

Facility: DC COOK 1 & 2 Scenario No.: 1 Op-Test No.: \_\_\_\_\_

Examiners: \_\_\_\_\_ Operators: \_\_\_\_\_  
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Initial Conditions: 80 % Power

Turnover: Restore power to 100% following Turbine Valve testing

Critical Tasks: Trip RCPs, Initiate 1 train of Safety Injection

Event No.	Malf. No.	Event Type*	Event Description
1		R-RO	Raise Turbine and Reactor Power
2	U1_MPC253 @ 0	I-RO TS	Turbine Impulse Transmitter (MPC-253) fails LOW
3		R-RO	Recover RODs and temperature
4	U1_MFC 121 @ 0	I-BOP TS	Steam Flow Channel (MFC-121) failure fails Low
5	U1_ED07B	C-RO TS	PZR HTR Transformer Fails (11PHC Fails).
6	U1_RC19A @ 100%	M	Pressurizer Safety Starts leaking and progresses to full open
7	U1_RP10A	C-RO	Train A Safety Injection signal failure to actuate in AUTO
8	U1_RP10B U1_RP11B	C-RO C-BOP	Train B Safety Injection signal failure to actuate in AUTO or Manual on the PRZ panel only
9	U1_RP19D	C-BOP	RPS Relay Failure Train A equipment fails to start (CV, SI, RHR, CC & Control Room Ventilation)
* (N)ormal, (R)eactivity, (I)nstrument, (C)omponent, (M)ajor			

### Event Summary

The Crew is directed to restore power to 100% following Turbine Valve testing.

A failure of Turbine Impulse instrument (MPC-253) results in a control rod insertion. The auto rod control circuit will see a power mismatch causing the rods to move in, decreasing reactor power and Tave. The auto rod control circuit will also see a decreased Tref (min 547 deg f) causing rods to move in. RO will be required to place rod control in manual. Crew will be required to implement AOP actions to stabilize the plant and trip Bistables.

The restoration of Tavg will require reactivity manipulations to restore the Axial Flux Difference

SG Steam Flow instrument (MFC-121) fails Low. This will result in the closing of #2 SG FWRV (FRV-220) to lower feedwater flow. The BOP will be required to take manual control and regulate FRV-230. The Crew will be required to implement AOP actions to stabilize the plant and trip bistables.

A failure of the PZR HTR Bus 11PHC will occur. The PZR SCR heater control will need to be transferred to 11PHA. The crew should also refer to Technical Specifications.

The major event will start with a leaking Pressurizer Safety Valve. This will progress to SV-45A PRZ Safety Valve failing full open. A unit trip will be required. As the crew performs the actions of E-0, the Safety Injection will fail to automatically actuate. The Crew must manually actuate SI (Trn B from SI panel only) and/or align ECCS Pumps and Equipment as required. The crew will transition to E-1. The scenario will terminate when the crew has transitioned to ES-1.2 for Post LOCA cooldown.

#### Critical Tasks

- Manually Actuate SI
- Stop all running RCPs when RCS pressure is below 1300 psig

#### Procedures

- E-0, Reactor Trip or Safety Injection
- E-1, Loss of Reactor or Secondary Coolant

Op-Test No.: Cook 2018      Scenario No.: NRC2018-1      Event No.: 1

Event Description: **Raise Turbine and Reactor Power**

Time	Position	Applicant's Actions or Behavior
	RO	Calculates the dilution required per OHP-4021-005-002, Attachment 9, Boration or Dilution Volume Determination.
	RO	Briefs crew on reactivity plan for power escalation.
	US	Reviews / concurs with reactivity plan.
	US	Directs RO to commence Power Escalation in accordance with OHP-4021-001-006, Power Escalation (at step 4.77)
	RO	Performs DILUTION (batch add OR Continuous): <ul style="list-style-type: none"> <li>Place RC Makeup Blend Control Mode switch in DILUTE or ALT DILUTE</li> <li>Adjust PW to the desired flow rate and/or amount.</li> <li>May close QRV-451 if aligning to CCP Suction Only</li> <li>Place RC Makeup Blend control switch in START</li> <li>May take QRV-303 to Manual and Open as required to maintain VCT Level and Pressure.</li> </ul>
	RO	Commences escalation: <ul style="list-style-type: none"> <li>Raises turbine load (reactor power) using the DCS HMI.</li> <li>Maintains Tavg/Tref deviation within limits by dilution and turbine load adjustments.</li> <li>Ensures Axial Flux Difference (AFD) is maintained within target band by manual control rod movement as needed.</li> </ul>
	RO	RO verifies appropriate reactivity feedback.
	BOP	Acts as peer checker for RO during blender operations.

Op-Test No.: <u>Cook 2018</u> Scenario No.: <u>NRC2018-1</u> Event No.: <u>2</u>		
Event Description: <b><u>Turbine Impulse Transmitter (MPC-253) fails LOW</u></b>		
Time	Position	Applicant's Actions or Behavior
	RO/BOP	Recognizes and reports multiple annunciators on Ann. Panels 111, 113, and 114 for a Turbine Impulse pressure failure.
	RO	Reports instrument malfunction and performs the immediate actions of OHP-4022-IFR-001, Instrument Failure Response: <ul style="list-style-type: none"> <li>• Checks for no turbine runback</li> <li>• Ensures control rods are in manual with no rod motion</li> <li>• Reports MPC-253 has failed low</li> <li>• Reports on Stability Checks</li> </ul>
	Crew	Performs plant stability checks.
	US	Enters and directs actions of OHP-4022-IFR-001, Instrument Failure Response procedure.
	US	Enters and directs actions of 1-OHP-4022-012-003, Continuous Control Bank Movement procedure (If Rods in AUTO).
	RO	Performs the following as directed (If Rods in AUTO): <ol style="list-style-type: none"> <li>1. Checks for no turbine runback</li> <li>2. Ensures control rods are in manual with no rod motion</li> <li>3. Checks rod position above low-low rod insertion limit</li> <li>4. Checks axial flux difference (AFD) within target band Note: Depending on the amount of rod motion, operators may find themselves in TS for AFD limits.</li> <li>5. Initiates restoration of equilibrium conditions using either: <ul style="list-style-type: none"> <li>• Control rod movement</li> <li>• Turbine load adjustment</li> </ul> </li> <li>6. Identifies failed Turbine First Stage Impulse Pressure Instrument</li> </ol>
	US	Directs actions per 1-OHP-4022-013-016, Turbine First Stage Impulse Pressure Instrument Malfunction.

Op-Test No.: Cook 2018      Scenario No.: NRC2018-1      Event No.: 2Event Description: **Turbine Impulse Transmitter (MPC-253) fails LOW**

Time	Position	Applicant's Actions or Behavior
	RO	Performs the following: <ol style="list-style-type: none"> <li>1. Verifies rod control in manual.</li> <li>2. Places AMSAC bypass/test switch in BYPASS/TEST</li> <li>3. Places Steam Dump selector control switches to OFF Or leaves them ON for Turbine Trip Controller Function</li> </ol>
	US	Initiates actions to trip bistables for MPC-253 failure per Attachment A of 1-OHP-4022-013-016.
	US	Refers to TS (LCO): <ul style="list-style-type: none"> <li>• TS 3.3.1 <u>Reactor Trip System (RTS) Instrumentation</u> (Table 3.3.1-1)               <ul style="list-style-type: none"> <li>○ Function 18e, <i>Reactor Trip System Interlocks - Turbine First Stage Pressure, P-13</i>. Condition L</li> </ul> </li> <li>• TS 3.3.2 <u>Engineered Safety Feature Actuation System (ESFAS) Instrumentation</u> (Table 3.3.2-1)               <ul style="list-style-type: none"> <li>○ Function 4e, <i>Steam Line Isolation - High Steam Flow in Two Steam Lines (per steam line), Coincident with Tavg – Low Low</i> Condition D</li> </ul> </li> <li>• TRM 8.3.6 <u>ATWS Mitigation System Actuation Circuitry (AMSAC)</u></li> </ul> <p><b>Note: P-13 interlock (Conditions L) must be verified in correct state within 1 hour. All other actions are greater than 1 hour.</b></p>

Op-Test No.: Cook 2018Scenario No.: NRC2018-1Event No.: 3Event Description: **Recover Rods and Temperature**

Time	Position	Applicant's Actions or Behavior
	SRO	Directs RO to develop reactivity plan to recover temperature and Delta Flux
	RO	<ul style="list-style-type: none"> <li>• Determines required Tavg based on Tref from Main Turbine HMI or Tech Data Book</li> <li>• Determines required AFD from Tech Data Book Curve</li> <li>• Determines previous Rod position from log/notes or PPC</li> </ul>
	RO	Develops plan for rod withdrawal to restore Tavg and AFD to target
	RO	Briefs crew on recovery plan.
	SRO	Directs RO to Implement plan to recover Tavg and AFD.
	RO	Withdraws rods in steps (2-3 steps at a time) while monitoring Temperature, Power and AFD

Op-Test No.: <u>Cook 2018</u> Scenario No.: <u>NRC2018-1</u> Event No.: <u>4</u>		
Event Description: <b><u>Steam Flow Channel (MFC-121) fails Low</u></b>		
Time	Position	Applicant's Actions or Behavior
	BOP	Recognizes and reports annunciators on Panel #113 (Drops 42, 43, and 33) which are indicative of a steam flow instrument failure. Panel #116 Drop 51 SJAE D/P may Alarm
	BOP	Reports instrument malfunction and performs the immediate actions of OHP-4022-IFR-001, Instrument Failure Response: Determine SG 2 level is lowering and that its Feedwater Regulating Valve (FRV-220) is not responding as expected. <ul style="list-style-type: none"> <li>• Notify US and takes manual control of FRV-220.</li> <li>• Determine failure affects MFPs, and take <math>\Delta P</math> controller to MANUAL.</li> <li>• Stabilize SG 2 level in manual</li> </ul>
	Crew	Performs plant stability checks.
	US	Enters and directs actions of OHP-4022-IFR-001, Instrument Failure Response procedure.
	US	Enters and directs actions of 1-OHP-4022-013-014, Steam Flow Instrument Malfunction procedure.
	BOP	Performs the following actions as directed: <ol style="list-style-type: none"> <li>1. Restores SG 2 level using MANUAL control of FRV-220.</li> <li>2. Places MFP <math>\Delta P</math> controller in MANUAL and maintains pressure.</li> <li>3. Reports MFC-121 has failed high.</li> <li>4. Places 1-FS-522C selector switch in channel 2 position.</li> <li>5. Nulls and returns FRV-220 controller to AUTO.</li> <li>6. Returns MFP <math>\Delta P</math> controller to AUTO.</li> </ol>
	US	Refers to the following Tech Specs (TS): <ul style="list-style-type: none"> <li>▪ TS 3.3.1 <u>RTS Instrumentation</u> (Table 3.3.1-1) <ul style="list-style-type: none"> <li>▪ Condition A – Refer to Table</li> <li>▪ Function 15 Condition D - Trip Bistables in 6 Hours</li> </ul> </li> <li>▪ TS 3.3.2 <u>ESFAS Instrumentation</u> (Table 3.3.2-1) <ul style="list-style-type: none"> <li>▪ Condition A – Refer to Table</li> <li>▪ Function 4e Condition D - Trip Bistables in 6 Hours</li> </ul> </li> </ul>
	US	Initiates actions to trip bistables associated with MFC-121 failure per Attachment B-1 of 1-OHP-4022-013-014.

Op-Test No.: Cook 2018      Scenario No.: NRC2018-1      Event No.: : 5

Event Description: **PZR HTR Transformer Fails (11PHC Fails).**

Time	Position	Applicant's Actions or Behavior
	RO	Recognizes and reports annunciators on Panel 108, Drops 46 and 50, indicative of a pressurizer (PRZ) heater power supply failure.
	RO	Reenergizes PRZ control (cycling) group heaters per 1-OHP-4024-108, Drop 50 annunciator response, as follows: <ul style="list-style-type: none"> <li>• Opens breaker CB11PHC6</li> <li>• Closes breaker CB11PHA6 (Drop 50 clears)</li> </ul>
	RO	Monitors PRZ pressure response and ensures normal PRZ heater operations for PHA supplied heaters.
	US	Refers to Tech Specs (TS): <ul style="list-style-type: none"> <li>• TS 3.4.9.b <u>Pressurizer</u> - (Condition B.1) due to a loss of 1 train of pressurizer heaters. Restore B/U heaters to operable within 72 Hours.</li> </ul>



Op-Test No.: Cook 2018 Scenario No.: NRC2018-1 Event No.: 6,7,8,& 9

Event Description: **Pressurizer Safety Leak Progressing to Full Open, Train A & B Auto Safety Injection failure with Train A Relay Failure (CV, SI, RHR,CC & Control Room Ventilation fails to auto start)**

Time	Position	Applicant's Actions or Behavior
	RO	Recognize and reports abnormal RCS leakage: <ul style="list-style-type: none"> <li>• RCS pressure lowering with PZR Heaters ON</li> <li>• PRZ Safety Valve SV-45A indicates open</li> <li>• Panel #108: <ul style="list-style-type: none"> <li>• Drop 8, Pressurizer Press Low Dev Backup Htrs On</li> <li>• Drop 29, PRZ SV A Disch Temp Hi</li> <li>• Drop 31, Prz Relief Tk Pressure High Or Low</li> </ul> </li> </ul>
	US	Direct entry into 1-OHP-4022-002-020, Excessive Reactor Coolant Leakage
	RO	Performs the following actions, if directed: <ul style="list-style-type: none"> <li>• Manually raises charging flow to maintain pressurizer level.</li> <li>• Manually adjusts seal injection flow (6–12 gpm / each RCP).</li> <li>• Reduces/isolates letdown flow to maintain pressurizer level.</li> <li>• Attempts to determine RCS leak rate.</li> </ul>
	BOP/RO	Monitor Containment Pressure
	US	Directs RO to Perform a Reactor Trip Directs RO/BOP to perform the immediate actions of 1-OHP-4023-E-0, Reactor Trip or Safety Injection.
	RO/BOP	Performs the immediate actions of E-0: <ol style="list-style-type: none"> <li>1. Checks reactor trip</li> <li>2. Checks turbine trip</li> <li>3. Checks power to AC emergency buses</li> <li>4. Checks safety injection status</li> </ol>

Op-Test No.: Cook 2018 Scenario No.: NRC2018-1 Event No.: : 6,7,8,& 9

Event Description: **Pressurizer Safety Leak Progressing to Full Open, Train A & B Auto Safety Injection failure with Train A Relay Failure (CV, SI, RHR,CC & Control Room Ventilation fails to auto start)**

Time	Position	Applicant's Actions or Behavior
	RO/BOP  Critical Task #1	<p><b>Check Safety Injection Actuated: Manually Actuate SI (From SI Panel for Train B) to establish High Head Injection Flowpath -OR-</b></p> <p>NOTE: May be performed in E-0, Attachment A. <b>Manually Align Valves</b></p> <ul style="list-style-type: none"> <li>• BIT Inlet Valves ICM-255 -AND/OR ICM-256 - OPEN</li> <li>• BIT Outlet Valves ICM-250 -AND/OR ICM-251 - OPEN</li> <li>• RWST to CCP Valves IMO-910 -AND/OR IMO-911 - OPEN</li> <li>• VCT to CCP Valves QMO-451 -AND/OR QMO-452 - CLOSED</li> </ul> <ul style="list-style-type: none"> <li>• Manually Start/Align ECCS Equipment and Actuate Phase A (Train A)</li> <li>• SI</li> <li>• RHR</li> </ul>
	US/RO Critical Task #2	<p><b>Foldout Page – RCP Trip Criteria:</b></p> <ul style="list-style-type: none"> <li>• <b><u>Stop all RCPs when RCS is &lt; 1300 psig and CCP/SI pump running</u></b></li> </ul>
	BOP	Manually controls AFW flow to maintain SG narrow range levels 14% - 50% once one SG narrow range level is greater than 14%.
	US	<ul style="list-style-type: none"> <li>· Ensures immediate actions of E-0 are completed</li> <li>· Directs subsequent actions of E-0.</li> </ul>
	RO/BOP	Completes actions of E-0 through step 19 as directed.

Op-Test No.: Cook 2018 Scenario No.: NRC2018-1 Event No.: : 6,7,8,& 9

Event Description: **Pressurizer Safety Leak Progressing to Full Open, Train A & B Auto Safety Injection failure with Train A Relay Failure (CV, SI, RHR,CC & Control Room Ventilation fails to auto start)**

Time	Position	Applicant's Actions or Behavior
	RO/BOP	Performs manual actions of E-0, Attachment A as directed by US. <ul style="list-style-type: none"> <li>• Verifies CEQ Fans and CCW to CEQ</li> <li>• Place DIS in Service – Turn on Igniters</li> <li>• Verify Train A Control Room Pressurization aligned</li> <li>• Reset Bypass switches for PACHMS</li> <li>• Verifies Containment Ventilation &amp; Phase A Isolations</li> </ul>
	US/RO	Checks if RCS is Intact – NO.
	US	Announces transition to 1-OHP-4023-E-1, Loss of Reactor or Secondary Coolant and directs operator actions.
	RO/BOP	Completes actions of E-1 through step 12 (Check if RCS Cooldown and Depressurization is required) as directed.
	BOP	Restore SG narrow range levels and maintain between 20% and 50%.
	US/RO	Checks if SI Termination Criteria is MET: <ul style="list-style-type: none"> <li>▪ RCS Subcooling &gt;40°F</li> <li>▪ Secondary Heat Sink (SG &gt;14% or AFW Flow &gt;240x10<sup>3</sup>)</li> <li>▪ RCS Pressure rising or stable - <b>NO</b></li> <li>▪ Pressurizer Level &gt;21%</li> </ul>
	US/RO	Check if RHR can be stopped (NO – RCS Pressure Lowering) <ul style="list-style-type: none"> <li>• Check RCS Pressure &gt; 300 psig and stable</li> </ul>

Op-Test No.: Cook 2018 Scenario No.: NRC2018-1 Event No.: : 6,7,8,& 9

Event Description: **Pressurizer Safety Leak Progressing to Full Open, Train A & B Auto Safety Injection failure with Train A Relay Failure (CV, SI, RHR,CC & Control Room Ventilation fails to auto start)**

Time	Position	Applicant's Actions or Behavior
	BOP	Shutdown Unloaded EDGs.
	US	Evaluate Plant Status Check Cold Leg Recirculation Capability Check Aux. Building Radiation
	US	Announces transition to 1-OHP-4023-ES-1.2, Post LOCA Cooldown and Depressurization (at step 12).
<b>Terminate Scenario</b>		

**Critical Task Summary**

Task	Elements	Results
<p align="center"><b>#1</b></p> <p align="center"><b>Manually Actuate/Align one train of Safety Injection to establish HIGH Head Injection Flow</b></p>	<p><u>Cueing:</u></p> <ul style="list-style-type: none"> <li>• Check SI Actuated "Safety Injection Actuated" Status Light LIT (E-0, Step 4.a) -OR-</li> <li>• Check BOTH CCP leakoff valve "Safety Injection Signal" white lights - LIT</li> </ul> <p><u>Performance Indicators:</u> Before transitioning from E-0:</p> <ul style="list-style-type: none"> <li>• Actuate 1 Train of SI -OR-</li> <li>• Manually Start/Align ECCS Equipment and Actuate Phase A (Train B)</li> </ul> <p>Manually Align Valves</p> <ul style="list-style-type: none"> <li>• BIT Inlet Valves ICM-255 -AND/OR ICM-256 - OPEN</li> <li>• BIT Outlet Valves ICM-250 -AND/OR ICM-251 - OPEN</li> <li>• RWST to CCP Valves IMO-910 -AND/OR IMO-911 - OPEN</li> <li>• VCT to CCP Valves QMO-451 -AND/OR QMO-452 – CLOSED</li> <li>• Ensure 1 CCP and SI running</li> </ul> <p><u>Performance Feedback:</u></p> <ul style="list-style-type: none"> <li>• ECCS flow is indicated to at least one train (as indicated by flow on cold leg BIT injection flowmeters)</li> <li>• One Train of Phase A Isolation is complete per E-0, Attachment A</li> </ul>	<p align="center"><b>SAT / UNSAT</b></p>
<p align="center"><b>#2</b></p> <p align="center"><b>Manually trip all Reactor Coolant Pumps</b></p>	<p><u>Cueing:</u></p> <ul style="list-style-type: none"> <li>• RCS pressure – less than 1300 psig AND CCPs or SI pumps – at least one running</li> <li>• E-0, Foldout Page, Step 1</li> <li>• E-1, Foldout Page, Step 1</li> <li>• E-1, Step 1</li> </ul> <p><u>Performance Indicators:</u></p> <ul style="list-style-type: none"> <li>• Manually stop all Reactor Coolant Pumps (RCPs) when RCS pressure is less than 1300 psig prior to core uncover leading to CETC &gt;2200°F.</li> </ul> <p><u>Performance Feedback:</u></p> <ul style="list-style-type: none"> <li>• RCP ammeters – zero current</li> <li>• RCP trip low flow alarms – lit</li> <li>• RCS loop flow meters – flow lowering</li> </ul>	<p align="center"><b>SAT / UNSAT</b></p>

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## Scenario Instructor Actions

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Setup:

1. Reset to IC-308 MOL; 80% power, 883 MW, 805.58 ppm, 565.7 F 195 Steps on D
2. Reset control rods and check group step counters.
3. Place Master Annunciator Silence pushbutton lockout ring in LOCKOUT position.
4. Advance chart recorder paper & clear chart recorder memory.
5. Activate the following (pre-load) malfunctions:

Train A Safety Injection Auto Failure

**U1\_RP10A**

Train B Safety Injection Auto Failure

**U1\_RP10B**

Train B Safety Injection Manual on the PRZ panel only

**U1\_RP11D**

RPS Relay Failure Train A

Equipment fails to start

(CV, SI, RHR,CC & Control Room Ventilation)

**U1\_RP19D**

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## Scenario Instructor Actions

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### Scenario Events:

#### **EVENT #1**

Respond as required to power change notifications and requests

#### **EVENT #2**

ICF U1\_MPC253 to 0 over 30 sec to cause Turbine Impulse Transmitter (MPC-253) to fail LOW.

**U1\_MPC253**

#### **EVENT #3**

Recover RODs and temperature

No Additional Actions

#### **EVENT #4**

ICF U1\_MFC121 to 0 over 3 sec to cause Steam Flow Channel (MFC-121) to fail LOW.

**U1\_MFC121**

#### **EVENT #5**

IMF U1\_ED07B to cause the PZR HTR Transformer Failure (11PHC Fails).

**U1\_ED07B**

If contacted as AEO to investigate the PZR HTR Transformer Failure, report back after ~ 2 min. delay that Breaker T11D9 has an OC trip.

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**Scenario Instructor Actions**

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**EVENTS #6,7,8,& 9**

IMF U1\_RC19A to 100 from .1 over 5 Minutes to simulate the PZR Safety leak to full open

**U1\_RC19A**

Malfunctions for Train A & B SI Auto Failure, Train B from PRZ Panel, and Train A Slave Relay have already been Entered.

**Perform Local actions after entry into E-0 as requested:**

- Locally stop U1 Ice Condenser AHUs MRF CHR01 to OFF

**U1\_CHR01**

- Aux Tour will monitor Spent Fuel Pool Level and Temperatures
- Place PACHMAS in service – MRF CHR02 or 03 with 10 min delay.

**U1\_CHR02** OR **U1\_CHR03**

(both have 10 minute delay built in)

- U2 has aligned CR vent for U1 SI, Fan 2-HV-AS-2 is running.

If directed to secure EDG jacket water pumps select **OFF** then **AUTO**

Remote	OFF	AUTO
<i>EGR 03A</i>	<b>U1_EGR03A</b>	<b>U1_EGR03A</b>
<i>EGR 03B</i>	<b>U1_EGR03B</b>	<b>U1_EGR03B</b>
<i>EGR 04A</i>	<b>U1_EGR04A</b>	<b>U1_EGR04A</b>
<i>EGR 04B</i>	<b>U1_EGR04B</b>	<b>U1_EGR04B</b>



Facility: DC COOK 1 & 2 Scenario No.: 2 Op-Test No.: \_\_\_\_\_

Examiners: \_\_\_\_\_ Operators: \_\_\_\_\_  
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Initial Conditions: Unit is at 50% power

Turnover: A 2 gpm tube leak on S/G #3 requires a T.S. shutdown. The Crew is in 1-OHP-4021-001-003 power Reduction, and has completed NARPI adjustments per step 4.13

Critical Tasks Isolate #13 Steam Generator, Cooldown RCS, Depressurize RCS to stop #13 SGTR leakage

Event No.	Malf. No.	Event Type*	Event Description
1	U1_RC24C @ 20 – 2 gpm	R-RO N- BOP	SG Tube Leakage requiring shutdown
2	U2_EESW Short Circuit U1_WPS705 fail	C- BOP	Unit 2 East ESW Pump Trip, Unit 1 West ESW fail to Start (Need Alarm 104 drop 78 on trigger with drop 66)
3	U1_NPP151 to 2500	I-RO TS	Pressurizer Pressure Channel Fails High
4	U1_RX08A @ 100%	C-RO	NRV-163 Controller Fails Open in Auto (insert with NPP151 failure)
5	U1_MPP230 to 1 over 30 Sec	I-BOP TS	SG Pressure Channel MPP-230 Fails Low.
6	U1_RC23C @ 50 ~ 500 Gpm	M	SG #13 Tube Rupture 500 GPM
7	U1_RP13A U1_RP13B	C- BOP	Phase A Fails to auto Actuate
8	U1_RC15A U1_RC15B	C-RO	NRV-163 & NRV -164 fail to OPEN (PORV must be used to depressurize)
* (N)ormal, (R)eactivity, (I)nstrument, (C)omponent, (M)ajor			

## Event Summary

The scenario begins at 50% power with a shutdown required per 01-OHP-4022-002-021, Steam Generator Tube Leakage due to SG tube leakage. The RO and BOP will perform actions of the shutdown procedure to bring the plant offline.

A trip of the UNIT 2 East ESW Pump and failure of the West U1 ESW pump will require the BOP to start the West ESW pump on unit 1.

After the Crew has addressed the ESW failure, the Pressurizer Pressure Channel NPP-151 Fails High, Pressurizer spray valves will go full open. The crew will need to take manual control of pressurizer pressure and enter an Abnormal Operating Procedure, defeat the failed channel, address Technical Specifications, and then restore pressurizer pressure control to auto.

Along with the Pressure Channel failure, a failure of the Pressurizer Spray Valve controller for NRV-163 to 100% causes NRV-163 to go full open. RCS pressure will begin to lower. The RO will be required to take manual control of NRV-163 and close the spray valve then return pressure to the normal band. Pressurizer pressure control may still be operated in AUTO with NRV-164.

The next event will involve the SG Pressure Channel MPP-230 fails low. The BOP will be required to take manual control SG 13 Feedwater Regulating Valve FRV-230 to stabilize level. The crew will address the failure with an Abnormal Operating Procedure, address Technical Specifications, select an operable channel, and restore automatic control.

A Steam Generator Tube Rupture will build in to 500 gpm over 5 minutes. The crew will perform a Reactor Trip and Safety Injection. The crew should identify the Steam Generator Tube Rupture on #13 SG. The crew will transition to E-3 to isolate #13 SG. As the crew performs the actions of E-3 to depressurize the SG the Pressurizer Spray Valves will fail to open requiring use of the PORV for depressurization, The scenario will terminate when the crew has completed the cooldown, depressurization, and terminated SI.

## Critical Tasks

- Isolate #13 Steam Generator
- Cooldown RCS
- Depressurize RCS to stop #13 SGTR leakage

## Procedures

- E-0, Reactor Trip or Safety Injection
- E-3, Steam Generator Tube Rupture

Op-Test No.: Cook 2018      Scenario No.: NRC2018-2      Event No.: 1

Event Description: **SG Tube Leakage requiring shutdown**

Time	Position	Applicant's Actions or Behavior
	US	Refers to Tech Specs 3.4.13 <u>RCS Operational Leakage</u> . SG Leakage >150 gpd/SG. Action D applies. - Be in Mode 3 in 6 hours.
	RO	Calculates boric acid addition per OHP-4021-005-002, Attachment 9, Boration or Dilution Volume Determination.
	RO	Briefs crew on reactivity plan for power reduction.
	US	Reviews / concurs with reactivity plan.
	US	Directs RO to commence Power Reduction in accordance with OHP-4021-001-003.
	RO	Performs BORATION: <ul style="list-style-type: none"> <li>▪ Place RC Makeup Blend Control Switch in STOP.</li> <li>▪ Place RC Makeup Blend Control Mode Selector Switch in BORATE.</li> <li>▪ Set desired batch on BA Flow Totalizer.</li> <li>▪ Adjust BA Flow Ctrl (RU-33) to desired flow.</li> <li>▪ Place RC Makeup Blend Control Switch in START.</li> </ul>
	RO	Commences power reduction: <ul style="list-style-type: none"> <li>· Lowers turbine load (reactor power) using HMI.</li> <li>· Maintains Tavg/Tref deviation within limits by boration and turbine load adjustments.</li> <li>· Ensures Axial Flux Difference (AFD) is maintained within target band by manual control rod movement as needed.</li> </ul>
	BOP/RO	BOP acts as peer checker for RO during blender operations and RO verifies appropriate reactivity feedback.

Op-Test No.: Cook 2018Scenario No.: NRC2018-2Event No.: 2Event Description: **Unit 2 East ESW Pump Trip, Unit 1 West ESW fail to Start**

Time	Position	Applicant's Actions or Behavior
	BOP	Recognizes and reports ESW annunciators on Ann. Panel 104 indicative of ESW pump trip including: <ul style="list-style-type: none"> <li>• Drop 66, WEST ESW HEADER PRESSURE LOW</li> <li>• Drop 78, WEST ESW PUMP LOW PRESSURE START-UP</li> </ul>
	BOP	Recognizes and reports that running Unit 2 East ESW pump has tripped and standby U1 West ESW pump failed to auto start.
	BOP	Manually starts West ESW pump in accordance with ESW Annunciator Response Procedures. Drop 78  Verify ESW system flow is greater than or equal to 2000 gpm by adjusting flow to the following as necessary (listed in preferred order): <ul style="list-style-type: none"> <li>○ CCW heat exchanger</li> <li>○ EDG heat exchanger(s)</li> <li>○ CTS heat exchanger (if used, maintain 2000 to 3000 gpm thru CTS heat exchanger)</li> </ul>
	US	May refer to actions of 1-OHP-4022-019-001, ESW System Loss/Rupture procedure.
	BOP	If 1-OHP-4022-019-001, ESW Malfunction procedure is used, the operator performs the following actions as directed: <ol style="list-style-type: none"> <li>1. Ensures at least one ESW pump is running</li> <li>2. Checks ESW flow established</li> <li>3. Checks ESW System Integrity</li> <li>4. Checks CCW Hx ESW Supply</li> <li>5. Checks Control Room Air Conditioner ESW Supply</li> </ol>

Op-Test No.: Cook 2018Scenario No.: NRC2018-2Event No.: 2Event Description: **Unit 2 East ESW Pump Trip, Unit 1 West ESW fail to Start**

Time	Position	Applicant's Actions or Behavior
	SRO	<p>Refers to TS 3.7.8, Essential Service Water (ESW) System. Condition A  U2 East ESW Pump is declared INOPERABLE.  One Train is INOPERABLE since the Crossties are Open.  Both Unit 1 and Unit 2 would enter Action A.</p> <p><b>Note: Low Pressure Auto Start is NOT a Required Safety Function. The W ESW pump is technically not INOPERABLE, but SI auto start is required. Unit 1 could close the crosstie and declare ESW OPERABLE on Unit 1</b></p>

Op-Test No.: Cook 2018      Scenario No.: NRC2018-2      Event No.: 3

Event Description: **Pressurizer Pressure Channel NPP 151 Fails High**

Time	Position	Applicant's Actions or Behavior
	RO	Recognizes and reports annunciators on Panel #108 indicative of a pressurizer (PRZ) pressure instrument failure (Drops 6, 7, 8).
	RO	<p>Reports instrument malfunction and performs the immediate actions of OHP-4022-IFR-001, Instrument Failure Response:</p> <p>Places PRZ pressure master controller OR both PRZ spray valve controllers (1-NRV-163 and 164) to manual and lowers controller output to close spray valves.</p>
	Crew	Performs plant stability checks.
	US	Enters and directs actions of OHP-4022-IFR-001, Instrument Failure Response procedure.
	US	<p>Enters and directs actions of 01-OHP-4022-013-009, Pressurizer Pressure Instrument Malfunction procedure.</p> <p>May enter Technical Specification 3.4.1 <u>RCS Pressure, Temperature, and Flow DNB Limits</u> if Pressure lowers to &lt;2168 psig. (2200 psig admin limit)</p>
	RO	<p>Performs the following actions as directed:</p> <ol style="list-style-type: none"> <li>1. Restores PRZ pressure using manual control of EITHER: <ul style="list-style-type: none"> <li>• PRZ pressure master controller</li> <li>• Both PRZ spray valve controllers</li> </ul> </li> <li>2. Reports 1-NPP-151 has failed</li> <li>3. Ensures PRZ pressure master controller is in manual</li> <li>4. Places PRZ Press Ctrl selector switch in Ch 2 &amp; 3 position</li> <li>5. Places the following recorder switches in Ch 2, 3 or 4 position: <ul style="list-style-type: none"> <li>• PRZ Press Rec selector</li> <li>• Delta T selector</li> <li>• Overpower Delta T selector</li> <li>• Overtemp Delta T selector</li> </ul> </li> </ol>

Op-Test No.: Cook 2018      Scenario No.: NRC2018-2      Event No.: 3

Event Description: **Pressurizer Pressure Channel NPP 151 Fails High**

Time	Position	Applicant's Actions or Behavior
	RO	Performs the following actions as directed: 6. Verifies 1-QMO-225, E CCP Leakoff is open <b>NOTE: (May place QRV251 in Manual while opening Leakoff – Letdown may also be reduced – QRV-251 should be returned to Auto)</b> 7. Dispatches Aux operator to open breaker for 1-QMO-225 (1-ABV-D-5C) 8. Checks 1-NLP-151, PRZ Level Channel 1 and 1-NLI-151, PRZ Level Cold Calibration instruments for failure 9. Nulls and returns the following controllers to auto: <ul style="list-style-type: none"> <li>• Both PRZ spray valve controllers</li> <li>• PRZ pressure master controller</li> </ul>
	US	Declares the 1E Centrifugal Charging Pump inoperable.
	US	Initiates actions to trip bistables associated with 1-NPP-151 PZR Pressure Failure per Attachment A of 1-OHP-4022-013-009.
	US	Refers to Tech Specs (TS): <ul style="list-style-type: none"> <li>• TS 3.3.1 <u>RTS Instrumentation</u> (Table 3.3.1-1, Function 6, 8a, 8b Condition D)</li> <li>• TS 3.3.2 <u>ESFAS Instrumentation</u> (Table 3.3.2-1, Function 1d Condition D, 8b Condition G *)</li> <li>• TS 3.3.4 <u>Remote Shutdown Instrumentation</u></li> <li>• TS 3.5.2 <u>ECCS Subsystems</u></li> <li>• TRM 8.1.1 <u>Rx Control Systems Charging Pumps – Operating</u></li> <li>• TRM 8.7.14, <u>LEFM</u>. (Applicable above 3250 MW)</li> </ul> *=Identifies requirement to verify the status of Permissive P-11 bistables within 1 hour of pressurizer pressure channel failure.

Op-Test No.: Cook 2018Scenario No.: NRC2018-2Event No.: 4

Event Description: **Pressurizer Spray Valve Controller NRV-163 fails to 100%** (Actions May have been performed in Previous Event or may re-appear when returning to Auto)

Time	Position	Applicant's Actions or Behavior
	RO	<ul style="list-style-type: none"> <li>• Recognizes and reports Ann. Panel 108, Drop 8, PRESSURIZER PRESS LOW DEV BACKUP HTRS ON.</li> <li>• Identifies that NRV-163 PRZ Spray Valve is open.</li> </ul>
	US	Directs RO to take manual control of NRV-163 and restore Pressurizer pressure.
	RO	<ul style="list-style-type: none"> <li>• Manually closes NRV-163 PRZ Spray Valve.</li> <li>• Monitors PRZ pressure control system and ensures pressure returns to normal conditions (~2235 psig).</li> </ul>
	US	<p>May enter the following TS if Pressure lowers to &lt;2168 (2200 Admin) psig during the transient:</p> <ul style="list-style-type: none"> <li>• TS 3.4.1, <u>RCS Pressure, Temperature, and Flow DNB Limits. Condition A.</u></li> </ul>



Op-Test No.: Cook 2018      Scenario No.: NRC2018-2      Event No.: 5

Event Description: **SG Pressure Channel MPP-230 Fails Low.**

Time	Position	Applicant's Actions or Behavior
	BOP	Recognizes and reports annunciators on Panel 114 which are indicative of a steam generator #3 water level control / pressure instrument failure (Drops 12, 14).
	BOP	Reports instrument malfunction and performs the immediate actions of OHP-4022-IFR-001, Instrument Failure Response: 1. Places FRV-230, SG 3 MFW Reg. Valve controller to MANUAL, lowers controller output and restores SG 3 level to program (may also place MFP $\Delta$ P controller in MANUAL at this time).
	Crew	Performs plant stability checks.
	US	Enters and directs actions of OHP-4022-IFR-001, Instrument Failure Response procedure.
	US	Enters and directs actions of 1-OHP-4022-013-012, Steam Generator Pressure Instrument Malfunction procedure.
	BOP	Performs the following actions as directed: 1. Restores SG 3 level using manual control of FRV-230. 2. Checks SG PORVs closed. 3. Places MFP $\Delta$ P controller in MANUAL. 4. Reports MPP-230 has failed. 5. Places 1-FS-532C selector switch in channel 2 position. 6. Nulls and returns FRV-230 controller to AUTO. 7. Returns MFP $\Delta$ P controller to auto.

Op-Test No.: Cook 2018      Scenario No.: NRC2018-2      Event No.: 5

Event Description: **SG Pressure Channel MPP-230 Fails Low.**

Time	Position	Applicant's Actions or Behavior
	US	Refers to Tech Specs (TS): <ul style="list-style-type: none"> <li>· TS 3.3.1 <u>RTS Instrumentation</u></li> </ul> Condition A – Check Table 3.3.1-1 Function: <ul style="list-style-type: none"> <li>· Function 15 – Cond. D Trip Bistables in 6 Hours</li> </ul> <li>· TS 3.3.2 <u>ESFAS Instrumentation</u></li> Condition A – Check Table 3.3.2-1 Functions: <ul style="list-style-type: none"> <li>· Function 1e(2) &amp; 4e – Cond. D - Trip Bistables in 6 Hours</li> <li>· TS 3.3.4 <u>Remote Shutdown Instrumentation</u> - Condition A – Restore within 30 Days</li> </ul>
	US	Initiates actions to trip bistables associated with MPP-230 per Attachment C-1 of 1-OHP-4022-013-012.

Op-Test No.: Cook 2018      Scenario No.: NRC2018-2      Event No.: 6, 7.& 8

Event Description: **SG #13 Tube Rupture 500 GPM, Phase A Auto Actuation Failure, NRV-163 & 164 Pressurizer Spray Valves fail closed**

Time	Position	Applicant's Actions or Behavior
	RO/BOP	Perform the following: <ul style="list-style-type: none"> <li>• Recognizes and reports excessive charging flow demand as indicated by:               <ul style="list-style-type: none"> <li>○ Lowering Pressurizer level</li> <li>○ Lowering Pressurizer pressure</li> <li>○ PRZ level deviation alarm</li> </ul> </li> </ul>
	US	May enter and direct operator actions per OHP-4022-002-021 SG Tube Leakage (or OHP-4022-002-020, Excessive RCS Leakage): <ul style="list-style-type: none"> <li>• Raise charging flow and isolate letdown</li> <li>• Start the second CCP</li> <li>• Maintain VCT level</li> </ul>
	RO	Recognizes and reports RCS leak rate greater than the capacity of charging pump <b>-OR-</b> unable to maintain Pressurizer level/VCT level
	US	Directs RO/BOP to manually trip the reactor and perform the immediate actions of OHP-4023-E-0, Reactor Trip or Safety Injection (based on RCS leak rate beyond charging system capability, may also initiate SI).
	US	Directs RO/BOP to perform the immediate actions of E-0, Reactor Trip or Safety Injection.
	RO/BOP	Performs the immediate actions of E-0: <ol style="list-style-type: none"> <li>1. Checks reactor trip</li> <li>2. Checks turbine trip</li> <li>3. Checks power to AC emergency buses</li> <li>4. Checks safety injection status (Manually initiate if required)</li> </ol>
	US	Ensures immediate actions of E-0 are completed

Op-Test No.: Cook 2018 Scenario No.: NRC2018-2 Event No.: 6, 7, & 8Event Description: **SG #13 Tube Rupture 500 GPM, Phase A Auto Actuation Failure, NRV-163 & 164 Pressurizer Spray Valves fail closed**

Time	Position	Applicant's Actions or Behavior
	US	Directs subsequent actions of E-0: <ul style="list-style-type: none"> <li>• Check Main Steam Isolation Required</li> <li>• Check CTS Required</li> <li>• Direct Attachment A to Be Performed</li> <li>• Check AFW Pumps and Flow</li> </ul>
	US	Directs BOP to isolate AFW flow to SG #3 when NR Level > 14%
	RO/BOP	Performs manual actions of Attachment A in E-0 as directed by US.
	RO/BOP	Identifies that Phase A did not Automatically Actuate <ul style="list-style-type: none"> <li>• Manually Actuates Phase A on Both Trains</li> <li>• Verifies Phase A Isolation Complete</li> </ul>
	US	Completes all actions of E-0 through step 18 (Check If SG Tubes Are Intact).
	US	Announces transition to OHP-4023-E-3, Steam Generator Tube Rupture (step 18 of E-0).
	US	Directs actions of E-3, Steam Generator Tube Rupture.
	US/BOP	Identifies SG #3 as ruptured
	<b>US/BOP</b>  <b>Critical Task #1</b>	<b>Manually closes the following valves for SG #13:</b> <ul style="list-style-type: none"> <li>• <b>FMO-231, TDAFP Discharge (may be performed in E-0, Step 8)</b></li> <li>• <b>FMO-232, MDAFP Discharge (may be performed in E-0, Step 8)</b></li> <li>• <b>MRV-230, SG Stop Valve</b></li> <li>• <b>MRV-231, SG Stop Valve Dump Valve</b></li> <li>• <b>MRV-232, SG Stop Valve Dump Valve</b></li> <li>• <b>MRV-233, PORV</b></li> <li>• <b>MCM-231, TDAFP Steam Supply</b></li> </ul>

Op-Test No.: Cook 2018 Scenario No.: NRC2018-2 Event No.: 6, 7.& 8Event Description: **SG #13 Tube Rupture 500 GPM, Phase A Auto Actuation Failure, NRV-163 & 164 Pressurizer Spray Valves fail closed**

Time	Position	Applicant's Actions or Behavior
	BOP	Closes DRV-407, SG Stop Valve Drain Valve
	US  Critical Task #2	Directs RCS Cooldown to required core exit temperature:  _____°F
	RO/BOP  Critical Task #2	Commence cooldown at maximum rate using Manual Steam Dump Operation –OR- INTACT (3) SG PORVs  Monitor RCS Thermocouple readings for target temperature  Stop RCS cooldown when TCs < required temperature: _____°F
	US	Directs operator action to maintain TCs < required temperature (provide band)
	RO/BOP	Performs the following as directed: <ul style="list-style-type: none"> <li>Resets SI and Containment Isolation Phase A</li> <li>Establish Control Air to Containment</li> <li>Stop RHR Pumps</li> </ul>
	US	Directs RCS Depressurization to minimize break flow: <ul style="list-style-type: none"> <li>Normal spray since RCPs are running</li> </ul>
	RO	Attempts to depressurize using Normal Sprays. Determines that NRV-163 and NRV -164 fail to Open

Op-Test No.: Cook 2018      Scenario No.: NRC2018-2      Event No.: 6, 7.& 8Event Description: **SG #13 Tube Rupture 500 GPM, Phase A Auto Actuation Failure, NRV-163 & 164 Pressurizer Spray Valves fail closed**

Time	Position	Applicant's Actions or Behavior
	US  Critical Task #3	Directs RCS Depressurization to minimize break flow: <ul style="list-style-type: none"> <li>• Directs Use of Pressurizer PORVs since Normal Spray is NOT available</li> </ul>
	RO  Critical Task #3	Commence depressurization using PORV(S) as directed: <ul style="list-style-type: none"> <li>• Monitor RCS pressure, PRZ level, and RCS Subcooling</li> <li>• Stop RCS depressurization based upon: (Criteria Used from E-3, Step 17 or Att. A): _____</li> </ul>
	US	Check if ECCS flow should be terminated
	US/RO	Terminate Safety Injection: <ul style="list-style-type: none"> <li>• Stop Both SI Pumps</li> <li>• Stop 1 CCP</li> <li>• Isolate BIT</li> </ul>
	US/RO	Establish normal charging flow
	US	Verify ECCS flow NOT required
<b>TERMINATE SCENARIO</b>		

**Critical Task Summary**

Task	Elements	Results
<p align="center"><b>#1</b></p> <p><b>Isolates Flow To and From The Ruptured Steam Generator</b></p>	<p><u>Cueing:</u></p> <ul style="list-style-type: none"> <li>• Isolate Flow From Ruptured SG (E-3, Step 3)</li> <li>• If Ruptured SG ... Then Close AFW Valves to Affected SG (E-0, Step 8, RNO)</li> <li>• Check Feed Flow To Ruptured SG Isolated (E-3, Step 4.b)</li> </ul> <p><u>Performance Indicators:</u> Prior to RCS cooldown to preclude transition to ECA-3.1, Loss of Reactor Coolant –Subcooled Recovery Desired:</p> <ul style="list-style-type: none"> <li>• Isolates SG13:               <ul style="list-style-type: none"> <li>○ Manually Closes SG PORV</li> <li>○ Trips SG 13 Stop Valve closed</li> <li>○ Closes SG 13 Stop Valve dump valves</li> <li>○ Isolates TDAFP Steam Supply from SG #13</li> <li>○ Isolates AFW to #13 SG when level is &gt; 14%</li> </ul> </li> </ul> <p><u>Performance Feedback:</u></p> <ul style="list-style-type: none"> <li>• Stable or rising pressure in the ruptured SG.</li> <li>• No feedwater flow to the ruptured SG.</li> </ul>	<p align="center"><b>SAT / UNSAT</b></p>
<p align="center"><b>#2</b></p> <p><b>Establishes and Maintains RCS Target Temperature</b></p>	<p><u>Cueing:</u></p> <ul style="list-style-type: none"> <li>• Initiate RCS Cooldown (E-3, Step 7)</li> </ul> <p><u>Performance Indicators:</u> Performs RCS cooldown, establishes and maintains CETC temperatures below target temperature. Temperature must be maintained within limits to prevent transition from E-3 due to either:</p> <ul style="list-style-type: none"> <li>• Loss of subcooling (high temp.)</li> <li>• CSF transition (low temp.)</li> </ul> <p><u>Performance Feedback:</u></p> <ul style="list-style-type: none"> <li>• RCS temp. less than target temp.</li> </ul>	<p align="center"><b>SAT / UNSAT</b></p>
<p align="center"><b>#3</b></p> <p><b>Depressurize RCS</b></p>	<p><u>Cueing:</u></p> <ul style="list-style-type: none"> <li>• Depressurize RCS Using PORV... (E-3, Step 18)</li> </ul> <p><u>Performance Indicators:</u> Depressurizes RCS using PRZ PORV:</p> <ul style="list-style-type: none"> <li>• Final RCS conditions must meet SI termination criteria</li> <li>• Ruptured SG inventory remains below 44ft. (RCLSG2)</li> </ul> <p><u>Performance Feedback:</u></p> <ul style="list-style-type: none"> <li>• RCS pressure lowering</li> <li>• PRZ level rising</li> </ul>	<p align="center"><b>SAT / UNSAT</b></p>

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## Scenario Instructor Actions

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Setup:

1. Reset to IC 310 MOL; 48% power, 485 MW, 892 ppm, 558 F 179 Steps on D, MSRs Isolated, West MFP in Speed Control idling at 3000, East in DP control
2. Reset control rods and check group step counters.
3. Place Master Annunciator Silence pushbutton lockout ring in LOCKOUT position.
4. Advance chart recorder paper & clear chart recorder memory.
5. Activate the following (pre-load) malfunctions:

Train A Phase A Auto Failure

**U1\_RP13A**

Train B Phase A Auto Failure

**U1\_RP13B**

Steam Generator Tube Leak &

**U1\_RC24C**

Radiation Monitor

**U12\_SRA1905**

**Close U2 East HX on T2**

Set up Triggers and ESW Auto Start Failure

**ESW<40 on T1**

T1 is true at <40 psig which turns on 104 Drop 78

**AN04\_U1(078)**

T2 is set by trigger 1 and then looks for pressure to Rise > 40 psig to clear 104 Drop 78

**ESW>40 on T2**

**AN04\_U1(078)**

Pressure switch failure keeps pump from starting

**U1\_WPS705**

Setup Phase A on Trigger 4 to fail normal spray valves

**Phase A on T4**

**U1\_RC15A**

**U1\_RC15B**

**U1\_NPP151**

Place Events 3 & 4 on Trigger 10

**U1\_RX08A**



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## Scenario Instructor Actions

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### Scenario Events:

#### **EVENT #1**

Respond as required to requests for chemistry sampling or shutdown preps

#### **EVENT #2**

ICF U2\_EESW to cause the U2 East ESW Pump to trip

**U2\_EESW**

Call as Unit 2 that the East ESW pump has Tripped

#### **EVENT #3&4**

Activate trigger ET to cause the Pressurizer Pressure Channel to fail High and the NRV-163 to fail Open in Auto

**Events 3 & 4 on T10**

-OR-

ICF U1\_NPP151 to 2700 over 10 seconds cause the Pressurizer Pressure Channel to fail High

**U1\_NPP151**

When Requested to De-energize Power for QMO-225 (1-ABV-D-5C)

**U1\_EDPR10J**

#### **EVENT #4**

ICF U2\_RX08A to 100 cause the NRV-163 Controller to Fail Open in Auto

**U1\_RX08A**

#### **EVENT #5**

ICF U1\_MPP230 to 1 over 30 seconds to cause the SG Pressure Channel MPP-230 to Fail Low

**U1\_MPP230**

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**Scenario Instructor Actions**

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**EVENT #6 - 8**

IMF RC23C, Final Value **50**, Ramp Time **5 min**, to cause a 500 gpm SGTR on SG #3

**U1\_RC23C**

If contacted as Radiation Protection, report that the requirements of 12-THP-6010-RPP-706, Gaseous Monitor Alarm Response have been met.

If contacted as Chemistry to evaluate SG Blowdown sample line activity per 12-THP-4030-002-208, Primary to Secondary Leakage – report back after some delay that leakage appears to be > 50 GPM on the #3 SG.

**Local actions after entry into E-0:**

- Locally stop U1 Ice Condenser AHUs MRF **U1\_CHR01** to OFF.

**U1\_CHR01**

- Aux Tour will monitor Spent Fuel Pool Level and Temperatures

- Place PACHMAS in service – MRF **U1\_CHR02 or 03** with 10 min delay.

**U1\_CHR02**

OR

**U1\_CHR03**

(both have 10 minute delay built in.)

- U2 has aligned CR vent for U1 SI, Fan **2-HV-AS-2** is running.

If directed to secure EDG jacket water pumps select **OFF** then **AUTO**:

Remote	OFF	AUTO
<i>EGR 03A</i>	<b>U1_EGR03A</b>	<b>U1_EGR03A</b>
<i>EGR 03B</i>	<b>U1_EGR03B</b>	<b>U1_EGR03B</b>
<i>EGR 04A</i>	<b>U1_EGR04A</b>	<b>U1_EGR04A</b>
<i>EGR 04B</i>	<b>U1_EGR04B</b>	<b>U1_EGR04B</b>

Facility: DC COOK 1 & 2 Scenario No.: 3 Op-Test No.: \_\_\_\_\_

Examiners: \_\_\_\_\_ Operators: \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_

Initial Conditions: Power is stable @ 1e-8 in Intermediate Range with AFW in service

Turnover: Raise Power to 3% to place MFP in service

Critical Tasks Manually Trip Reactor, Actuate SI, Establish Cold Leg Recirculation

Event No.	Malf. No.	Event Type*	Event Description
1		R-RO	Raise Power to 3% using rods
2		N-BOP	Control SG levels using AFW
3	U1_NPP15 1 @ 1700	I-RO TS	Pressurizer Pressure Channel Fails Low
4	Set U1_MSVM RV210 .94	C- BOP	Main Steam Stop Valve Comes Off Detent (Open Limit Switch)
5	U1_MPP21 2 to 1500	I-BOP TS	SG PORV Pressure Transmitter Failure
6	U1_RC10A to 5%	C-RO	RCS Leakage ramps in over 10 min. ramp
7	U1_RC01A at 50%.	M	RCS LOCA over 30 second. ramp
8	U1_RP01A U1_RP01B	C - RO	Auto RX trip Fails – Manual Works
9	U1_RP10A U1_RP10B	I(ATC)	Auto SI Fails – Manual Works
10	U1_RP16B U1_RP17B	C- BOP	CTS (West) Train B - fails to actuate (AUTO/MANUAL)

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

### Event Summary

The scenario starts with the plant stable at ~ 1e-8 amps on IR. The crew will be directed to withdraw rods to raise power to 3 % to roll the Main FW pump. The BOP will need to control SG levels with AFW in Manual.

After power has been raised, The Controlling Pressurizer Pressure channel will fail low. The RO will be required to take manual control of Pressurizer Pressure Master Controller and restore normal pressure control. The Crew will implement the Abnormal Operating Procedure, address Technical Specifications, select an operable channel, and restore pressure control to automatic.

The #1 SG Main Steam Stop Valve will come off the open limit switch/detent. The crew will need dispatch an operator to check the status and then reopen the Stop Valve to continue on.

Next a failure of SG #11 Pressure Channel (MPP-212) fails high causing SG #11 PORV to fully open. This will also cause Reactor power to slightly rise. The BOP will need to take manual action to close the PORV, the crew will implement AOP actions, and the US will need to declare the associated radiation monitor inoperable.

Shortly after the SG Pressure Channel failure, a slowly developing RCS leak will require the RO to control Charging in an attempt to stabilize the plant.

The RCS leakage will develop into a large break LOCA. The plant will NOT automatically trip and Automatic Safety Injection will NOT actuate. The Crew will be required to manually trip the reactor and actuate Safety Injection. The BOP should identify that train B of Containment Spray/Phase B has failed to actuate and align as required. The crew will transition to E-1 and to ES-1.3 to align for cold leg recirculation. The scenario will terminate when the crew has aligned ECCS for cold leg injection.

### Critical Tasks

- Manually Trip Reactor
- Manually Actuate SI
- Establish Cold Leg Recirculation

### Procedures

- E-0 Reactor Trip or Safety Injection
- E-1 Loss of Reactor or Secondary Coolant
- ES-1.3 Transfer to Cold Leg Recirculation

Op-Test No.: Cook 2018      Scenario No.: NRC2018-3      Event No.: 1

Event Description: **Raise Power to 3 % from 1e-8 amps**

Time	Position	Applicant's Actions or Behavior
	RO	Briefs crew on reactivity plan for power rise.
	US	Reviews reactivity plan.
	US	Directs RO to commence Power Escalation in accordance with 1-OHP-4021-001-006, Power Escalation procedure.
	RO	Commences power rise. <ul style="list-style-type: none"> <li>• Verifies Control Rod Selector in Manual indicating rod Speed 48 Steps/min.</li> <li>• Place Rod Control to withdraw for desired number of steps (0.5 to 3)</li> <li>• Verify expected response Positive SUR and Power rising on Intermediate Range</li> <li>• Verify expected response on RCS Tavg, Delta-T power and steam dump demand as power rises above the Point of adding Heat.</li> </ul>
	US	Acts as reactivity manager.

Op-Test No.: Cook 2018Scenario No.: NRC2018-3Event No.: 2Event Description: **Control SG levels using AFW**

Time	Position	Applicant's Actions or Behavior
	BOP	Monitors SG levels and Adjusts AFW flow control valves as required
	BOP	Adjusts AFW valves as power reaches Point of Adding Heat

Op-Test No.: Cook 2018      Scenario No.: NRC2018-3      Event No.: 3

Event Description: **Pressurizer Pressure Channel NPP 151 Fails Low**

Time	Position	Applicant's Actions or Behavior
	RO	Recognizes and reports annunciators on Panel #108 indicative of a pressurizer (PRZ) pressure instrument failure (Drops 8, 9, 10).
	RO	Reports instrument malfunction and performs the immediate actions of OHP-4022-IFR-001, Instrument Failure Response: <ol style="list-style-type: none"> <li>Restores PRZ pressure using manual control of EITHER:               <ul style="list-style-type: none"> <li>PRZ pressure master controller</li> <li>Both PRZ spray valve controllers</li> </ul> </li> </ol>
	Crew	Performs Plant Stability Checks May Stabilize Power Rise by Inserting Control Rods
	US	Enters and directs actions of OHP-4022-IFR-001, Instrument Failure Response procedure.
	US	Enters and directs actions of OHP-4022-013-009, Pressurizer Pressure Instrument Malfunction procedure.
	RO	Performs the following actions as directed: <ol style="list-style-type: none"> <li>Reports NPP-151 has failed</li> <li>Ensures PRZ pressure master controller is in manual</li> <li>Places PRZ Press Ctrl selector switch in Ch 2 &amp; 3 position</li> <li>Places the following recorder switches in Ch 2, 3 or 4 position:               <ul style="list-style-type: none"> <li>PRZ Press Rec selector</li> <li>Delta T selector</li> <li>Overpower Delta T selector</li> <li>Overtemp Delta T selector</li> </ul> </li> <li>Verifies QMO-225, E CCP Leakoff is open</li> <li>Dispatches Aux operator to open breaker for QMO-225 (1-ABV-D-5C)</li> </ol>

Op-Test No.: Cook 2018      Scenario No.: NRC2018-3      Event No.: 3

Event Description: **Pressurizer Pressure Channel NPP 151 Fails Low**

Time	Position	Applicant's Actions or Behavior
	RO	Performs the following actions as directed: <ol style="list-style-type: none"> <li>7. Checks NLP-151, PRZ Level Channel 1 and NLI-151, PRZ Level Cold Calibration instruments for failure</li> <li>8. Nulls (~2235#) and returns the following controllers to auto:               <ul style="list-style-type: none"> <li>• Both PRZ spray valve controllers</li> <li>• PRZ pressure master controller</li> </ul> </li> <li>9. Verify P-11 is in its correct state.</li> </ol>
	US	Declares the East Centrifugal Charging Pump inoperable.
	US	Refers to ITS LCO: <ul style="list-style-type: none"> <li>• 3.3.1 <u>RTS Instrumentation</u> (Table 3.3.1-1, Function 6, 8a, 8b – Cond D)</li> <li>• 3.3.2 <u>ESFAS Instrumentation</u> (Table 3.3.2-1, Function 1d, 8b – Cond D &amp; G) (6 hours to trip bistables)</li> <li>• 3.3.4 <u>Remote Shutdown Instrumentation</u> (Table B3.3.4-1 Function 2 Cond A – 30 Days)</li> <li>• 3.4.1 <u>DNB &amp; Tavq Parameters</u> (if RCS pressure goes &lt;2200 psig when in Mode 1)</li> <li>• 3.5.2 <u>ECCS Subsystems</u> (Cond A – 72 hr)</li> <li>• TRM 8.1.1 <u>Boration Systems</u> (Cond A – 72 hr)</li> <li>• TRM 8.7.14 <u>Thermal Power</u> (Only applicable greater than 3250 MWt – NA)</li> </ul>
	US	Notifies SM/MTI to initiate actions to trip bistables associated with NPP-151 PZR Pressure Failure per Attachment A of OHP-4022-013-009.
	RO	Monitors PRZ pressure response and ensures normal PRZ heater operations



Op-Test No.: Cook 2018Scenario No.: NRC2018-3Event No.: 4Event Description: **Main Steam Stop Valve Comes Off Detent (Open Limit Switch)**

Time	Position	Applicant's Actions or Behavior
	BOP	Recognizes and reports annunciator on Panel #113 indicative of a Stop Valve misalignment  Drop 6 SG 1 STOP VLV1-MRV-210 ABNORMAL
	US	Directs BOP to review ARP for annunciators and dispatch operator to Investigate.
	BOP	Determines Main Steam Stop Valve 1-MRV-210 has come off the open detent.
	US	Directs BOP to reopen Main Steam Stop Valve 1-MRV-210
	BOP	Re-open Main Steam Stop Valve 1-MRV-210 by placing Control Switch to open  May Refer to 1-OHP-4021-051-003 Removing a SG Stop Valve MMO or MRV from Service.
	US	May Refer to Technical Specification 3.7.2

Op-Test No.: Cook 2018Scenario No.: NRC2018-3Event No.: 5Event Description: **SG Pressure Channel MPP-212 Fails HIGH – SG 1 PORV Opens**

Time	Position	Applicant's Actions or Behavior
	BOP	Recognize and reports Annunciator Panel #114, Drop 21, 1-MRV-213 OP OR HSD1 PANEL OVERRIDE alarm that indicates SG #1 PORV (MRV-213) has opened.
	BOP	Place SG PORV #1 in Manual and Closes #1 PORV.
	Crew	Performs plant stability checks.
	US	Enters and directs actions of OHP-4022-IFR-001, Instrument Failure Response procedure.
	US	Direct operator actions to determine cause, verify SG #1 PORV closed, and monitor Reactor Power.
	BOP	Reports MPP-212 has failed high.
	US	Enters and directs actions of 1-OHP-4022-013-012, Steam Generator Pressure Instrument Malfunction procedure.
	US	Refers to TSs / TRM: <ul style="list-style-type: none"> <li>· TS 3.3.2 <u>ESFAS Instrumentation</u> (Table 3.3.2-1, Function 1.e (1&amp; 2) &amp; 4.d – all Condition D) Trip bistables in 6 hours</li> <li>· TS 3.7.4, SG PORVs (Note: Only Manual Ops Required) – N/A</li> <li>· TRM 8.3.8. <u>Radiation Monitoring Instrumentation</u> (Table 8.3.8-1, Function 2.b – Condition C) <ul style="list-style-type: none"> <li>· Declares MRA-1601 inoperable</li> <li>· Restore in 7 days</li> </ul> </li> </ul>
	US	Notifies SM/MTI to Initiate actions to trip bistables associated with MPP-212 Steam Generator Pressure Instrument Failure per Attachment A-3 of 1-OHP-4022-013-012.

Op-Test No.: Cook 2018      Scenario No.: NRC2018-3      Event No.: 6

Event Description: **RCS Leakage ramps in over 10 min. ramp**

Time	Position	Applicant's Actions or Behavior
	RO/US	Determines that a loss of reactor coolant is occurring based on the following: <ul style="list-style-type: none"> <li>• Pressurizer and VCT level change</li> <li>• Charging and letdown flow mismatch</li> <li>• Containment radiation monitoring trend ERS-1300, ERS-1400</li> <li>• Containment pressure rise</li> <li>• Containment sump level rise</li> <li>• Containment dewpoint</li> </ul>
	US	Enter and direct actions of 1-OHP-4022-002-020, Excessive Reactor Coolant Leakage procedure.
	RO	Performs the following actions, if directed: <ol style="list-style-type: none"> <li>1. Manually raises charging flow to maintain pressurizer level.</li> <li>2. Manually adjusts seal injection flow (6–12 gpm / each RCP).</li> <li>3. Reduces/isolates letdown flow to maintain pressurizer level.</li> <li>4. Attempts to determine RCS leak rate.</li> </ol>

Op-Test No.: Cook 2018      Scenario No.: NRC2018-3      Event No.: 7, 8, 9,& 10

Event Description: **RCS LOCA over 30 second. ramp, Rx Trip and SI Auto Actuation Failures, Train B Phase B /CTS Auto/Manual Failure**

Time	Position	Applicant's Actions or Behavior
	US/BOP	Acknowledges Ann. Panel 122, Drop 83, ICE CONDENSER INLET DOORS OPEN, alarm and/or RMS PPC Alarms on Panel 111 and determines that the reactor coolant leak rate has risen
	US	Directs RO/BOP to manually trip the Reactor and perform the immediate actions of OHP-4023-E-0, Reactor Trip or Safety Injection (based on RCS leak rate beyond charging or makeup system capability or rising containment pressure).
	<b>RO Critical Task #1</b>	Performs Manual Reactor Trip <b>Opens Trip Breaker A - OR- Trip Breaker B</b>
	RO/BOP	Perform the immediate actions of E-0: 1. Checks reactor trip. 2. Checks turbine trip. 3. Checks power to AC emergency buses
	<b>RO/BOP Critical Task #2</b>	<b>Determines that Automatic Safety Injection Did NOT occur and is required.</b> <b>Actuates Safety Injection (Must have one train actuated)</b> <b>Pressurizer Panel – Train A and/or Train B</b> <b>-OR-</b> <b>Safety Injection Panel – Train A and/or Train B</b>
	US	Ensures immediate actions of E-0 are completed.
	RO/BOP	Reviews E-0 Foldout Page Criteria.

Op-Test No.: Cook 2018 Scenario No.: NRC2018-3 Event No.: 7, 8, 9.& 10Event Description: **RCS LOCA over 30 second. ramp, Rx Trip and SI Auto Actuation Failures, Train B Phase B /CTS Auto/Manual Failure**

Time	Position	Applicant's Actions or Behavior
	RO/BOP	Trip Reactor Coolant Pumps due to Phase B
	RO/BOP	Determines that Train B CTS has NOT actuated (White CTS timer off on Train B – CTS Monitor Lights Not Lit)
	US	Directs Operator to Actuate CTS/Phase B and Align Valves as Required
	RO/BOP	Actuate CTS and Phase B Align CTS Valves as Required per SML-9A and SML-9B Verifies East CTS Pump starts and starts West CTS pump as directed by US.
	US	Directs subsequent actions of E-0.
	RO/BOP	Performs manual actions of E-0 Attachment A as directed by US.
	RO/BOP	Manually controls AFW flow to maintain SG narrow range levels 13% [28%] - 50% once one SG narrow range level is > 13% [28%].
	CREW	Completes all actions of E-0 through step 19 (Check If RCS Is Intact).
	RO/BOP	Manually Closes Train B Phase B valves (May Use Sup-004)
<b>NOTE:</b>		
Momentary entry into OHP-4023-FR-P.1 will be required until crew verifies RHR flow sufficient to indicate a LB LOCA has occurred.		
	US	Enters OHP-4023-E-1, Loss Of Reactor Or Secondary Coolant.

Op-Test No.: Cook 2018      Scenario No.: NRC2018-3      Event No.: 7, 8, 9.& 10

Event Description: **RCS LOCA over 30 second. ramp, Rx Trip and SI Auto Actuation Failures, Train B Phase B /CTS Auto/Manual Failure**

Time	Position	Applicant's Actions or Behavior
	RO/BOP	Reviews E-1 Foldout Page Criteria (see <b>NOTE</b> regarding cold leg switchover criteria).
<p style="text-align: center;"><b>NOTE:</b></p> <p style="text-align: center;">When RWST level lowers to &lt; 30% then the crew must immediately Transition to ES-1.3, Transfer To Cold Leg Recirculation.</p> <p style="text-align: center;"><b>See Page 13 for applicants actions or behaviors associated with ES-1.3, Transfer To Cold Leg Recirculation.</b></p>		
	US	Directs actions of OHP-4023-E-1, Loss Of Reactor Or Secondary Coolant.
	BOP	Maintains SG narrow range levels 20% - 50%.
	US/RO	Check If CTS may be terminated – (No Pressure < 300 Psig) Check If RHR may be terminated – (No Pressure < 300 Psig)
	BOP	Performs the following as directed: <ol style="list-style-type: none"> <li>1. Reset SI.</li> <li>2. Stops running Emergency Diesel Generators (EDGs).</li> <li>3. Dispatches operator to secure EDG jacket water pumps.</li> </ol>
	US	Evaluate Plant Status <ul style="list-style-type: none"> <li>• Check Recirc Capabilities</li> <li>• Check Aux Building Radiation</li> </ul>

Op-Test No.: Cook 2018      Scenario No.: NRC2018-3      Event No.: 7, 8, 9.& 10Event Description: **RCS LOCA over 30 second. ramp, Rx Trip and SI Auto Actuation Failures, Train B Phase B /CTS Auto/Manual Failure**

Time	Position	Applicant's Actions or Behavior
	US	Announces transition to OHP-4023-ES-1.3, Transfer To Cold Leg Recirculation when RWST level < 30% per: <ul style="list-style-type: none"> <li>• E-0, Foldout Page, Criteria 3</li> <li>• E-1, Foldout Page, Criteria 5</li> <li>• E-1, Step 13</li> </ul>
<b>Applicants actions or behavior associated with ES-1.3, Transfer To Cold Leg Recirculation.</b>		
	US	Directs actions of ES-1.3, Transfer To Cold Leg Recirculation.
	RO/BOP	Resets both trains of Safety Injection.
	RO/BOP	Adjusts CCW return flow on each RHR HX at 3000-3500 gpm.
	RO/BOP	Checks the following prior to switching over to cold leg recirc: <ul style="list-style-type: none"> <li>• RWST level &lt; 20%</li> <li>• Cntmt water level &gt; MIN RECIRC LEVEL</li> </ul>

Op-Test No.: Cook 2018      Scenario No.: NRC2018-3      Event No.: 7, 8, 9.& 10

Event Description: **RCS LOCA over 30 second. ramp, Rx Trip and SI Auto Actuation Failures, Train B Phase B /CTS Auto/Manual Failure**

Time	Position	Applicant's Actions or Behavior
	<p><b>US/RO</b></p> <p><b>Critical Task #3</b></p>	<p><b>Directs/Performs switchover as follows:</b></p> <p><b><i>NOTE: If RWST level &lt; 9% then stop CCPs and SI pumps.</i></b></p> <ol style="list-style-type: none"> <li><b>1. Stops and locks out East RHR pump.</b></li> <li><b>2. Stops and locks out East CTS pump (if not previously stopped).</b></li> <li><b>3. Checks East CTS and East RHR pumps stopped</b></li> <li><b>4. Initiates valve closure:</b> <ul style="list-style-type: none"> <li><b>• IMO-310, East RHR pump suction</b></li> <li><b>• IMO-215, East CTS pump suction from RWST</b></li> </ul> </li> <li><b>5. Stops and locks out West CTS pump (if not previously stopped).</b></li> <li><b>6. Stops and locks out West RHR pump.</b></li> <li><b>7. Checks West CTS and West RHR pumps stopped.</b></li> <li><b>8. Initiates valve closure:</b> <ul style="list-style-type: none"> <li><b>• IMO-320, West RHR pump suction</b></li> <li><b>• IMO-225, West CTS pump suction from RWST</b></li> </ul> </li> </ol>



Op-Test No.: Cook 2018      Scenario No.: NRC2018-3      Event No.: 7, 8, 9.& 10

Event Description: **RCS LOCA over 30 second. ramp, Rx Trip and SI Auto Actuation Failures, Train B Phase B /CTS Auto/Manual Failure**

Time	Position	Applicant's Actions or Behavior
	<p><b>US/RO</b></p> <p><b>Critical Task #3</b></p>	<p><b>Continues to direct/perform switchover as follows:</b></p> <p><b>9. Restores control power to ICM-305, Recirc sump to East RHR/CTS pumps.</b></p> <p>10. Checks ICM-305 open interlock:</p> <ul style="list-style-type: none"> <li>• IMO-310 fully closed</li> <li>• IMO-215 fully closed</li> </ul> <p><b>11. Opens ICM-305.</b></p> <p><b>12. Starts:</b></p> <ul style="list-style-type: none"> <li>• <b>East RHR pump</b></li> <li>• <b>East CTS pump if previously running.</b></li> </ul> <p><b>13. Restores control power to ICM-306, Recirc sump to West RHR/CTS pumps.</b></p> <p>14. Checks ICM-306 open interlock:</p> <ul style="list-style-type: none"> <li>• IMO-320 fully closed</li> <li>• IMO-225 fully closed</li> </ul> <p><b>15. Opens ICM-306.</b></p> <p><b>16. Starts</b></p> <ul style="list-style-type: none"> <li>• <b>West RHR pump</b></li> <li>• <b>Starts the West CTS pump if previously running.</b></li> </ul> <p>17. Checks at least one RHR pump running on the recirc sump</p>
<b>TERMINATE SCENARIO</b>		

**Critical Task Summary**

Task	Elements	Results
<p align="center"><b>#1</b></p> <p align="center"><b>Manually Trip Reactor</b></p>	<p><b><u>Cueing:</u></b></p> <ul style="list-style-type: none"> <li>· Symptoms which require a reactor trip (i.e., RCS Pressure, Containment Pressure)</li> <li>· Challenge to multiple reactor trip instrumentation setpoints (i.e.):               <ul style="list-style-type: none"> <li>· Lo Pressurizer Pressure</li> <li>· Hi Containment Pressure</li> </ul> </li> </ul> <p><b><u>Performance Indicators:</u></b></p> <ul style="list-style-type: none"> <li>· Manually open at least one reactor trip breaker from the control room.</li> <li>· Reactor trip breaker must be opened prior to Crew transition to FR S.1 or FR C series</li> </ul> <p><b><u>Performance Feedback:</u></b></p> <ul style="list-style-type: none"> <li>· RPIs indicate rods - fully inserted</li> <li>· Rod bottom lights – lit</li> <li>· Neutron flux - lowering</li> </ul>	<p align="center"><b>SAT / UNSAT</b></p>
<p align="center"><b>#2</b></p> <p align="center"><b>Manually Actuate/Align one train of Safety Injection</b></p>	<p><b><u>Cueing:</u></b></p> <ul style="list-style-type: none"> <li>• Check SI Actuated “Safety Injection Actuated” Status Light LIT (E-0, Step 5.a)</li> <li>-OR-</li> <li>• Check BOTH CCP leakoff valve "Safety Injection Signal" white lights - LIT</li> </ul> <p><b><u>Performance Indicators:</u></b></p> <p>Before transitioning from E-0:</p> <ul style="list-style-type: none"> <li>• Manually Actuate SI (Train A or B)</li> <li>-OR-</li> <li>• Manually Start/Align ECCS Equipment and Actuate Phase A (Train A or B)</li> </ul> <p><b><u>Performance Feedback:</u></b></p> <ul style="list-style-type: none"> <li>• ECCS flow is indicated to at least one train (as indicated by flow on cold leg BIT injection flowmeters, 1 SI Train and 1 RHR Train)</li> <li>• One Train of Phase A Isolation is complete per E-0 Attachment A</li> </ul>	<p align="center"><b>SAT / UNSAT</b></p>

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**Critical Task Summary**

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Task	Elements	Results
<p style="text-align: center;"><b>#3</b></p> <p><b>Establish Cold Leg Recirculation Flow</b></p>	<p><b><u>Cueing:</u></b></p> <ul style="list-style-type: none"> <li>• E-0 Foldout Page, Criteria 3 (switchover criteria)</li> <li>• E-1 Foldout Page, Criteria 5 (switchover criteria)</li> <li>• E-1, Step 13, Check For Transfer To CL Recirc.</li> </ul> <p><b><u>Performance Indicators:</u></b></p> <ul style="list-style-type: none"> <li>• At least one train of ECCS running aligned to the containment sump.</li> <li>• RHR pumps stopped for no longer than 5 minutes during switchover.</li> <li>• No total interruption of ECCS flow (CHG and SI) to the RCS during switchover.</li> </ul> <p><b><u>Performance Feedback:</u></b></p> <ul style="list-style-type: none"> <li>• At least one train of ECCS pumps running / indicating flow with suction aligned to Recirc Sump.</li> </ul>	<p style="text-align: center;"><b>SAT / UNSAT</b></p>

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## Scenario Instructor Actions

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Setup:

1. Reset to IC 850 1623 PPM 170 Steps on Bank D, 548.9 Power is stable @ 1e-8 in Intermediate Range with AFW in service Mode 1 Checklist Complete
2. Reset control rods and check group step counters.
3. Place Master Annunciator Silence pushbutton lockout ring in LOCKOUT position.
4. Advance chart recorder paper & clear chart recorder memory.
5. Activate the following (pre-load) malfunctions:

Train A Reactor Trip Auto Failure

**U1\_RP01A**

Train B Reactor Trip Auto Failure

**U1\_RP01B**

Train A Safety Injection Auto Failure

**U1\_RP10A**

Train B Safety Injection Auto Failure

**U1\_RP10B**

Train B Phase B Auto Fails

**U1\_RP16B**

Train B Phase B Manual Fails

**U1\_RP17B**

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## Scenario Instructor Actions

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### Scenario Events:

### **EVENT #1 & 2**

Respond as required to requests for chemistry sampling or startup preps

### **EVENT #3**

ICF U1\_NPP151 to 1700 over 3 seconds cause the Pressurizer Pressure Channel to fail Low

**U1\_NPP151**

When Requested to De-energize Power for QMO-225 (1-ABV-D-5C)

**U1\_EDPR10J**

### **EVENT #4**

Set the Main Steam Stop Valve to 94% to simulate valve off open detent.

**Set U1\_MSVMRV210 0.94**

### **EVENT #5**

ICF U1\_MPP212 to 1200 over 4 seconds to cause the SG Pressure Channel MPP-212 to Fail High (SG11 PORV Opens in Auto)

**U1\_MPP212**

### **EVENT #6**

ICF U1\_RC10A to 5 over 10 minutes to cause RCS Leakage

**U1\_RC10A**

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**Scenario Instructor Actions**

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**EVENT #7 (8, 9, & 10 already loaded)**

ICF U1\_RC01A to 50 over 30 seconds to cause RCS Break

**U1\_RC01A**

**Local actions after entry into E-0:**

- Locally stop U1 Ice Condenser AHUs MRF **CHR01** to OFF  

**U1\_CHR01**
- Aux Tour will monitor Spent Fuel Pool Level and Temperatures
- Place PACHMAS in service – MRF **CHR02 or 03** with 10 min delay.  

**U1\_CHR02**

 OR
 

**U1\_CHR03**

(both have 10 minute delays built in)
- U2 has aligned CR vent for U1 SI, Fan **2-HV-AS-2** is running.

If directed to secure EDG jacket water pumps select **OFF** then **AUTO**

Remote	OFF	AUTO
<i>EGR 03A</i>	<b>U1_EGR03A</b>	<b>U1_EGR03A</b>
<i>EGR 03B</i>	<b>U1_EGR03B</b>	<b>U1_EGR03B</b>
<i>EGR 04A</i>	<b>U1_EGR04A</b>	<b>U1_EGR04A</b>
<i>EGR 04B</i>	<b>U1_EGR04B</b>	<b>U1_EGR04B</b>

Facility: DC Cook 1 & 2 Scenario No.: 4 Op-Test No.: \_\_\_\_\_

Examiners: \_\_\_\_\_ Operators: \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_

Initial Conditions: 80% Power

Turnover: Start the West TACW pump and stop the East TACW Pump

Critical Tasks Align High Head Injection, Trip RCPs, Make-up / Reduce RWST Outflow

Event No.	Malf. No.	Event Type*	Event Description
1		N-BOP	Swap Turbine Aux Cooling Water (TACW) Pumps.
2	U1_CV04C	C-RO	Letdown Orifice valve fails closed
3	U1_NLP151 @ 0%	I-RO TS	Pressurizer Level Channel Failure (perform before letdown is restored)
4	U1_FFC220 @ 0 over 20 sec	I-BOP TS	Feed Flow Channel Fails low on SG 2
5	U1_FW05A	C-BOP R-RO	East Main Feed Pump Trip
6		R-RO N-BOP	Stabilize Plant And Recover AFD from FW Pump Trip
7	U1_RC02C 100%	M	Hot Leg LOCA
8	U1_ED05H	C-BOP	Loss of Power to T11D
9	U1_RP20B, U1_RP20G	C-RO	Slave Relay failures: High Head [ECCS] Charging valves fail to align (Preloaded)
10	U1_WRHR	C- BOP	RHR Pump Fails to Start ECA-1.1

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

## Event Summary

The Crew is directed to start West TACW pump and stop East TACW Pump.

After the TACW pump swap, the in-service letdown orifice valve will fail closed. The RO will need to restore letdown through a different valve.

Prior to restoring letdown, the controlling Pressurizer Level channel NLP-151 fails LOW. Charging flow control valve (QRV-251) will be in manual so RO will monitor for stability. Pressurizer water level low alarm comes in (letdown was previously isolated) and all pressurizer heaters will de-energize. The RO will have manual control of the Pressurizer Level controller and will be restoring level. The crew should implement the AOP, stabilize the plant, trip bi-stables, select an operable channel, and restore letdown and level control to auto.

The #2 SG Feed Flow instrument (FFC-220) fails LOW. This will result in the opening of #2 SG FWRV (FRV-220) to raise feedwater flow. The BOP will be required to take manual control and regulate FRV-220. The Crew will be required to implement AOP actions to stabilize the plant.

A trip of the East Main Feed Pump will result in a rapid power reduction to less than 60% if not already performed. The BOP will start additional pumps as required and stabilize FW pump speed control.

The RO will be required to control reactivity while the BOP monitors the SG levels.

A Hot Leg break will result in a Reactor Trip and Safety Injection. On the SI, various slave relay failures will cause the High Head Charging (ECCS) Injection flowpath to fail to align. The RO will need to manually align the High Head Injection Valves. The crew will enter E-0 and transition to E-1. The West RHR pump will trip resulting in a loss of Recirculation Capability requiring entry into ECA-1.1.

On the Generator Trip, a loss of 4 KV bus T11D causes a trip of the running Charging Pump, Component Cooling Pump, and ESW pump. The Standby ESW (U2) and CCW pumps will start. (The East RHR and North SI pumps will also be unavailable)

## Critical Tasks

- Align High Head Injection
- Trip RCPs

## Procedures

- E-0, Reactor Trip or Safety Injection
- E-1, Loss of Reactor or Secondary Coolant
- FR-Z.1, Response to High Containment Pressure
- FR-P.1, Response to Imminent Pressurized Thermal Shock



Op-Test No.: Cook 2018      Scenario No.: NRC2018-4      Event No.: 1

Event Description: **Swap Turbine Aux Cooling Water (TACW) Pumps.**

Time	Position	Applicant's Actions or Behavior
	US	Directs actions of 1-OHP-4021-058-002, Operation of TACW System.
	BOP	Performs the following to swap TACW pumps as directed: <ul style="list-style-type: none"><li>· Start Standby (West) TACW Pump.</li><li>· Stop running (East) TACW Pump.</li><li>· Place East TACW Pump in AUTO.</li></ul>

Op-Test No.: Cook 2018      Scenario No.: NRC2018-4      Event No.: 2

Event Description: **Letdown Orifice valve fails closed**

Time	Position	Applicant's Actions or Behavior
	RO	Identifies and reports rise in pressurizer (PRZ) or lowering VCT level due to a loss of letdown flow as a result of QRV-162 failing closed.
	US/RO	Minimizes charging flow to that amount required for seal injection.
	US	Directs RO to restore normal letdown (using QRV-161, 75 gpm letdown orifice) per 1-OHP-4021-003-001, Letdown, Charging, and seal water Operation, Attachment 13.
	RO/BOP	Restores normal letdown per Attachment 13, Section 4.1 as follows: (Will Perform after following event) <ol style="list-style-type: none"> <li>1. Places QRV-302 in divert position.</li> <li>2. Verifies orifice isolations closed (QVR-160, 161 and 162).</li> <li>3. Adjusts CRV-470 controller to <math>\geq 50\%</math> output.</li> <li>4. Verifies open letdown isolation valves:               <ol style="list-style-type: none"> <li>a. QCR-300, CVCS letdown Cntmt isol</li> <li>b. QCR-301, CVCS letdown Cntmt isol</li> <li>c. QRV-111, RC letdown to Regen hx</li> <li>d. QRV-112, RC letdown to Regen hx</li> </ol> </li> <li>5. Adjusts QRV-301 controller to 50% output.</li> <li>6. Checks/adjusts charging flow to <math>&gt; 75</math> gpm.</li> <li>7. Opens QRV-161, 75 gpm letdown orifice isolation.</li> <li>8. Adjusts QRV-301 to maintain 160 – 350 psig on QPC-301.</li> <li>9. Places QRV-301 in auto (if desired).</li> <li>10. Nulls and returns CRV-470 controller to auto.</li> <li>11. Adjusts charging flow as required to maintain PRZ level.</li> <li>12. Places PRZ level control in automatic (if desired).</li> <li>13. Places QRV-302 in normal (demin) position when letdown temperature is stable.</li> </ol>

Op-Test No.: Cook 2018Scenario No.: NRC2018-4Event No.: 3

Event Description: **Pressurizer Level Channel NLP-151 Failure (perform before letdown is restored)**

Time	Position	Applicant's Actions or Behavior
	RO	Recognizes and reports annunciators on Panel #108 (Drops 4 and 5). Reports instrument malfunction indicative of a pressurizer (PRZ) level instrument failure.
	RO	Reports instrument malfunction and performs the immediate actions of OHP-4022-IFR-001, Instrument Failure Response: <ul style="list-style-type: none"> <li>Verifies 1-QRV-251, Charging Flow Controller OR PRZ Level Controller in manual from previous event or manually adjusts output to restore charging header flow and seal injection to normal</li> </ul>
	Crew	Performs plant stability checks.
	US	Enters and directs actions of OHP-4022-IFR-001, Instrument Failure Response procedure.
	US	Enters and directs actions of OHP-4022-013-010, Pressurizer Level Instrument Malfunction procedure.
	RO	Performs the following actions as directed: <ol style="list-style-type: none"> <li>Restores PRZ level using 1-QRV-251 or level controller</li> <li>Reports 1-NLP-151 has failed</li> <li>Ensures PRZ level control is in manual</li> <li>Places PRZ Level CTRL selector switch in Ch 2 &amp; 3 position</li> <li>Places PRZ Level REC selector switch in 2 or 3 position</li> <li>Checks NPP-151 and NLI-151 for failure</li> <li>Restore Letdown or Excess Letdown per 1-OHP-4021-003-001 (See Previous Event)</li> <li>Cycle PRZ Heaters to restore control</li> <li>Nulls and returns 1-QRV-251 and PRZ Level Controller back to auto</li> </ol>
	US	Initiates actions to trip bistables associated with 1-NLP-151 PZR Level Failure per Attachment A of OHP-4022-013-010.
	US	Refers to Tech Specs (TS): <ul style="list-style-type: none"> <li>TS 3.3.1 <u>RTS Instrumentation</u> (Table 3.3-1, *Function 9 Action D)</li> <li>TS 3.3.3 <u>Post Accident</u> (Minimum channels met) <ul style="list-style-type: none"> <li>*Identifies requirement to trip associated bistables within 1 hour of pressurizer level channel failure.</li> </ul> </li> <li>TS 3.3.4 <u>Remote Shutdown Instrumentation</u></li> </ul>

Op-Test No.: Cook 2018 Scenario No.: NRC2018-4 Event No.: 4Event Description: **Feed Flow Channel (FFC-220)Fails low on SG 2**

Time	Position	Applicant's Actions or Behavior
	BOP	Recognizes and reports annunciators on Panel #113 <ul style="list-style-type: none"> <li>• Drop 32, Steam Generator 2 Water LVL HI Deviation</li> <li>• Drop 42 Steam Generator 2 Feedwater Flow High</li> <li>• Drop 43, Steam Generator 2 SF &gt; FWF Mismatch</li> </ul>
	BOP	Reports instrument malfunction and performs the immediate actions of OHP-4022-IFR-001, Instrument Failure Response: <ul style="list-style-type: none"> <li>• Verifies FRV-220, SG #2 MFW Reg. Valve controller in manual Lowers controller output to match the operable feed flow channel with steam flow.</li> <li>• Restores SG #2 level to program.</li> <li>• Performs Stability Checks</li> </ul>
	Crew	Performs plant stability checks.
	US	Enters and directs actions of OHP-4022-IFR-001, Instrument Failure Response procedure.
	US	Enters and directs actions of OHP-4022-013-015, Feedwater Flow Instrument Malfunction procedure.
	BOP	Performs the following actions as directed: <ol style="list-style-type: none"> <li>1. Reports FFC-220 has failed low</li> <li>2. Places FS-520-C selector switch in channel 2 position.</li> <li>3. Nulls and returns FRV-220 controller to auto.</li> </ol>
	US	Refers to Tech Specs 3.3.1 <u>RTS Instrumentation</u> (Table 3.3.1-1, Function 15, Condition D). Trip Bistables in 6 Hr
	US	Notifies SM/MTI to Initiate actions to trip bi-stables associated with FFC-220 FW Flow Failure per Attachment B-1 of OHP-4022-013-015.

Op-Test No.: Cook 2018 Scenario No.: NRC2018-4 Event No.: 5Event Description: East Main Feed Pump Trip

Time	Position	Applicant's Actions or Behavior
	BOP	Recognizes indication of MFP trip and reports annunciator Panel #115, Drop 1, East FPT DCS Trouble, DCS Screen East FW Pump Tripped Status
	US	Directs operators to perform the immediate actions per OHP-4022-055-001, Loss of One MFP.
	RO	Performs the following immediate actions: <ol style="list-style-type: none"> <li>1. Verify Turbine Load is automatically reduced to &lt; 60</li> <li>2. Verifies rod control switch in AUTO and functioning properly.</li> </ol>
	BOP	Performs the following immediate actions: <ol style="list-style-type: none"> <li>1. Close the East FW Pump Emergency Leakoff Valves FRV-251 &amp; 252</li> <li>2. Adjust West FW Pump speed/integration as required</li> <li>3. Start Standby Hotwell &amp; Condensate Booster Pumps if required</li> <li>4. Start AFW pumps if required.</li> </ol>
	US	Checks the immediate actions and directs operators to perform the subsequent actions of OHP-4022-055-001, Loss of One MFP.
	BOP	Verify SG levels are stable at or returning to normal (44%).
	RO	Initiate normal or emergency boration flow (if required) to maintain rods above the RIL (~1.89 * % power)
	CREW	May enter Technical Specification 3.4.1 <u>RCS Pressure, Temperature, and Flow DNB Limits</u> if Pressure lowers to <2168 psig. (2200 psig admin limit)

Op-Test No.: Cook 2018Scenario No.: NRC2018-4Event No.: 6Event Description: **Stabilize Plant And Recover AFD from FW Pump Trip**

Time	Position	Applicant's Actions or Behavior
	US	Direct operator actions to restore normal system alignment: (as required) <ul style="list-style-type: none"> <li>• Restore AFD to required Band</li> <li>• Restore Megawatt Control to OUT</li> <li>• Return W MFP to DP control</li> <li>• Check ALL PRZ Backup Heaters on</li> <li>• Reset Steam Dump Load Rejection</li> <li>• Stop running AFW pumps and align for standby condition</li> <li>• Complete FW Pump Shutdown</li> <li>• Align Condensate system for current plant conditions</li> </ul>
	RO	Borate to position rods to restore AFD to within Target Band
	BOP	Stop AFW Pumps and Place in Standby Stabilize West FW pump speed and restore required DP Reset Steam Dump Load Rejection Align Condensate system for current plant conditions

Op-Test No.: Cook 2018      Scenario No.: NRC2018-4      Event No.: 7,8,9, & 10

Event Description: **Hot Leg LOCA with trip of T11D bus, High Head SI Relay failure and Loss of RHR**

Time	Position	Applicant's Actions or Behavior
	RO/US	Acknowledge Ann. Panel 122, Drop 84, ICE CONDENSER INLET DOORS OPEN, alarm. Determines that a loss of reactor coolant is occurring based on the following: <ul style="list-style-type: none"> <li>• Pressurizer and VCT level change</li> <li>• Charging and letdown flow mismatch</li> <li>• Containment radiation monitoring trend</li> <li>• Containment pressure rise</li> <li>• Containment sump level rise</li> <li>• Containment dewpoint</li> </ul>
	US	Directs RO/BOP to manually trip the reactor and initiate safety injection and perform the immediate actions of OHP-4023-E-0, Reactor Trip or Safety Injection (based on RCS leak rate beyond charging system capability or rising Containment Pressure).
	RO/BOP	Performs the immediate actions of OHP-4023-E-0: <ul style="list-style-type: none"> <li>• Checks reactor trip</li> <li>• Checks turbine trip</li> </ul>
	BOP	Checks power to AC emergency buses <ul style="list-style-type: none"> <li>• Determines that T11A and T11B are Energized</li> <li>• May Identify that 1AB DG did Not Start (from relay failure)</li> <li>• Determines That T11D and T11C are De-Energized</li> </ul>
	RO	Verifies that Safety Injection Has Actuated
	US	Ensures immediate actions of E-0 are completed
	US	Directs subsequent actions of E-0.
	RO/BOP	Reviews E-0 Foldout Page Criteria.
	BOP	Manually controls AFW flow to maintain SG narrow range levels 13% - 50% once one SG narrow range level is > 13%.

Op-Test No.: Cook 2018      Scenario No.: NRC2018-4      Event No.: 7,8,9, & 10

Event Description: **Hot Leg LOCA with trip of T11D bus, High Head SI Relay failure and Loss of RHR**

Time	Position	Applicant's Actions or Behavior
	RO	Reports that RHR pumps are NOT running – 1E RHR pump off due to T11D Power Loss and 1W RHR Pump has tripped.
	<b><u>US/RO</u></b>  <b>Critical Task #1</b>	<b>Manually opens high head safety injection valves:</b> <ul style="list-style-type: none"> <li>• BIT Inlet Valve <ul style="list-style-type: none"> <li>○ 2-IMO-256</li> </ul> </li> <li>• BIT Outlet Valve <ul style="list-style-type: none"> <li>○ 2-ICM-251</li> </ul> </li> </ul> <b>Note: Event 9, Manually align the High Head Injection Valves.</b>
	US/RO	Verifies Containment Isolation - Phase A.
	<b><u>CREW</u></b>  <b>Critical Task #2</b>	<b>Manually stops all Reactor Coolant Pumps (RCPs) within 5 minutes of RCS pressure lowering below 1300 psig.</b>
	RO/BOP	Performs verification and actions of E-0 Attachment A as directed by US.
	CREW	Completes all actions of E-0 through step 19 (Check If RCS Is Intact).
	US	Announces transition to OHP-4023-E-1, Loss Of Reactor Or Secondary Coolant (at step 19 of E-0).  Checks Status Trees for Red Path



Op-Test No.: Cook 2018      Scenario No.: NRC2018-4      Event No.: 7,8,9, & 10

Event Description: **Hot Leg LOCA with trip of T11D bus, High Head SI Relay failure and Loss of RHR**

Time	Position	Applicant's Actions or Behavior
	US	May Transition to Z.1 on Orange Path in Containment based on Pressure. <ul style="list-style-type: none"> <li>• Check Containment Isolation</li> <li>• Verify CTs operating and Phase B</li> <li>• Stop Vent Fans</li> <li>• Verify CEQ Fans Running and Lineup</li> <li>• Verify Secondary not Faulted &amp; Isolated</li> </ul> Return to Procedure and step in effect
	US	May Transition to OHP-4023-FR-P.1 due to RED Path. <ul style="list-style-type: none"> <li>• Identifies RCS pressure &lt; 300psig – May exit at RNO</li> </ul> May Continue since No RHR Flow <ul style="list-style-type: none"> <li>• Verifies Cooldown Sources Isolated</li> <li>• Check PZR PORVS</li> <li>• Check ECCS</li> </ul> Go to Step 26 due to No Subcooling for Soak and exit
	RO/BOP	Reviews E-1 Foldout Page Criteria.
	US	Directs actions of E-1, Loss Of Reactor Or Secondary Coolant.
	BOP	Maintains SG narrow range levels 27% - 50%. Directs chemistry to initiate post-accident sampling

Op-Test No.: Cook 2018      Scenario No.: NRC2018-4      Event No.: 7,8,9, & 10

Event Description: **Hot Leg LOCA with trip of T11D bus, High Head SI Relay failure and Loss of RHR**

Time	Position	Applicant's Actions or Behavior
	US	Checks if SI Termination Criteria is MET: <ul style="list-style-type: none"> <li>• RCS Subcooling &gt;40°F – NO</li> <li>• Secondary Heat Sink (SG &gt;13% or AFW Flow &gt;240x103)</li> <li>• RCS Pressure rising or stable – NO Lowering</li> <li>• Pressurizer Level &gt;20%</li> </ul>
	Crew	Checks CTS Injection – (If Containment < 2 PSIG RCS pressure <300 Psig so operate for 24 Hours)
	RO/BOP	Performs the following as directed: <ol style="list-style-type: none"> <li>1. Resets both trains of Safety Injection</li> <li>2. Checks Emergency Diesel Generators (EDG) NOT running</li> <li>3. Dispatches operator to secure EDG jacket water pumps (for EDG Stopped)</li> <li>4. Evaluate Long Term Plant Status (RHR Not Available)</li> </ol>
	US	Announces transition to OHP-4023-ECA-1.1, Loss of Emergency Coolant Recirculation (at step 11 of E-1).
<b>Terminate Scenario</b>		

**Critical Task Summary**

Task	Elements	Results
<p align="center"><b>#1</b></p> <p><b>Manually Align one train of Safety Injection to establish HIGH Head Injection Flow</b></p>	<p><u>Cueing:</u></p> <ul style="list-style-type: none"> <li>• Check BIT Flow (E-0, Attachment A Step 2)               <ul style="list-style-type: none"> <li>• 1-IFI-51</li> <li>• 1-IFI-52</li> <li>• 1-IFI-53</li> <li>• 1-IFI-54</li> </ul> </li> </ul> <p><u>Performance Indicators:</u>            Before transitioning from E-0:            Manually Align Valves</p> <ul style="list-style-type: none"> <li>• BIT Inlet Valve ICM-256 - OPEN</li> <li>• BIT Outlet Valve ICM-251 - OPEN</li> </ul> <p><u>Performance Feedback:</u></p> <ul style="list-style-type: none"> <li>• ECCS flow is indicated to at least one train (as indicated by flow on cold leg BIT injection flowmeters)               <ul style="list-style-type: none"> <li>• 1-IFI-51</li> <li>• 1-IFI-52</li> <li>• 1-IFI-53</li> <li>• 1-IFI-54</li> </ul> </li> </ul>	<p align="center"><b>SAT / UNSAT</b></p>
<p align="center"><b>#2</b></p> <p><b>Manually trip all Reactor Coolant Pumps</b></p>	<p><u>Cueing:</u></p> <ul style="list-style-type: none"> <li>• RCS pressure – less than 1300 psig AND CCPs or SI pumps – at least one running</li> <li>• E-0, Foldout Page, Step 1</li> <li>• E-1, Foldout Page, Step 1</li> <li>• E-1, Step 1</li> </ul> <p><u>Performance Indicators:</u></p> <ul style="list-style-type: none"> <li>• Manually stop all Reactor Coolant Pumps (RCPs) when RCS pressure is less than 1300 psig prior to core uncover leading to CETC &gt;2200°F.</li> </ul> <p><u>Performance Feedback:</u></p> <ul style="list-style-type: none"> <li>• RCP ammeters – zero current</li> <li>• RCP trip low flow alarms – lit</li> <li>• RCS loop flow meters – flow lowering</li> </ul>	<p align="center"><b>SAT / UNSAT</b></p>

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## Scenario Instructor Actions

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Setup:

1. Reset to IC- 308 MOL; 80% power, 883 MW, 805.58 ppm, 565.7 F 195 Steps on D
2. Reset control rods and check group step counters.
3. Place Master Annunciator Silence pushbutton lockout ring in LOCKOUT position.
4. Advance chart recorder paper & clear chart recorder memory.
5. Activate the following (pre-load) malfunctions:

Generator Trip to Trigger 4

**Generator Trip on T4**

T11D Failure to Trigger 4

**U1\_ED05H**

RPS Relay Failure Train B  
AB DG, QMO226, 1S NESW, IMO-256  
ICM-251

**U1\_RP20B**

**U1\_RP20G**

West RHR Trip ON T10

**U1\_WRHR**

Hot Leg Break on T10

**U1\_RC02C**

CL Break on T10 (raise size of RCS break)

**U1\_RC01C**

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## Scenario Instructor Actions

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### Scenario Events:

#### **EVENT #1**

If asked, a "Starting Party" is standing by to observe swap of the TACW Pumps.

#### **EVENT #2**

IMF CV04C, to cause QRV-162, 75 gpm letdown orifice to fail closed.

**U1\_CV04C**

If desired, direct the Crew as the SM to restore ONLY 75 GPM letdown using section 4.1 of Attachment 13.

#### **EVENT #3**

ICF U1\_NLP151 to 0 to fail Pressurizer Level Channel NLP-151 (perform before letdown is restored)

**U1\_NLP151**

#### **EVENT #4**

ICF U1\_FFC220 to 0 over 20 Seconds to cause Feed Flow Channel FFC-220 to fail low on SG 2

**U1\_FFC220**

#### **EVENT #5**

IMF U1\_FW05A to cause the East Main Feed Pump Trip

**U1\_FW05A**

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## Scenario Instructor Actions

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### **EVENT #6, 7, 8,& 9**

**Activate Trigger 10** to begin the LOCA with Slave Relay failures, RHR Pump Trip and Loss of T11D (on Generator Trip)

**Start LOCA On T10**

#### Local actions after entry into E-0:

- Locally stop U1 Ice Condenser AHUs MRF **CHR01** to OFF  

**U1\_CHR01**
- Aux Tour will monitor Spent Fuel Pool Level and Temperatures
- Place PACHMAS in service – MRF **CHR02 or 03** with 10 min delay.  

**U1\_CHR02**

OR

**U1\_CHR03**

(both have 10 minute delay built in)
- U2 has aligned CR vent for U1 SI, Fan **2-HV-AS-2** is running.

Manually (locally) CLOSE 1-HV-ACR-DA-2A if Dispatched

**U1\_HVR11**

If directed to secure EDG jacket water pumps select **OFF** then **AUTO**

Remote	OFF	AUTO
<i>EGR 03A</i>	<b>U1_EGR03A</b>	<b>U1_EGR03A</b>
<i>EGR 03B</i>	<b>U1_EGR03B</b>	<b>U1_EGR03B</b>
<i>EGR 04A</i>	<b>U1_EGR04A</b>	<b>U1_EGR04A</b>
<i>EGR 04B</i>	<b>U1_EGR04B</b>	<b>U1_EGR04B</b>

Facility: DC Cook 1 & 2 Scenario No.: 5 Op-Test No.: \_\_\_\_\_

Examiners: \_\_\_\_\_ Operators: \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_

Initial Conditions: 100% power

Turnover: Reduce power for East AFW pump inoperable > 72 hours – Shutdown in 4 hours

Critical Tasks Insert Negative Reactivity, Isolate the Faulted Steam Generator

Event No.	Malf. No.	Event Type*	Event Description
1	U1_QLC45 2 to 100	I-RO TS	VCT Level Channel QLC 452 fails HIGH
2		R-RO N-BOP	Perform Rapid Power Reduction
3	U1_RX11D @100%	C-BOP	SG PORV Controller Failure
4	U1_ECP	C-RO TS	East CCP pump trips
5	U1_BLP111 @ 0 over 30 sec	I-BOP TS	#11 SG level Transmitter fails LOW
6	U1_MS01D @ 20 over 2 min	M-ALL	Steam Line Break inside Containment (#14 SG)
7	U1_RP03A U1_RP03B	C-RO	AUTO/MANUAL Reactor trip actuation failure (ATWS)
8	U1_RP07A U1_RP07B	C-BOP	Steam Line Isolation fails to AUTO actuate

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

### Event Summary

The scenario starts with the East MDAF pump inoperable due to a failed coupling. The crew must perform a shutdown within the next 4 hours.

Prior to reducing power, the VCT Level Channel QLC-452 fails high. This will cause the QRV-303 VCT Divert valve to fully divert letdown flow to the HUT. The Operator is required to take Manual control of QRV-303 and direct letdown flow back to the VCT. Crew will be required to implement AOP actions to stabilize the plant and address Technical Specifications (TRM).

If required, the crew will be directed by the Shift Manager to lower power.

The next event will involve a trip of the East Charging Pump. This will result in the loss of charging and letdown. RO will be required to manually start the West Charging Pump to restore charging flow. Crew will be required to take manual control of charging and restore letdown to stabilize the plant.

A failure of the SG #11 PORV Controller while in Auto will occur. The Controller will fail causing PORV MRV-213 to fully open. This will also cause Reactor power to slightly rise. The BOP will need to take manual action to close the PORV and the US will need to declare the associated radiation monitor inoperable.

The #11 Steam Generator Level instrument (BLP-111) fails LOW. This results in a higher feedwater flow and Steam Generator level will rise. BOP will be required to take manual control and restore normal level. Crew will be required to implement AOP actions to stabilize the plant and address Technical Specifications.

The main event will involve a Steamline Break inside containment on the #14 SG. The unit will NOT trip and a Safety Injection will actuate. The reactor must be locally tripped. The crew will implement FR-S.1 actions until reactor is subcritical. Failure of the Steam Line Isolation actuation circuit will require a manual actuation. After the crew performs the actions of FR-S.1, they should identify the Main Steamline Break inside containment on the #14 SG. The crew will isolate the SG in FR-Z.1 or eventually transition to E-2 to isolate #14 SG. The scenario will terminate when the crew has isolated the Faulted SG.

#### Critical Tasks

- Insert Negative Reactivity
- Isolate the Faulted Steam Generator

#### Procedures

- E-0, Reactor Trip or Safety Injection
- E-2, Faulted Steam Generator Isolation
- FR-S.1, Response to Anticipated Trip without Scram
- FR-Z.1, Response to High Containment Pressure



Op-Test No.: Cook 2018      Scenario No.: NRC2018-5      Event No.: 1

Event Description: **VCT Level Channel QLC 452 fails HIGH**

Time	Position	Applicant's Actions or Behavior
	RO	Recognizes indication of VCT Level problem and reports Annunciator Panel #109 (if VCT level on QLC-451 lowers to 14%): <ul style="list-style-type: none"> <li>• Drop 48 VOLUME CTRL TANK MAKEUP NOT IN AUTO alarm</li> <li>• Drop 49 VOLUME CONTROL TANK LEVEL LOW alarm</li> </ul>
	Crew	Performs plant stability checks.
	US	Enters and directs actions of OHP-4022-IFR-001, Instrument Failure Response procedure.
	RO	Reports instrument malfunction and performs the immediate actions of OHP-4022-IFR-001, Instrument Failure Response: <ul style="list-style-type: none"> <li>• Place QRV-303 controller in Manual and lowers demand –OR–</li> <li>• Place Divert valve (QRV-303) in VCT position.</li> <li>• Recognizes and reports failure of VCT Level Transmitter (QLC-452).</li> </ul>
	US	Directs operator actions per 1-OHP-4022-013-017, VCT Instrument Malfunction.
	US	Refers TRM 8.1.1, Boration Systems – Operating: <ul style="list-style-type: none"> <li>• Condition A (Interposing Relay should be energized for Refueling Water Sequence).</li> </ul> Enters action statement to restore to operable status within 72 hours.
	US	Notify SM/MTI to imitate actions to energize Interposing Relay in accordance with Attachment B.

Op-Test No.: Cook 2018Scenario No.: NRC2018-5Event No.: 2Event Description: **Rapid Power Reduction Shutdown**

Time	Position	Applicant's Actions or Behavior																																																							
	US	Directs RO to commence Rapid Power Reduction in accordance with 1-OHP-4022-001-006, Rapid Power Reduction.																																																							
	RO	<p>Performs (Att. D) <b>NORMAL BORATION</b>:</p> <ul style="list-style-type: none"> <li>• Verify charging is &gt; 75 gpm</li> <li>• CLOSE 1-QMO-225, EAST CCP Mini-Flow (CCP ELO)</li> <li>• Place RC Makeup Blend control switch in STOP.</li> <li>• Place RC Makeup Blend Control Mode switch in BORATE.</li> <li>• Adjust BA Controller/Totalizer to the desired flow rate and amount.</li> <li>• Place RC Makeup Blend control switch in START.</li> <li>• May take QRV-303 to MANUAL/OPEN (as required) to maintain VCT level and pressure.</li> </ul> <p>1-OHP 4022-001-006 Attachment D Table</p> <table border="1"> <thead> <tr> <th>Change in Power Level (%)</th> <th>Amount of Boric Acid Required (gals)</th> <th>Volume change expected in BAST (%)</th> <th>Desired Rate of Change in Reactor Power(%/min)</th> <th>Boration Rate (gpm)</th> </tr> </thead> <tbody> <tr> <td>10</td> <td>100</td> <td>1.0</td> <td>1</td> <td>10</td> </tr> <tr> <td>20</td> <td>200</td> <td>2.0</td> <td>2</td> <td>20</td> </tr> <tr> <td>30</td> <td>300</td> <td>3.0</td> <td>3</td> <td>30</td> </tr> <tr> <td>40</td> <td>400</td> <td>4.0</td> <td></td> <td></td> </tr> <tr> <td>50</td> <td>500</td> <td>5.0</td> <td></td> <td></td> </tr> <tr> <td>60</td> <td>600</td> <td>6.0</td> <td></td> <td></td> </tr> <tr> <td>70</td> <td>700</td> <td>7.0</td> <td></td> <td></td> </tr> <tr> <td>80</td> <td>800</td> <td>8.0</td> <td></td> <td></td> </tr> <tr> <td>90</td> <td>900</td> <td>9.0</td> <td></td> <td></td> </tr> <tr> <td>100</td> <td>1000</td> <td>10.0</td> <td></td> <td></td> </tr> </tbody> </table> <p><b>-OR-</b> (Next page)</p>	Change in Power Level (%)	Amount of Boric Acid Required (gals)	Volume change expected in BAST (%)	Desired Rate of Change in Reactor Power(%/min)	Boration Rate (gpm)	10	100	1.0	1	10	20	200	2.0	2	20	30	300	3.0	3	30	40	400	4.0			50	500	5.0			60	600	6.0			70	700	7.0			80	800	8.0			90	900	9.0			100	1000	10.0		
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Op-Test No.: Cook 2018Scenario No.: NRC2018-5Event No.: 2Event Description: **Rapid Power Reduction Shutdown**

Time	Position	Applicant's Actions or Behavior																																																							
		<p>Performs (Att. E) <b>EMERGENCY BORATION:</b></p> <ul style="list-style-type: none"> <li>• Verify charging is &gt; 75 gpm.</li> <li>• CLOSE 1-QMO-225, EAST CCP Mini-Flow (CCP ELO)</li> <li>• Place #2 BAT pump to FAST speed.</li> <li>• Open QMO-410, Emergency Boration To CHG Pump Suction valve.</li> <li>• Verify QFI-410, Emergency Boration Flow.</li> <li>• May take QRV-303 to MANUAL/OPEN (as required) to maintain VCT level and pressure.</li> </ul> <p>1-OHP 4022-001-006 Attachment E Table</p> <table border="1" data-bbox="553 1050 1370 1566"> <thead> <tr> <th>Change in Power Level (%)</th> <th>Amount of Boric Acid Required (gals)</th> <th>Volume change expected in BAST (%)</th> <th>Desired Rate of Change in Reactor Power(%/min)</th> <th>Boration Rate (gpm)</th> </tr> </thead> <tbody> <tr><td>10</td><td>100</td><td>1.0</td><td>1</td><td>10</td></tr> <tr><td>20</td><td>200</td><td>2.0</td><td>2</td><td>20</td></tr> <tr><td>30</td><td>300</td><td>3.0</td><td>3</td><td>30</td></tr> <tr><td>40</td><td>400</td><td>4.0</td><td>4</td><td>40</td></tr> <tr><td>50</td><td>500</td><td>5.0</td><td>5</td><td>50</td></tr> <tr><td>60</td><td>600</td><td>6.0</td><td></td><td></td></tr> <tr><td>70</td><td>700</td><td>7.0</td><td></td><td></td></tr> <tr><td>80</td><td>800</td><td>8.0</td><td></td><td></td></tr> <tr><td>90</td><td>900</td><td>9.0</td><td></td><td></td></tr> <tr><td>100</td><td>1000</td><td>10.0</td><td></td><td></td></tr> </tbody> </table>	Change in Power Level (%)	Amount of Boric Acid Required (gals)	Volume change expected in BAST (%)	Desired Rate of Change in Reactor Power(%/min)	Boration Rate (gpm)	10	100	1.0	1	10	20	200	2.0	2	20	30	300	3.0	3	30	40	400	4.0	4	40	50	500	5.0	5	50	60	600	6.0			70	700	7.0			80	800	8.0			90	900	9.0			100	1000	10.0		
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	RO	<p>Commences power reduction:</p> <ul style="list-style-type: none"> <li>• Verify all PRZ backup heaters ON.</li> <li>• Ensures control rods in AUTO.</li> </ul>																																																							
	BOP	<p>Acts as peer checker for RO and verifies appropriate reactivity feedback.</p>																																																							

Op-Test No.: Cook 2018

Scenario No.: NRC2018-5

Event No.: 2

Event Description: **Rapid Power Reduction Shutdown**

Time	Position	Applicant's Actions or Behavior																																								
	BOP	<p>Performs Attachment F Adjusting Main Turbine Load</p> <ul style="list-style-type: none"> <li>Places MW feedback IN</li> <li>Enters TARGET Load into HMI</li> <li>Enters RAMP RATE into HM</li> <li>Depresses GO to Lower Turbine load using HMI.</li> </ul> <table border="1" data-bbox="548 821 1406 1335"> <thead> <tr> <th>Final Power Level (%)</th> <th>Final Turbine Load Target (MW)</th> <th>Desired Rate of Change (%/min)</th> <th>Turbine Unloading Rate (MW/Min)</th> </tr> </thead> <tbody> <tr> <td>90</td> <td>1034</td> <td>1</td> <td>11.5</td> </tr> <tr> <td>80</td> <td>919</td> <td>2</td> <td>23.0</td> </tr> <tr> <td>70</td> <td>804</td> <td>3</td> <td>34.5</td> </tr> <tr> <td>60</td> <td>689</td> <td>4</td> <td>46.0</td> </tr> <tr> <td>50</td> <td>574</td> <td>5</td> <td>57.5</td> </tr> <tr> <td>40</td> <td>459</td> <td></td> <td></td> </tr> <tr> <td>30</td> <td>344</td> <td></td> <td></td> </tr> <tr> <td>20</td> <td>229</td> <td></td> <td></td> </tr> <tr> <td>10</td> <td>114</td> <td></td> <td></td> </tr> </tbody> </table>	Final Power Level (%)	Final Turbine Load Target (MW)	Desired Rate of Change (%/min)	Turbine Unloading Rate (MW/Min)	90	1034	1	11.5	80	919	2	23.0	70	804	3	34.5	60	689	4	46.0	50	574	5	57.5	40	459			30	344			20	229			10	114		
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	CREW	Begins Load Reduction on Main Turbine																																								
	RO	Monitors Power and Tavg as load lowers																																								
	BOP	Monitors SG Levels and FW Pumps as Load Lowers																																								

Op-Test No.: Cook 2018 Scenario No.: NRC2018-5 Event No.: 3Event Description: **SG PORV Controller Failure**

Time	Position	Applicant's Actions or Behavior
	BOP	Recognize and reports Annunciator #114 Drop 24 that indicates SG #4 PORV MRV-243 has opened.
	BOP	Reports instrument malfunction and performs the immediate actions of OHP-4022-IFR-001, Instrument Failure Response: <ul style="list-style-type: none"> <li>• Place SG PORV #4 in MANUAL and closes SG #4 PORV.</li> </ul>
	Crew	Performs plant stability checks.
	US	Enters OHP-4022-IFR-001, Instrument Failure Response: to direct operator actions to close SG #4 PORV and monitor Reactor Power.
	US	Declares the SG #4 PORV Radiation Monitor MRA-1602 inoperable.
	US	Refers to the following Tech Specs (TS) / Tech Requirements Manual (TRM): <ul style="list-style-type: none"> <li>· TS 3.7.4, SG PORVs - (<u>Note</u>: Only Manual Ops Required) – N/A</li> <li>· TRM 8.3.8. <u>Radiation Monitoring Instrumentation</u>, Condition C.1- Restore channel/monitor to operable status within 7 Days (PORV must be able to auto open for Radiation Monitor but not PORV safety Function.)</li> </ul>

Op-Test No.: Cook 2018      Scenario No.: NRC2018-5      Event No.: 4Event Description: East CCP pump trips

Time	Position	Applicant's Actions or Behavior
	RO	Recognizes and reports multiple annunciators on Panel #107, #108 and #109 which are indicative of a loss of charging capability. <ul style="list-style-type: none"> <li>• Loss of charging flow</li> <li>• Loss of letdown flow</li> <li>• Loss of RCP seal injection flow</li> </ul>
	RO	Recognizes and reports that running (E) CCP has tripped.
	US	Directs RO to start the W CCP per annunciator response procedure(s): <ul style="list-style-type: none"> <li>• 1-OHP 4024-108 Drop 20, Charging Flow &lt; Min Set Point or</li> <li>• 1-OHP 4024-109 Drop 11, East CCP Motor Instant Trip</li> </ul>
	RO	Performs the following as directed: <ul style="list-style-type: none"> <li>• Starts W CCP</li> <li>• Adjusts QRV-200 and QRV-251 flow to maintain RCP seal injection flow and pressurizer level.</li> <li>• Places normal letdown back in service in accordance with 1-OHP-4021-003-001, Attachment 13.</li> </ul>

(Continued on next page)

Op-Test No.: Cook 2018 Scenario No.: NRC2018-5 Event No.: 4Event Description: East CCP pump trips

Time	Position	Applicant's Actions or Behavior
	RO	Restores normal letdown per 1-OHP-4021-003-001, Letdown, Charging, and Seal Water Operation, Attachment 13 : <ol style="list-style-type: none"> <li>1. Places QRV-302 in divert position.</li> <li>2. Verifies orifice isolations closed (QRV-160, 161 and 162).</li> <li>3. Adjusts CRV-470 controller to 50%.</li> <li>4. Verifies open letdown isolation valves:               <ul style="list-style-type: none"> <li>• QCR-300</li> <li>• QCR-301</li> <li>• QRV-111</li> <li>• QRV-112</li> </ul> </li> <li>5. Adjusts QRV-301 controller to 50%.</li> <li>6. Checks/adjusts charging flow to &gt; 75 gpm.</li> <li>7. Opens QRV-161 or 162.</li> <li>8. Adjusts QRV-301 to maintain 160 – 350 psig.</li> <li>9. Places QRV-301 in AUTO.</li> <li>10. Nulls and returns CRV-470 controller to AUTO.</li> <li>11. Adjusts charging flow as required to maintain PRZ level.</li> <li>12. Places PRZ level control in automatic (if desired).</li> <li>13. Places QRV-302 in normal (demineralizer) position when letdown temperature is stable.</li> </ol>
	US	Declares E CCP inoperable and refers to Tech Specs (TS): <ul style="list-style-type: none"> <li>• 3.5.2, <u>ECCS Subsystems – Tavg &gt; 350°F</u> (Condition A)</li> </ul> Refers to Technical Requirements Manual (TRM): <ul style="list-style-type: none"> <li>• TRM 8.1.1, <u>Boration Systems - Operating</u> (Enters action statements to restore E CCP to operable status within 72 hours.)</li> </ul>

Op-Test No.: Cook 2018      Scenario No.: NRC2018-5      Event No.: 5

Event Description: **#11 SG level Transmitter BLP-111 fails LOW**

Time	Position	Applicant's Actions or Behavior
	Crew	Respond to ANNUNCIATOR #113 RESPONSE: STEAM GENERATOR 1 AND 2: Drop 3: STEAM GEN 1 WATER LVL LOW DEVIATION Drop 5: STEAM GEN 1 WATER LEVEL LOW-LOW Drop 13: STEAM GEN 1 SF > FWF FLOW MISMROH
	BOP	Reports instrument malfunction and performs the immediate actions of OHP-4022-IFR-001, Instrument Failure Response: <ul style="list-style-type: none"> <li>Verifies FRV-210, SG 1 Feedwater Regulating Valve, controls in MANUAL.</li> </ul>
	Crew	Performs plant stability checks.
	US	Enters and directs actions of OHP-4022-IFR-001, Instrument Failure Response procedure.
	BOP	<ul style="list-style-type: none"> <li>Restore Steam Generator Narrow Range Level using Manual Control of Feedwater Regulating Valve 1-FRV-210</li> <li>Check Steam Generator Narrow Range Level – Stable OR Trending to 44%</li> </ul>
	US	Enters and directs actions of 1-OHP-4022-013-013, Steam Generator Level Instrument Malfunction
	US	Refers to the following TS: 3.3.1 <u>RTS Instrumentation</u> (Table 3.3.1-1, Function 14 – Cond D). 3.3.2 <u>ESFAS Instrumentation</u> (Table 3.3.2-1, Function 5b & 6c – Cond D).
	US	Direct actions to trip bi-stables per Attachment A-2 of 1-OHP-4022-013-013.



Op-Test No.: Cook 2018      Scenario No.: NRC2018-5      Event No.: 6,7,8, & 9

Event Description: **Steam line #4 break inside containment, Reactor trip failure (ATWS), Steam Line isolation does not occur in automatic,**

Time	Position	Applicant's Actions or Behavior
	Crew	Recognize RCS temp/press, pressurizer level lowering, reactor power rising MT MW lowering and reactor trip requirements.
	US	Enter 1-OHP-4023-E-0: Reactor Trip or Safety Injection - Directs RO to Perform Reactor trip
	RO	Recognizes and reports failure of reactor to manually trip
	US	Directs actions of OHP-4023-FR-S.1, Response to Nuclear Power Generation/ATWS
	<b>RO</b>  <b>Critical Task #1</b>	Performs the immediate actions of FR-S.1: 1. Checks reactor trip <b>Automatically/Manually insert control rods(must Insert Negative Reactivity through Inserting Control Rods or Emergency Boration)</b>
	BOP	Performs the immediate actions of FR-S.1: 1. Manually actuate AMSAC 2. Check Turbine Trip 3. Check AFW pumps running <ul style="list-style-type: none"> <li>• MDAFP – West Running</li> <li>• TDAFP – Running</li> </ul>
	US	Ensures immediate actions of FR-S.1 are completed

Op-Test No.: Cook 2018 Scenario No.: NRC2018-5 Event No.: 6,7,8, & 9Event Description: **Steam line #4 break inside containment, Reactor trip failure (ATWS), Steam Line isolation does not occur in automatic,**

Time	Position	Applicant's Actions or Behavior
	RO Critical Task #1	<p><b>Initiate Emergency Boration of RCS(must Insert Negative Reactivity through Inserting Control Rods or Emergency Boration)</b></p> <ul style="list-style-type: none"> <li>• CCPs – at least one running</li> <li>• Initiate emergency boration <ul style="list-style-type: none"> <li>• Start both boric acid transfer pumps in FAST speed</li> <li>• Open 1-QMO-410. Emergency boration to CCP suction valve</li> <li>• Check emergency boration flow – GREATER THAN 44 GPM</li> </ul> </li> </ul> <p>Check PRZ pressure LESS THAN 2335 PSIG</p>
	Crew	<p>Check Containment Ventilation Isolation Closed:</p> <ul style="list-style-type: none"> <li>• Pressure Relief</li> <li>• Instrument room</li> <li>• Purge</li> </ul> <p>Check SI Status – Actuation status light – LIT</p> <ul style="list-style-type: none"> <li>• As time permits, perform Steps 5 through 13 of E-0</li> </ul>
	US	<p>Check if the following trips have occurred:</p> <ul style="list-style-type: none"> <li>• Reactor Trip – Reactor Trip Breakers, Bypass breakers, Rod drive MG set output breakers</li> <li>• Turbine Trip</li> </ul> <p>Dispatch Operator to Locally Trip Reactor</p>
	CREW	<p>Check if Reactor is Subcritical – Go to step 20</p> <p>Continue Boration To Maintain Adequate Shutdown Margin During Subsequent Recovery Actions:</p> <ul style="list-style-type: none"> <li>• Determine shutdown margin</li> <li>• Return To Procedure And Step In Effect E-0</li> </ul>
	US	Transition to OHP-4023-E-0 and direct actions

**NOTE:**

**Crew may transition to FR-Z.1 on exit from FR-S.1  
Steps for FR-Z.1 follow. Steps for E-0 are on Page 14**

Op-Test No.: Cook 2018      Scenario No.: NRC2018-5      Event No.: 6,7,8, & 9

Event Description: **Steam line #4 break inside containment, Reactor trip failure (ATWS), Steam Line isolation does not occur in automatic,**

Time	Position	Applicant's Actions or Behavior
	Crew	Check Containment Isolation Status <ul style="list-style-type: none"> <li>• Ventilation Isolation – Completed</li> <li>• Phase A Isolation - Completed</li> </ul>
	US/RO	Check CTS Actuation <ul style="list-style-type: none"> <li>• CTS Pumps Running</li> <li>• CTS Valve Alignment per SML-9A,B, C</li> <li>• Phase B Isolation – Completed</li> <li>• Stop RCPs</li> <li>• Stop Lower Containment Ventilation Fans</li> <li>• Stop Control Rod Drive Fans</li> </ul>
	US	Check RHR Spray Not Required
	BOP	Check Containment Recirculation Fans Operating <ul style="list-style-type: none"> <li>• CEQ Fans Running</li> <li>• CEQ Fan Dampers open</li> <li>• CEQ CCW Cooling Valves open</li> </ul>
	BOP	Check DIS in Service
	BOP	Check all SG stop valves and SG SV Dump Valves are closed Stop Valves may NOT trip closed if Steam Pressure is low. May be driven closed with hydraulics from control switch
	Crew  <b>Critical Task#2</b>	<b>Check SG Stop Valves CLOSED – 1-MRV-240 (may need to close with C/S hydraulics)</b> <b>Check SG Stop Valve Dump Valves CLOSED – 1-MRV-241 and 1-MRV-242</b> Check if any SG secondary pressure boundary is intact <ul style="list-style-type: none"> <li>• Pressure in all SGs – Any stable or rising</li> </ul> Identify Faulted SG Isolate Faulted SG: <ul style="list-style-type: none"> <li>• Check feedwater valves for faulted SG CLOSED</li> <li>• Check AFW valves for faulted SG CLOSED               <ul style="list-style-type: none"> <li>• <b>1-FMO-241</b></li> <li>• <b>1-FMO-242</b></li> </ul> </li> </ul>

Op-Test No.: Cook 2018      Scenario No.: NRC2018-5      Event No.: 6,7,8, & 9

Event Description: **Steam line #4 break inside containment, Reactor trip failure (ATWS), Steam Line isolation does not occur in automatic,**

Time	Position	Applicant's Actions or Behavior
<b>May Terminate once SG is Isolated E-0 Actions</b>		
	CREW	Check Reactor Trip Check Turbine Trip Check Power to AC Busses – At least ONE Energized AC Emergency Busses – ALL Energized Check SI Status – Status Light LIT BOTH CCP Leakoff valve “Safety Injection Signal” white lights – LIT
	BOP	Check Main Steamline Isolation - Required – Verify all SG stop valves and SG SV Dump Valves are closed Stop Valves may NOT trip closed if Steam Pressure is low. May be driven closed with hydraulics from control switch
	RO	Check CTS– CTS is required and should be actuated (timed out) <ul style="list-style-type: none"> <li>• Verify CTS Pumps Running and valves aligned</li> </ul>
	RO/BOP	Stops all Reactor Coolant Pumps
	RO/BOP	Verifies CEQ fan operation Places Lower Containment Vent Unit fans in OFF Places CRDM fans in STOP Places DIS in service <ul style="list-style-type: none"> <li>• Dispatches operator to stop all ice condenser AHUs</li> <li>• Starts all hydrogen igniters</li> </ul>
	RO/BOP	Implement Attachment A While Continuing With This Procedure
	Crew	Check If Ruptured SG Is Suspected: SG narrow range levels – NONE rising in an uncontrolled manner

Op-Test No.: Cook 2018      Scenario No.: NRC2018-5      Event No.: 6,7,8, & 9

Event Description: **Steam line #4 break inside containment, Reactor trip failure (ATWS), Steam Line isolation does not occur in automatic,**

Time	Position	Applicant's Actions or Behavior
	Crew	Check AFW pumps running – MDAFPs – West running, TDAFP running, East OOS Check Total AFW flow – GREATER THAN 240x10 <sup>3</sup> PPH Minimize Unnecessary RCS Cooldown: <ul style="list-style-type: none"> <li>• Check SG narrow range level Greater than 13%</li> <li>• Control feed flow to maintain SG narrow range level between 13% and 50%</li> </ul> Check AFW Pump Discharge valves – OPEN or Throttled
	Crew	Check FW Isolation <ul style="list-style-type: none"> <li>• Main feed pumps – BOTH TRIPPED</li> <li>• Feed pump discharge valves – CLOSED</li> <li>• Feedwater regulating valves - CLOSED</li> <li>• Feedwater isolation valves – CLOSED</li> </ul> Check RCS Temperature: <ul style="list-style-type: none"> <li>• Cold Leg Temperatures stable at or trending to 547°F</li> <li>• Stop dumping steam</li> <li>• Verify 1-DRV-407 CLOSED</li> <li>• If cooldown continues, then control total feed flow</li> <li>• If cooldown continued, then perform the following:               <ul style="list-style-type: none"> <li>• Trip all SG stop valves closed (or manually close)</li> <li>• Verify SG stop valve dump valves are closed</li> </ul> </li> </ul>
		Check PRZ PORVs and Spray Valves CLOSED <ul style="list-style-type: none"> <li>• PORV block valves at least one energized</li> <li>• Block valves at least one open</li> </ul> Check IF RCPs Should Be Stopped: <ul style="list-style-type: none"> <li>• RCS Pressure less than 1300 PSIG</li> <li>• ECCS pumps at least one running</li> <li>• Stop all RCPs</li> </ul> Check If SG Secondary Pressure Boundaries are Intact: Pressure in all SGs: <ul style="list-style-type: none"> <li>• NO SG pressure lowering in an uncontrolled manner</li> <li>• NO SG completely depressurized</li> </ul> RNO: Go to OHP-4023-E-2, Faulted Steam Generator Isolation

Op-Test No.: Cook 2018      Scenario No.: NRC2018-5      Event No.: 6,7,8, & 9

Event Description: **Steam line #4 break inside containment, Reactor trip failure (ATWS), Steam Line isolation does not occur in automatic,**

Time	Position	Applicant's Actions or Behavior
	US	Announces entry into OHP-4023-E-2, Faulted SG Isolation
	Crew <b>Critical Task#2</b>	<p><b>Check SG Stop Valves CLOSED – 1-MRV-240 (may need to close with C/S hydraulics)</b></p> <p><b>Check SG Stop Valve Dump Valves CLOSED – 1-MRV-241 and 1-MRV-242</b></p> <p>Check if any SG secondary pressure boundary is intact</p> <ul style="list-style-type: none"> <li>• Pressure in all SGs – Any stable or rising</li> </ul> <p>Identify Faulted SG</p> <ul style="list-style-type: none"> <li>• Check pressure in all SGs</li> <li>• Any SG Pressure Lowering in an Uncontrolled Manner or</li> <li>• Any SG Completely Depressurized</li> </ul> <p>Isolate Faulted SG:</p> <ul style="list-style-type: none"> <li>• Check feedwater valves for faulted SG CLOSED</li> <li>• Check AFW valves for faulted SG CLOSED               <ul style="list-style-type: none"> <li>• <b>1-FMO-241</b></li> <li>• <b>1-FMO-242</b></li> </ul> </li> <li>• Check PORVs for faulted SG CLOSED</li> <li>• Check blowdown isolation valve for faulted SG CLOSED</li> <li>• Place 1-DRV-407, SG stop valves drain valve in CLOSED</li> <li>• Check 1-DRV-407 CLOSED</li> <li>• Check Steam line warming valves CLOSED</li> </ul>
<b>May Terminate once SG is Isolated</b>		

Op-Test No.: Cook 2018      Scenario No.: NRC2018-5      Event No.: 6,7,8, & 9

Event Description: **Steam line #4 break inside containment, Reactor trip failure (ATWS), Steam Line isolation does not occur in automatic,**

Time	Position	Applicant's Actions or Behavior
		Check CST Level Greater Than 15% Check Secondary Radiation: <ul style="list-style-type: none"> <li>• Reset containment isolation Phase A if Necessary</li> <li>• Direct Chemistry to periodically sample all SGs for activity</li> <li>• Check SG PORV radiation monitors</li> <li>• Secondary radiation – NORMAL</li> </ul> Check If ECCS Flow Should Be Reduced RCS subcooling based on core exit TCs – Greater than 40F Secondary heat sink: <ul style="list-style-type: none"> <li>• Total feed flow to intact SGs – Greater Than <math>240 \times 10^3</math> PPH</li> <li>• Narrow range level in at least one intact SG – Greater Than 14%</li> </ul> RCS pressure - Stable or Rising PZR level - Greater than 21% Go to OHP-4023-ES-1.1, SI Termination
<b>Terminate Scenario</b>		

**Critical Task Summary**

Task	Elements	Results
<p align="center"><b>#1</b> <b>Manually Trip Reactor</b></p>	<p><b><u>Cueing:</u></b></p> <ul style="list-style-type: none"> <li>• Symptoms which require a reactor trip (i.e., loss of feedwater flow to SGs)</li> <li>• Challenge to multiple reactor trip instrumentation setpoints (i.e.):               <ul style="list-style-type: none"> <li>· Lo SG Level with FF/SF mismatch</li> <li>· Lo-Lo SG level</li> </ul> </li> <li>• RX TRIP BKR TRAIN A/B UV TRIP (ATWS) alarms</li> </ul> <p><b><u>Performance Indicators:</u></b></p> <ul style="list-style-type: none"> <li>• Manually open at least one reactor trip breaker from the control room.</li> <li>• Reactor trip breaker must be opened prior to exceeding the RCS pressure safety valve limit of 2485 psig).</li> </ul> <p><b><u>Performance Feedback:</u></b></p> <ul style="list-style-type: none"> <li>• RPIs indicate rods - fully inserted</li> <li>• Rod bottom lights – lit</li> <li>• Neutron flux - lowering</li> </ul>	<p align="center"><b>SAT / UNSAT</b></p>
<p align="center"><b>#2</b> <b>Isolate Faulted Steam Generator</b></p>	<p><b><u>Cueing:</u></b></p> <ul style="list-style-type: none"> <li>• E-2, steps 1, 2 and 5</li> <li>• FR-Z.1 Steps 7-10</li> <li>• Steam generator pressure lowering</li> <li>• RCS temperature lowering</li> </ul> <p><b><u>Performance Indicators:</u></b></p> <ul style="list-style-type: none"> <li>• Isolate SG 14 by closing:               <ul style="list-style-type: none"> <li>· MFW valves</li> <li>· AFW valves – FMO-241, FMO-242</li> <li>· SG Stop valve – MRV-240</li> </ul> </li> <li>• SG 24 must be isolated before transitioning out of E-2/FR-Z.1</li> </ul> <p><b><u>Performance Feedback:</u></b></p> <ul style="list-style-type: none"> <li>• RCS cooldown stops</li> <li>• Depressurization of intact SGs stop</li> <li>• Feedwater flow to affected SG stops</li> </ul>	<p align="center"><b>SAT / UNSAT</b></p>



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## Scenario Instructor Actions

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Setup:

1. Reset to IC- 303 MOL; 100% power, 1130 MW, ppm, 571 F Steps on D East AFW Pump OOS
2. Reset control rods and check group step counters.
3. Place Master Annunciator Silence pushbutton lockout ring in LOCKOUT position.
4. Advance chart recorder paper & clear chart recorder memory.
5. Activate the following (pre-load) malfunctions:
6. **RP03A** (Reactor Trip / Train A breaker failure) 

<b>U1_RP03A</b>
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7. **RP03B** (Reactor Trip / Train B breaker failure) 

<b>U1_RP03B</b>
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8. **RP07A** (Streamline Isolation A auto failure) 

<b>U1_RP07A</b>
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9. **RP07B** (Streamline Isolation B auto failure) 

<b>U1_RP07B</b>
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10. **U1\_FWR61** (E MDAFP Breaker Racked Out) 

<b>U1_FWR61</b>
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## Scenario Instructor Actions

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### Scenario Events:

#### **EVENT #1**

Insert Malfunction during Brief for power change

Prior to starting the Ramp ICF U1\_QLC452 to 100 to fail VCT Level Channel QLC-452 High

U1\_QLC452

To trip Interposing relay LBX185B

U1\_RPR158

#### **EVENT #2**

Respond to Power Change Requests as required

#### **EVENT #3**

IMF U1\_RX11D to 100 to cause SG 4 PORV Controller to fail to 100% in Auto

U1\_RX11D

#### **EVENT #4**

ICF U1\_ECP to cause the East CCP to trip (Report Instantaneous OC trip on Breaker if Dispatched)

U1\_ECP

#### **EVENT #5**

ICF U1\_BLP111 to 0 to cause the SG Level Channel BLP-111 to fail Low on SG 1

U1\_BLP111

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**Scenario Instructor Actions**

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**EVENT #6, 7, 8,& 9**

**IMF MS01D** to 20% over 2 minutes cause a MS Break Inside Containment on SG 4  
(The Failure of the reactor to trip and the Steamline Isolation Failures are Already entered.)

**U1\_MS01D**

To Locally Trip open the MG Set Breakers Wait until crew is past step 7 in FR S.1

**U1\_RDR01**

**U1\_RDR03**

**Local actions after entry into E-0:**

- Locally stop U1 Ice Condenser AHUs MRF **CHR01** to OFF

**U1\_CHR01**

- Aux Tour will monitor Spent Fuel Pool Level and Temperatures

- Place PACHMAS in service – MRF **CHR02 or 03** with 10 min delay.

**U1\_CHR02**

OR

**U1\_CHR03**

(both have 10 minute delay built in)

- U2 has aligned CR vent for U1 SI, Fan **2-HV-AS-2** is running.

If directed to secure EDG jacket water pumps select **OFF** then **AUTO**

Remote	OFF	AUTO
<i>EGR 03A</i>	<b>U1_EGR03A</b>	<b>U1_EGR03A</b>
<i>EGR 03B</i>	<b>U1_EGR03B</b>	<b>U1_EGR03B</b>
<i>EGR 04A</i>	<b>U1_EGR04A</b>	<b>U1_EGR04A</b>
<i>EGR 04B</i>	<b>U1_EGR04B</b>	<b>U1_EGR04B</b>