is open. e. Report completion of the surveillance to the CRS.



**Operator Actions**

**ES-D-2**

**Op Test No.: 2**

**Scenario 2  
No.:**

**Event No.: 2**

**Event Description:** Continue Reactor Startup

**Cause:** N/A

**Effects:** N/A

<u>Time</u>	<u>Position</u>	<u>Applicant's Actions or Behavior</u>
	CRS	1. Directs URO to continue the reactor startup per the startup sequence.
	URO	1. Obtains a copy of SO 62.1.A-2, Withdrawing/Inserting a Control Rod, and performs the following for withdrawing control rods. a. Places the Rod Select Power Switch in ON. b. Depresses the pushbutton for the rods per the startup sequence. c. Verify rod is selected on the Full Core Display and the Four Rod Display. d. Verifies the Rod Withdraw Permissive Light is lit. e. Places and holds the Emergency In/Notch Override Switch to the NOTCH OVERRIDE position. f. Places and holds the Rod Control Switch to the OUT NOTCH position. g. Releases both switches when the control rod reaches position 12. 2. Reperforms the above steps for subsequent control rods.
	PRO	1. Provides a peer check for rod withdrawal.

**Operator Actions**

**ES-D-2**

**Op Test No.:** 2      **Scenario No.:** 2      **Event No.:** 3

**Event Description:** RWM Rod Block

**Cause:** None

**Effects:** None

<u>Time</u>	<u>Position</u>	<u>Applicant's Actions or Behavior</u>
	URO	<ol style="list-style-type: none"><li>1. Recognizes and reports alarm 211 F-5, RWM Rod Block, is in alarm.</li><li>2. Performs alarm response as follows:<ol style="list-style-type: none"><li>a. Verifies power is below the LPSP setpoint.</li><li>b. Verifies no indicated rod block on the RWM display.</li><li>c. Verifies Rod by Rod sequence is not active.</li><li>d. Verifies that BPWS enforcement is not active.</li><li>e. Attempts to re-initialize the RWM.</li></ol></li><li>3. Initializes the RWM per SO 62A.1.A-2, Rod Worth Minimizer System Initialization, as follows:<ol style="list-style-type: none"><li>a. Presses and holds the "System Initialize" pushbutton on the RWM panel.</li><li>b. Depresses "Full Core Display".</li><li>c. Verifies no substitute rod positions.</li><li>d. Depresses "RWM Main".</li><li>e. Depress and hold "System Diagnostic" pushbutton and verify light stays lit.</li><li>f. Verifies indicator lights operate as expected.</li><li>g. Depress and hold "System Diagnostic" pushbutton and verify light goes out.</li></ol></li><li>4. Recognize and report that the RWM alarm has cleared.</li></ol>
	CRS	<ol style="list-style-type: none"><li>1. Acknowledges report from the URO.</li></ol>

**Operator Actions**

**ES-D-2**

**Op Test No.:** 2      **Scenario No.:** 2      **Event No.:** 4

**Event Description:**      APRM D Fails Upscale

**Cause:**      Failure in APRM control circuit.

**Effects:**      Indication of high power on APRM D and HI-HI/INOP alarm.

<u>Time</u>	<u>Position</u>	<u>Applicant's Actions or Behavior</u>
	URO	<ol style="list-style-type: none"><li>1. Recognize and report alarm 211 A-3, APRM/OPRM Hi-Hi Inop, is in.</li><li>2. Recognizes and reports the D APRM has failed upscale.</li><li>3. Recognizes that only the D APRM is reading upscale.</li></ol>
	CRS	<ol style="list-style-type: none"><li>1. Acknowledges the report of the failed D APRM.</li><li>2. Directs URO to bypass the D APRM.</li></ol>
	URO	<ol style="list-style-type: none"><li>1. Acknowledges direction to bypass the D APRM.</li><li>2. Places the APRM Selector Switch to the 'D' position.</li></ol>

**Operator Actions**

**ES-D-2**

**Op Test No.:** 2      **Scenario No.:** 2      **Event No.:** 5

**Event Description:** A Drywell Chiller Trip

**Cause:** Compressor UV Breaker Trip.

**Effects:** Rising Drywell Temperature

<u>Time</u>	<u>Position</u>	<u>Applicant's Actions or Behavior</u>
	PRO	<ol style="list-style-type: none"><li>1. Recognize and report trip of the A Drywell Chiller.</li><li>2. Performs ARC 217 D-1, Drywell Chiller Trouble</li></ol>
	CRS	<ol style="list-style-type: none"><li>1. Directs PRO to start the B or C Drywell Chiller per SO 44A.6.A-2, Placing an Additional Drywell Chiller in Service.</li></ol>
	PRO	<ol style="list-style-type: none"><li>1. Places the control switch for the B(C) Drywell Chiller to START.</li><li>2. Verifies Chilled Water Flow.</li><li>3. Dispatches EO to vent the B(C) Drywell Chiller.</li></ol>

**Operator Actions**

**ES-D-2**

**Op Test No.:** 2      **Scenario No.:** 2      **Event No.:** 6

**Event Description:** Earthquake/RCIC Spurious Start

**Cause:** Short in the starting circuit for RCIC

**Effects:** RCIC turbine starts and injects into the RPV.

<u>Time</u>	<u>Position</u>	<u>Applicant's Actions or Behavior</u>
	PRO	<ol style="list-style-type: none"><li>1. Recognize and report Earthquake alarms are in.</li><li>2. Updates and enters SE-5, Earthquake.</li><li>3. Dispatches EO to the Cable Spread Room to investigate earthquake alarms.</li><li>4. Recognizes and reports multiple RCIC alarms are in.</li><li>5. Recognizes and reports that RCIC has started and is injecting into the RPV.</li><li>6. Directs EO to investigate spurious start of RCIC.</li></ol>
	CRS	<ol style="list-style-type: none"><li>1. Updates and enters OT-104, Positive Reactivity Addition.</li><li>2. Directs PRO to trip RCIC per the Rapid Response Card.</li></ol>
	PRO	<ol style="list-style-type: none"><li>1. Depresses the TRIP pushbutton for RCIC.</li><li>2. Closes MO-2-13-021, To Feed Line.</li><li>3. Closes MO-2-13-131, Supply.</li><li>4. Verifies closed MO-2-13-030, Full Flow Test.</li></ol>
<b>TS</b>	CRS	<ol style="list-style-type: none"><li>1. Enters a 14 day LCO for RCIC being inoperable per T.S. 3.5.3.A.</li></ol>

**Operator Actions**

**ES-D-2**

**Op Test No.:** 2      **Scenario No.:** 2      **Event No.:** 7

**Event Description:** A APRM Fails Upscale

**Cause:** Failure of the Monitoring circuit

**Effects:** Multiple high power alarms

<u>Time</u>	<u>Position</u>	<u>Applicant's Actions or Behavior</u>
	URO	<ol style="list-style-type: none"><li>1. Recognize and report alarm 211 A-3, APRM/OPRM Hi-Hi Inop, is in.</li><li>2. Recognizes and reports the 'A' APRM has failed upscale.</li><li>3. Recognizes that only the 'A' APRM is reading upscale.</li></ol>
<b>TS</b>	CRS	<ol style="list-style-type: none"><li>1. Acknowledges the report of the failed 'A' APRM.</li><li>2. Enters a 12 hour LCO for the 'A' APRM being inoperable per T.S. 3.3.1.1.A.</li></ol>

**Operator Actions****ES-D-2**

**Op Test No.:** 2                      **Scenario No.:** 2                      **Event No.:** 8

**Event Description:** Loss of Condensate/Recirc Water Leak

**Cause:** Overcurrent trip of Cond't Pump and Break in Recirc Loop

**Effects:** Pump Trips/HPCI does not automatically start and rising drywell pressure

<u>Time</u>	<u>Position</u>	<u>Applicant's Actions or Behavior</u>
	URO	<ol style="list-style-type: none"> <li>1. Recognizes and reports trip of the running Condensate Pump.</li> <li>2. Reports RPV water level is lowering.</li> <li>3. Recognizes and reports rising drywell pressure.</li> <li>4. Updates and reports performing a reactor scram.</li> </ol>
	CRS	<ol style="list-style-type: none"> <li>1. Acknowledges the report of the reactor scram.</li> <li>2. Updates and enters OT-101, High Drywell Pressure.</li> <li>3. Updates and enters T-101, RPV Control.</li> <li>4. Updates and enters T-102, Primary Containment Control.</li> <li>5. Directs URO to maintain RPV water level between +5 and +35" with HPCI and RCIC.</li> <li>6. Directs URO to maintain RPV pressure 300-500 psig with DEHC.</li> </ol>
	URO	<ol style="list-style-type: none"> <li>1. Depresses the Scram Pushbuttons.</li> <li>2. Places the Mode Switch in Shutdown.</li> <li>3. Reports control rods are inserting, and power is downscale.</li> <li>4. Verifies SDV vents and drains are closed.</li> <li>5. Recognizes failure of HPCI and RCIC to start. (See Event 9)</li> </ol>

**Operator Actions**

**ES-D-2**

**Op Test No.:** 2      **Scenario No.:** 2      **Event No.:** 8 cont.

**Event Description:** Loss of Condensate/Recirc Water Leak

<u>Time</u>	<u>Position</u>	<u>Applicant's Actions or Behavior</u>
	PRO	<ol style="list-style-type: none"><li>1. Verifies Group II and III isolations.</li><li>2. Verifies HWC has tripped.</li><li>3. Verifies Recirc Pumps are at minimum.</li><li>4. Reports Instrument Air pressure is greater than Drywell pressure.</li><li>5. Bypasses and restores Drywell Instrument Nitrogen as follows:<ol style="list-style-type: none"><li>a. Place AO-2969A and B control switches in CLOSE.</li><li>b. Place D/W Inst. N2 keylock switches in BYPASS.</li><li>c. Verifies alarm 219 G-1, Drywell Inst. N2 Valves Isolation Bypass is in.</li><li>d. Place AO-2969A and B control switches in AUTO/OPEN</li></ol></li><li>6. Recognizes and reports drywell pressure above 2 psig.</li><li>7. Verifies Diesel Generator starts.</li></ol>



## Operator Actions

ES-D-2

Op Test No.: 2      Scenario No.: 2      Event No.: 9

**Event Description:** HPCI/RCIC Fails to Autostart

**Cause:** Failure of the auto initiate relays

**Effects:** HPCI and RCIC do not automatically start.

<u>Time</u>	<u>Position</u>	<u>Applicant's Actions or Behavior</u>
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CT1	URO	<ol style="list-style-type: none"><li>1. Recognizes and reports failure of HPCI to start.</li><li>2. Resets and starts RCIC as follows:<ol style="list-style-type: none"><li>a. Places MO-4487, Trip Throttle Vlv, control switch to CLOSE.</li><li>b. Closes MO-2-13-131, Supply.</li><li>c. When MO-2-13-131 indicates full closed, then open MO-4487.</li><li>d. Verify Alarm 222 A-1, RCIC Turbine Trip, is reset.</li><li>e. Verify AO-2-13-137, Exh Line Drain Isol, is open.</li><li>f. Verify RCIC is injecting at 600 gpm.</li></ol></li><li>3. Starts HPCI as follows:<ol style="list-style-type: none"><li>a. Simultaneously places 20P026, Aux Oil Pump, to START and opens MO-2-23-014, Supply.</li><li>b. Opens MO-2-23-019, To Feed Line.</li><li>c. Places 20K002, Vac Pump, to START.</li><li>d. Verify HPCI pump flowrate is 5000 gpm.</li></ol></li></ol>
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## Operator Actions

ES-D-2

Op Test No.: 2                      Scenario No.: 2                      Event No.: 10

Event Description: Aftershock/Loss of Level Indication

<u>Time</u>	<u>Position</u>	<u>Applicant's Actions or Behavior</u>
	CREW	<ol style="list-style-type: none"><li>1. Recognizes and reports alarms for a second earthquake.</li><li>2. Recognizes and reports loss of level indication.</li></ol>
	CRS	<ol style="list-style-type: none"><li>1. Updates and enters T-116, RPV Flooding.</li><li>2. Determines an ATWS is not in progress.</li><li>3. Directs RO to open all ADS valves.</li></ol>
<b>CT2</b>	PRO	<ol style="list-style-type: none"><li>1. <b>Opens all 5 ADS Valves.</b></li><li>2. Reports RPV pressure is below 330 psig.</li></ol>
	CRS	<ol style="list-style-type: none"><li>1. Directs URO to inject with RHR and Core Spray to flood the RPV.</li><li>2. Directs RO to close the MSIVs, HPCI and RCIC Steam Isolation Valves, and Main Steam Line Drains.</li><li>3. Directs ROs to report indications of RPV being flooded.</li></ol>
<b>CT3</b>	CREW	<ol style="list-style-type: none"><li>1. Closes the MSIVs, HPCI and RCIC Steam Isolation Valves, and Main Steam Line Drains.</li><li>2. <b>Reports indications of the following when available:</b><ol style="list-style-type: none"><li>a. <b>Rising RPV pressure</b></li><li>b. <b>SRV Tailpipe temperatures lowering</b></li><li>c. <b>SRVs indicate open after depressurization</b></li></ol></li></ol>

### TERMINATION CRITERIA:

The scenario may be terminated when an RPV Blowdown is performed and the RPV is flooded to the Main Steam Lines.