



# SIMULATOR EXERCISE GUIDE (SEG)

**SITE: PRAIRIE ISLAND**

**SEG # PI-ILT-NRC-1601S**

**SEG TITLE: 2016 ILT NRC SIMULATOR EVALUATION #1**

**REV. # 0**

**PROGRAM: INITIAL LICENSE OPERATOR TRAINING #: FL-ILT**

**COURSE: INITIAL LICENSE OPERATOR TRAINING #: FL-ILT**

**TOTAL TIME: 2.0 HOURS**

Additional site-specific signatures may be added as desired.

<b>Developed by:</b>	<b>Shawn Sarrasin</b> <i>Instructor</i>	<b>11/23/2015</b> <i>Date</i>
<b>Reviewed by:</b>	<b>Fred Collins</b> <i>Instructor</i> <i>(Simulator Scenario Development Checklist.)</i>	<b>12/28/2015</b> <i>Date</i>
<b>Validated by:</b>	<b>Fred Collins</b> <i>Validation Lead Instructor</i> <i>(Simulator Scenario Validation Checklist.)</i>	<b>12/28/2015</b> <i>Date</i>
<b>Approved by:</b>	<b>Mike Petersen</b> <i>Training Supervision</i>	<b>3/25/2016</b> <i>Date</i>

## Guide Requirements

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**Evaluation Objectives:**

Evaluate the crews ability to diagnose and respond to a:

1. Power Range Nuclear Instrument failing LOW per 1C51.4.
  2. RWST Level Instrument failing LOW per C47019-0403.
  3. Loss of GAP cooling per C47021-0503.
  4. Turbine Control malfunction per 1C23 AOP2, 1C1.4 AOP1, 1E-0, and 1ES-0.1.
  5. Dropped Rod per 1C5 AOP4.
  6. Small Break LOCA per 1E-0 and 1E-1.
  7. Failure of Containment Isolation to automatically actuate per Attachment L of E-0.
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**Training Resources:**

1. Full Scope Simulator
  2. NRC Evaluation Team
  3. Booth Operator (Backup Communicator)
  4. Primary Communicator
- 

**Related PRA Information:**

**Initiating Event with Core Damage Frequency:**  
LOCA (27.3%)

**Important Components:**  
11 RWST

**Important Operator Actions with Task Number:**  
NONE

## QUANTITATIVE ATTRIBUTES

### **Malfunctions:**

#### *Before EOP Entry:*

1. N44, Power Range Nuclear Instrument, fails LOW.
2. 1LT-921, 11 RWST Level Transmitter, fails LOW.
3. 11 Reactor Vessel Support Cooling Fan trips OFF.
4. CV-31167, 1A Turbine Control Intercept Valve, and CV-31173, 2B Turbine Control Intercept Valve, fail CLOSED.
5. Dropped Rod - Control Bank D Rod K7.

#### *After EOP Entry:*

1. Failure of the reactor to automatically trip.
2. CS-46450, C Panel Reactor Trip Switch fails to operate.
3. Failure of Containment Isolation to automatically actuate.

### **Abnormal Events:**

1. Nuclear Instrument Failure.
2. Loss of GAP Cooling.
3. Turbine Malfunction.
4. Dropped Rod.

### **Major Transients:**

1. Small Break LOCA.

### **Critical Tasks:**

1. Trip Reactor Coolant Pumps within ten minutes of RCP trip criteria being met.
2. Manually actuate Containment Isolation or close Containment Isolation valves such that at least one valve is closed on each penetration before the end of the scenario.

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**CRITICAL TASK SHEET**

Critical Task:	Trip Reactor Coolant Pumps within ten minutes of RCP trip criteria being met.
Safety Significance:	Failure to trip the RCPs under the postulated plant conditions lead to core uncover and to fuel cladding temperatures in excess of 2200F. Thus, failure to perform the task represents misoperation or incorrect crew performance in which the crew has failed to prevent degradation of the fuel cladding barrier to fission product release.
Plant Conditions:	<ul style="list-style-type: none"> <li>• Small Break LOCA.</li> <li>• Break size less than 2.5 inches.</li> <li>• At least one Safety Injection Pump running.</li> <li>• RCPs Running.</li> <li>• RCP trip criteria are met.</li> </ul>
Cues:	<ul style="list-style-type: none"> <li>• Injection flow exists to RCS: <ul style="list-style-type: none"> <li>○ At least one SI Pump running and flow indicated.</li> <li>-OR-</li> <li>○ At least one RHR Pump running and flow indicated.</li> </ul> </li> <li>• RCS Pressure is less than 1250 psig [1575 psig].</li> <li>• An operator controlled cooldown has NOT been initiated.</li> </ul>
Performance Indicator:	Manually stopping RCPs using: <ul style="list-style-type: none"> <li>• CS-46255, 11 REACTOR CLNT PUMP.</li> <li>• CS-46256, 12 REACTOR CLNT PUMP.</li> </ul>
Feedback:	Indication that all RCPs are stopped. <ul style="list-style-type: none"> <li>• Both RCP Pump green indicating lights LIT.</li> <li>• Both RCP Pump red indicating lights NOT LIT.</li> <li>• RCP flow decreasing.</li> </ul>

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**CRITICAL TASK SHEET**

Critical Task:	Manually actuate Containment Isolation or close Containment Isolation valves such that at least one valve is closed on each Containment penetration before the end of the scenario.
Safety Significance:	Failure to close at least one Containment Isolation valve on each containment penetration results in unnecessary degradation of the Containment barrier that is relied upon in the safety analysis for a Loss of Coolant Accident.
Plant Conditions:	<ul style="list-style-type: none"> <li>• LOCA is occurring.</li> <li>• At least one Containment penetration has both Containment Isolation valves fail to close automatically.</li> <li>• At least one Containment Isolation valve on each Containment penetration can be closed manually from the control room.</li> </ul>
Cues:	<ul style="list-style-type: none"> <li>• Indication that SI actuated. AND</li> <li>• At least one of the following indications in the Control Room: <ul style="list-style-type: none"> <li>○ Containment Isolation did NOT actuate.</li> <li>○ Both valves on at least one Containment penetration are open.</li> </ul> </li> </ul>
Performance Indicator:	<ul style="list-style-type: none"> <li>• Manually actuating Containment Isolation using one of the following: <ul style="list-style-type: none"> <li>○ CS-46085.</li> <li>○ CS-46113.</li> </ul> </li> <li>• Closing at least one Containment Isolation per Containment penetration by manipulating controls from the Control Room or directing an out-plant operator.</li> </ul>
Feedback:	Containment Isolation Status Light Panel indicates at least one Containment Isolation valve is closed on each Containment penetration.

## SCENARIO OVERVIEW:

### INITIAL CONDITIONS:

- Exposure: MOC
- Power: 100%
- Boron: (CB): 825 ppm
- Temperature: 560°F
- Pressure: 2235 psig
- Xenon: Equilibrium
- Rods: "D" @ 218
- Generator: 580 MW

### EQUIPMENT OOS

- D1 Diesel Generator
- N51 and N52 Displays

### SEQUENCE OF EVENTS:

#### Event 1: Yellow Channel Power Range Nuclear Instrument fails LOW

- N44 indicator pegs low.
- Bank D Control Rods step out two steps.
- The crew will perform the following per 1C51.4:
  - Place control rods in manual.
  - Remove N44 from service.
  - Restore Tavg to Tref and place control rods in auto.
- The crew will enter TS LCO 3.3.1 Conditions A, D, E, Q, and R.

#### Event 2: 11 RWST Level Transmitter fails LOW

- One RWST level indicator will peg low.
- Other RWST level indicator will remain unchanged.
- The crew will enter TS LCO 3.3.3 Condition A.

#### Event 3: Loss of GAP Cooling

- 11 Reactor Support Cooling fan trips.
- Reactor Support Cooling Low Flow annunciator is received.
- The crew will respond per C47021-0503 and start 12 Rx Support Cooling Fan.

#### Event 4: Turbine Malfuction requiring a Rapid Downpower

- CV-31167, Intercept Valve 1A, fails closed.
- 10 seconds later, CV-31173, Intercept Valve 2B, fails closed.
- Plant load lowers and control rods automatically step in.
- The crew enters 1C23 AOP2 for a Turbine Malfuction.
- Crew diagnoses that two intercept valves from diagonally opposite MSRs have closed.
- The crew performs a rapid downpower to 50% per 1C1.4.

**Event 5: Dropped Rod**

- Control Bank A Group 1 Rod B-8 will indicate zero steps.
- RCS Tavg will lower.
- NI Power will lower.
- A negative flux rate reactor trip will be received.
- The reactor will fail to automatically trip.
- The crew will diagnose a dropped rod and manually trip the reactor per 1C5 AOP4.
- The crew will enter 1E-0 and transition to 1ES-0.1.

**Event 6: Small Break LOCA**

- PRZR level and pressure will lower.
- CTMT pressure and humidity will rise.
- The crew will actuate Safety Injection and re-enter 1E-0.
- The crew will trip both RCPs.
- Containment Isolation will fail to automatically actuate.
- The crew will manually actuate Containment Isolation.
- The crew will transition to 1E-1.
- The crew will stop RHR pumps.

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SCENARIO TIME-LINE:			
SEQ	SEQUENCE OF EVENTS / INSTRUCTOR NOTES	CREW POS	EXPECTED STUDENT RESPONSES
	<ol style="list-style-type: none"> <li>1. SIMULATOR PRE-BRIEF:               <ol style="list-style-type: none"> <li>a. The Simulator Pre-Brief is conducted prior to the crew entering the simulator.</li> </ol> </li> <li>2. COMPLETE TURNOVER:               <ol style="list-style-type: none"> <li>a. "UNIT 1 LPEO / PEO TURNOVER LOG."</li> <li>b. PRA Printout.</li> <li>c. Verify crew performs walk down of control boards and the reviews turnover checklists.</li> </ol> </li> </ol>	CREW	Review the following with the off-going operator: <ul style="list-style-type: none"> <li>• "Unit 1 LPEO / PEO Turnover Log"</li> <li>• PRA printout</li> <li>• Walk-down the control boards and ask questions as appropriate</li> </ul>



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<p><b>EVENT 1</b></p>	<p>Booth Operator:</p> <ol style="list-style-type: none"> <li>1. After the crew has assumed the duty and/or at the discretion of the lead evaluator, enter: <b>Trigger 1, PR Yellow Channel N44, fails LOW.</b></li> <li>2. If contacted as I&amp;C to trip bistables, inform the crew two I&amp;C Technicians will be available in 45 minutes.</li> <li>3. If contacted as the Operations Management, acknowledge the report of the failure, and agree to make other notifications to the NRC, Duty Station Manager, etc. as asked.</li> <li>4. If contacted as the FIN Team Supervisor, inform the crew that you will write a work order and assign an I&amp;C Supervisor to investigate.</li> <li>5. If contacted as Nuclear Engineering, acknowledge the request to perform SP-1120.</li> </ol>	<p>RO</p> <p>SS</p> <p>RO</p> <p>SS</p>	<p><b>1C5 AOP1, UNCONTROLLED ROD MOTION</b></p> <ul style="list-style-type: none"> <li>• Check generator load stable.</li> <li>• Place rod bank selector switch to “MANUAL”.</li> <li>• Check rod motion stopped.</li> <li>• Determine N44 is failed.</li> <li>• Go to 1C51.4.</li> </ul> <p><b>1C51.4, PWR RNG NUCLEAR INSTR N-44 – LOW</b></p> <ul style="list-style-type: none"> <li>• Place rods in MANUAL and maintain Tavg at Tref.</li> <li>• Refer to the following TS requirements: <ul style="list-style-type: none"> <li>○ Enter TS LCO 3.3.1 Condition A <ul style="list-style-type: none"> <li>- Reference Table 3.3.1-1 immediately.</li> </ul> </li> <li>○ Enter TS LCO 3.3.1 Condition D <ul style="list-style-type: none"> <li>- Place channel in trip in 6 hours and perform SP-1120 OR</li> <li>- Be in Mode 3 in 12 hours</li> </ul> </li> <li>○ Enter TS LCO 3.3.1 Condition E <ul style="list-style-type: none"> <li>- Place channel in trip in 6 hours OR</li> <li>- Be in Mode 3 in 12 hours</li> </ul> </li> <li>○ Enter TS LCO 3.3.1 Condition Q <ul style="list-style-type: none"> <li>- Verify P-10 is in required state for existing unit conditions in 1 hour OR</li> <li>- Be in Mode 3 in 7 hours</li> </ul> </li> </ul> </li> </ul>
<p><b>EVENT 1 (CONT)</b></p>	<p>Plant Response:</p> <ol style="list-style-type: none"> <li>1. Control rods step out automatically.</li> <li>2. The following annunciators will be received: <ol style="list-style-type: none"> <li>a. 47013-0201, NIS PR NEG FLUX RATE CH ALERT.</li> <li>b. 47013-0203, NIS PR RANGE DEVIATION.</li> </ol> </li> </ol>	<p>LEAD</p>	<ul style="list-style-type: none"> <li>○ Enter TS LCO 3.3.1 Condition R <ul style="list-style-type: none"> <li>- Verify P-7, P-8, and P-9 are in required states for existing unit conditions in 1 hour OR</li> <li>- Be in Mode 3 in 7 hours</li> </ul> </li> <li>○ TRM TLCO 3.2.1 Condition A.</li> <li>○ SR 3.2.4.2 (SP-1120). <ul style="list-style-type: none"> <li>- QPTR every 12 hours.</li> </ul> </li> </ul> <ul style="list-style-type: none"> <li>• Remove N44 from service as follows: <ul style="list-style-type: none"> <li>○ Place ROD STOP BYPASS SW in N-44</li> <li>○ Place POWER MISMATCH BYPASS SW in N-44</li> <li>○ Place UPPER SECTION CURRENT COMPARATOR DEFEAT SW in N-44</li> </ul> </li> </ul>

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SCENARIO TIME-LINE:			
SEQ	SEQUENCE OF EVENTS / INSTRUCTOR NOTES	CREW POS	EXPECTED STUDENT RESPONSES
		RO  LEAD / RO / SS	<ul style="list-style-type: none"> <li>○ Place LOWER SECTION CURRENT COMPARATOR DEFEAT SW in N-44</li> <li>○ Place COMPARATOR CHANNEL DEFEAT SW in N-44</li> <li>○ Remove N-44 PR B drawer instrument fuses.</li> <li>○ Remove N-44 PR A drawer control power fuses.</li> <li>○ Verify annunciators 47013-0101, 0102, 0201, 0202, and 0403 are received.</li> <li>○ Verify status lights LIT for 44178-0406 &amp; 0407; and 44205-0404.</li> <li>● Restore Tav<sub>g</sub> to Tref with rods and return rod control to AUTO.</li> <li>● Trip bistables within 6 hours.</li> <li>● Check P7 in its required state in 1 hour.</li> <li>● Check P8 and P9 in its required state in 1 hour.</li> <li>● Log ΔI every 30 minutes.</li> <li>● Verify NR-45 selected to operable channel.</li> <li>● Check TPM.</li> <li>● Notify Nuclear Engineering to perform SP-1120.</li> </ul>



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SCENARIO TIME-LINE:			
SEQ	SEQUENCE OF EVENTS / INSTRUCTOR NOTES	CREW POS	EXPECTED STUDENT RESPONSES
	<p>1. After Shift Supervisor has addressed Technical Specifications for RWST failure, and/or at the discretion of the Lead Evaluator, then enter: <b>Trigger 3, 11 RX SUPPORT COOLING FAN TRIP.</b></p> <p>2. If contacted as the Operations Management, acknowledge the report of the failure, and agree to make other SWI O-28 notifications to the NRC, Duty Station Manager, etc.</p> <p>3. If contacted as the FIN Team Supervisor, inform the crew that you will write a work order and assign an Engineering Supervisor to investigate.</p> <p>Plant Response:</p> <ol style="list-style-type: none"> <li>11 Rx Support Cooling fan trips.</li> <li>Annunciator 47021-0503 alarms.</li> </ol>		<ul style="list-style-type: none"> <li>Determine no SI signal present.</li> <li>Start standby reactor support cooling fan.</li> </ul>



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SCENARIO TIME-LINE:			
SEQ	SEQUENCE OF EVENTS / INSTRUCTOR NOTES	CREW POS	EXPECTED STUDENT RESPONSES
		LEAD / RO	<ul style="list-style-type: none"><li>• Verify the Boric Acid integrator is reset.</li><li>• Set 1YIC-110, BA TO BLENDER BATCH INTEGRATOR, to quantity desired.</li><li>• Place CS-46300, MAKE-UP MODE SELECTOR, to "BORATE".</li><li>• If desired, then adjust 1HC-110, BA TO BLENDER FLOW CONT, to "MANUAL" and adjust output for desired flow rate.</li><li>• Momentarily place CS-46457, BORIC ACID MAKE-UP CONTROL, to "START", to initiate the boration.</li><li>• When the desired quantity of boric acid has been added, then verify automatic makeup stopped as indicated by CS-46457, BORIC ACID MAKE-UP CONTROL, green light LIT.</li><li>• If additional boration is desired, then return to step 2.</li><li>• When the boration is complete, then verify 1HC-110, BA TO BLENDER FLOW CONT, is in "AUTO".</li><li>• Reset the Boric Acid integrator.</li><li>• Perform a 10 gallon flush.</li></ul>







Control Room that Unit 2 Cooling Water/Chilled Water valves are in their safeguards positions.  
 3. If Control Room personnel ask for status of Battery Room Temperatures, then inform the Control Room that Battery Room temperatures are 74°F.

**CRITICAL TASK**

***Manually actuate Containment Isolation or close Containment Isolation valves such that at least one valve is closed on each penetration before the end of the scenario.***

**EMERGENCY PLAN CLASSIFICATION**

***SITE AREA EMERGENCY –FS1 due to loss of RCS fission product barrier due to Small Break LOCA and potential loss of Containment fission product barrier due to failure of Containment Isolation to automatically actuate during a Safety Injection.***

**EVENT 6  
(cont)**

ATTACHMENT L MALFUNCTIONED COMPONENT LIST			
Panel	44104 ID	Component	Control Switch
C	A1	CV-31318	CS-46266
C	B1	CV-31319	CS-46262
B	D2	CV-31339	CS-46166
B	A3	MV-32199	CS-46173
B	B3	MV-32166	CS-46132
A	A4	CV-31545	CS-46235
A	B4	CV-31546	CS-46234
A	C4	CV-31434	CS-46237
A	D4	CV-31435	CS-46236
A	A5	CV-31436	CS-46231
A	B5	CV-31437	CS-46230
A	C5	CV-31438	CS-46233

LEAD

- "CONTAINMENT ISOLATION" lights - LIT FOR PLANT CONDITIONS.
  - **CI Phase A fails to actuate.**
  - **Manually actuate CI or manually align individual components per the table on page 17.**
- Check Category 1 Vent Zone Boundary.
- Close MV-32115, 122 SFP HX INLT HDR MV B.
- Check Cooling Water Header Pressures - BOTH GREATER THAN 65 PSIG.
- Verify Plant Announcements Complete.
- Check If Main Steamlines Are Isolated.
- Determine MSIVs, Bypass Valves, and Containment Instrument Air Valves do NOT need to be closed.
- Verify SI Flow.
- Verify RHR Flow.
- Verify Containment Spray is actuated (if necessary).
- Check RCP Cooling.
- Verify Local Actions Complete.
- Verify Generator Breakers – OPEN.
- Verify All Heater Drain Pumps – STOPPED.
- Check Turbine Valves:
  - Turbine reheat and intercept valves – CLOSED.
  - Open turbine drain valves.
- Verify Main Feedwater Alignment:
  - Both main feedwater pumps – STOPPED.
  - Main and bypass FRVs – CLOSED.
- Verify All Condensate Pumps – STOPPED.
- Verify Steam Dump in "STM PRESS" Mode.
- Verify Unit 1 Cooling Water/Chilled Water Alignment:
  - CFCU control switches - "SLOW".
  - CFCU dampers - ALIGNED TO DOME.
  - Unit 1 cooling water/chilled water valves closed.
  - Unit 1 CRDM shroud cooling supply and return valves – CLOSED.
  - CFCU cooling water supply and return valves – OPEN.

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SCENARIO TIME-LINE:						
SEQ	SEQUENCE OF EVENTS / INSTRUCTOR NOTES				CREW POS	EXPECTED STUDENT RESPONSES
	A	D5	CV-31439	CS-46232		<ul style="list-style-type: none"> <li>○ CFCU chilled water supply and return valves – CLOSED.</li> <li>● Verify 11 Safeguards Screenhouse Ventilation lineup.</li> <li>● Verify Control Room Ventilation Alignment:                             <ul style="list-style-type: none"> <li>○ Chillers and fans – RUNNING.</li> <li>○ Control room chiller suction/discharge tie closed - STATUS LIGHT LIT.</li> </ul> </li> <li>● Verify Unit 2 Cooling/Chilled Water Alignment.</li> <li>● Verify 21 Safeguards Screenhouse Ventilation lineup.</li> <li>● Verify 11 and 12 Battery Charger Operation is normal.</li> <li>● Verify Battery Room temps less than 84°F.</li> <li>● Check status of Spent Fuel Cooling.</li> <li>● Check Status of Notifications.</li> <li>● Notify SS Of Any Discrepancies.</li> </ul>
	D	B6	MV-32044	CS-46339		
	D	C6	MV-32058	CS-46340		
	D	D6	MV-32040	CS-46969		
	D	E6	MV-32043	CS-46968		
	A	A7	CV-31621	CS-46054		
	A	B7	CV-31622	CS-46055		
	E	C7	MV-32023	CS-46413		
	E	D7	MV-32024	CS-46414		
	OP*	D8	CV-31402	CS-70612		
	OP*	E8	CV-31403	CS-70613		
	RMR**	A10	CV-31750	CS-19447		
	RMR**	B10	CV-31022	CS-19449		
	***	D15	CV-31438 OR CV-31439	CS-46233 OR CS-46232		
	***	E15	CV-31438 OR CV-31439	CS-46233 OR CS-46232		
	* Control Switch located in Out-Plant. If examinee directs the out-plant operator to close the 11/12 SGB Isolation Valves, then enter <b>REMOTES SG102 &amp; SG103 to CLOSE.</b>					
	** Panel located opposite R-11/R-12 Radiation Monitor Racks.					
	*** Closing either CV will cause both SMP A and ANN Discharge valves to CLOSE.					
<b>END</b>	Once the crew has secured RHR pumps and/or at the discretion of the Lead Evaluator, then place the simulator in FREEZE. Inform the crew that training has the duty.					

## 016 ILT NRC SIMULATOR EVALUATION #1, REV. 0

RETENTION: 7 Days

<b>UNIT 1 LPEO / PEO TURNOVER LOG</b>
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DATE:

DAY/NIGHT SHIFT: Day

CAT 1 VENT OPENINGS: 0 ft<sup>2</sup>

SYSTEM CONDITION: GREEN

<b>SAFEGUARDS EQUIPMENT OOS/TECH SPEC REQUIRED ACTION STATEMENTS</b>
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- |   |  |
|---|--|
| <p>1. D1 DIESEL GENERATOR is out of service for corrective maintenance.</p> <ul style="list-style-type: none"> <li>• TS LCO 3.8.1 Condition B was entered with 10 days remaining.</li> <li>• D2 DIESEL GENERATOR has been evaluated for common cause failure and has been determined to be OPERABLE.</li> </ul> <p>2. N51 and N52 displays are out of service.</p> <ul style="list-style-type: none"> <li>• TS LCO 3.3.3 Condition A was entered with 23 days remaining.</li> <li>• TS LCO 3.3.3 Condition D was entered with 5 days remaining.</li> <li>• N51 and N52 counts can be viewed in ERCS.</li> </ul> |  |
|---|--|

<b>PROTECTED EQUIPMENT</b>
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12 MD AFW PUMP	12 RHR PUMP	122 CR Air Supply Fan
D2 DIESEL GENERATOR	12 SI PUMP	122 CR Chiller & Pump
22 CLG WATER PUMP	12 CC PUMP	122 CR Clean Up Fan

<b>RAD MONITORS OOS</b>	<b>ANNUNCIATORS OOS</b>
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NONE

NONE

<b>OUTSTANDING SP'S</b>	<b>FIRE DET / PROT EQP IMPAIRMENTS</b>
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SP 1118 (SR 3.8.1.1) was completed 1 hour ago and is due in 5 hours.	NONE
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<b>OTHER EQUIPMENT OOS / STATUS</b>
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- |  |   |
|--|---|
| <ul style="list-style-type: none"> <li>• Exposure: MOC</li> <li>• Power: 100%</li> <li>• Boron: (CB): 825 ppm</li> <li>• Temperature: 560°F</li> </ul> | <ul style="list-style-type: none"> <li>• Pressure: 2235 psig</li> <li>• Xenon: Equilibrium</li> <li>• Rods: "D" @ 218</li> <li>• Generator: 580 MW</li> </ul> |
|--|---|

<b>MAJOR EQUIPMENT REPAIRED / RETURNED TO SERVICE</b>
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NONE

<b>OPERATIONAL PLANS FOR COMING SHIFT</b>
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Maintain 100% power. Dilute 10 gallons 1-2 times per shift for temperature control.
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<b>NEW PROCEDURES / INSTRUCTIONS</b>
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NONE



# SIMULATOR EXERCISE GUIDE (SEG)

**SITE: PRAIRIE ISLAND**

**SEG # PI-ILT-NRC-1602S**

**SEG TITLE: 2016 ILT NRC SIMULATOR EVALUATION #2**

**REV. # 0**

**PROGRAM: INITIAL LICENSE OPERATOR TRAINING #: FL-ILT**

**COURSE: INITIAL LICENSE OPERATOR TRAINING #: FL-ILT**

**TOTAL TIME: 2.0 HOURS**

Additional site-specific signatures may be added as desired.

<b>Developed by:</b>	<b>Shawn Sarrasin</b> <i>Instructor</i>	<b>11/23/2015</b> <i>Date</i>
<b>Reviewed by:</b>	<b>Fred Collins</b> <i>Instructor</i> <i>(Simulator Scenario Development Checklist.)</i>	<b>12/15/2015</b> <i>Date</i>
<b>Validated by:</b>	<b>Fred Collins</b> <i>Validation Lead Instructor</i> <i>(Simulator Scenario Validation Checklist.)</i>	<b>12/15/2015</b> <i>Date</i>
<b>Approved by:</b>	<b>Mike Petersen</b> <i>Training Supervision</i>	<b>3/25/2016</b> <i>Date</i>

## Guide Requirements

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### Evaluation Objectives:

Evaluate the crews ability to:

1. Raise SI Accumulator pressure per 1C18.
2. Perform a load increase from 90% to 95% power per 1C1.4.

Evaluate the crews ability to diagnose and respond to a:

3. First Stage Pressure Instrument failing LOW per 1C5 AOP1 and 1C51.2.
  4. Loss of Charging Flow to the Regenerative Heat Exchanger per 1C12.1 AOP2.
  5. Fire Protection Line Break per C31 AOP1.
  6. Steam Generator Fault into Containment per 1E-0 and 1E-2.
  7. Loss of Containment Cooling per Attachment L of E-0 or 1FR-Z.1.
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### Training Resources:

1. Full Scope Simulator
  2. NRC Evaluation Team
  3. Booth Operator (Backup Communicator)
  4. Primary Communicator
- 

### Related PRA Information:

#### **Initiating Event with Core Damage Frequency:**

INTERNAL FLOOD (45.4%)  
MSFLB (<1%)

#### **Important Components:**

NONE

#### **Important Operator Actions with Task Number:**

OPERATORS FAIL TO ISOLATE AFW TO AFFECTED SG (1.3%)  
CRO 301 003 06 01 000 – Faulted Steam Generator Isolation

## QUANTITATIVE ATTRIBUTES

### **Malfunctions:**

#### *Before EOP Entry:*

1. 1PT-485, Turbine First Stage Pressure Instrument, fails LOW.
2. CV-31328, Regenerative HX Charging Line Valve, fails to the CLOSED position.
3. Fire Protection System automatically starting on low fire header pressure.

#### *After EOP Entry:*

1. 11 and 13 Containment Fan Coil Units fail to start in SLOW or FAST after SI signal.
2. 12 and 14 Containment Fan Coil Units fail to automatically start in SLOW after SI signal.
3. 11 and 12 Containment Spray Pumps fail to automatically start on HIGH-HIGH Containment Pressure.

### **Abnormal Events:**

1. Uncontrolled Rod Motion.
2. Loss of Charging Flow to Regenerative Heat Exchanger.
3. Fire Protection Line Break.

### **Major Transients:**

1. 11 Steam Generator Faults into Containment.

### **Critical Tasks:**

1. Manually actuate containment cooling as necessary to prevent containment pressure from exceeding 46 psig.
2. Establish feedwater flow to the Steam Generators before both Steam Generator Wide Range Levels lower below 9% [20%] (Only applicable if both AFW Pumps trip on low discharge pressure).
3. Stop feed flow to the faulted Steam Generator before the end of the scenario.

## 2016 ILT NRC SIMULATOR EVALUATION #2, REV. 0

**CRITICAL TASK SHEET**

Critical Task:	Manually actuate containment cooling as necessary to prevent containment pressure from exceeding 46 psig.
Safety Significance:	Failure to actuate sufficient containment cooling during a high energy release into containment will result in containment pressure exceeding the design limit of 46 psig. Exceeding this limit will result in a loss of the Containment Barrier.
Plant Conditions:	<ul style="list-style-type: none"> <li>• At least one of the following accidents: <ul style="list-style-type: none"> <li>- LOCA into Containment.</li> <li>- Unisolable Steam Line Break into Containment.</li> </ul> </li> <li>• Containment pressure will exceed 46 psig if no operator action is taken to start available containment cooling equipment.</li> <li>• Sufficient containment cooling equipment is available to start from the Control Room to prevent containment pressure from exceeding 46 psig.</li> </ul>
Cues:	<ul style="list-style-type: none"> <li>• Containment pressure is rising.</li> <li>• Containment cooling equipment fails to start, actuate, or align to their safeguards alignment.</li> </ul>
Performance Indicator:	<p>Starting, actuating, or aligning the following equipment, as necessary, to establish sufficient containment cooling to prevent containment pressure from exceeding 46 psig:</p> <ul style="list-style-type: none"> <li>• Containment Fan Coil Units (CFCUs)</li> <li>• Cooling Water / Chilled Water supply to CFCUs.</li> <li>• Containment Spray System</li> </ul>
Feedback:	Containment pressure lowering or stable below 46 psig.

## 2016 ILT NRC SIMULATOR EVALUATION #2, REV. 0

**CRITICAL TASK SHEET**

Critical Task:	Establish feedwater flow to the Steam Generators before both Steam Generator Wide Range Levels lower below 9% [20%].
Safety Significance:	With insufficient feedwater flow, the Steam Generators dry out, causing an RCS pressure increase that opens the pressurizer PORVs. The open PORVs create a small break LOCA that challenges the Core Cooling CSF.
Plant Conditions:	<ul style="list-style-type: none"> <li>• SGs are required for heat sinks.</li> <li>• Feedwater flow is available but not established from any of the following: <ul style="list-style-type: none"> <li>○ Auxiliary Feedwater Pumps</li> <li>○ Main Feedwater Pumps</li> <li>○ Condensate Pumps</li> </ul> </li> <li>• Sufficient time is available to align feedwater flow to at least one Steam Generator prior to Wide Range level lowering below 9% [20%].</li> <li>• NO ATWS</li> <li>• NO Station Blackout</li> </ul>
Cues:	<ul style="list-style-type: none"> <li>• Less than 200 GPM of feedwater flow to the Steam Generators.</li> <li>• Both Steam Generator levels lowering.</li> <li>• RCS pressure is above the pressure of all Steam Generators.</li> </ul>
Performance Indicator:	<ul style="list-style-type: none"> <li>• Prior to the need to establish bleed and feed, the crew manipulates controls to establish feedwater flow into at least one SG with one or more of the following: <ul style="list-style-type: none"> <li>○ Auxiliary Feedwater Pumps</li> <li>○ Main Feedwater Pumps</li> <li>○ Condensate Pumps</li> </ul> </li> <li>• The crew establishing RCS bleed and feed instead of using a feedwater source would most likely constitute a failure.</li> </ul>
Feedback:	<ul style="list-style-type: none"> <li>• Increasing water level in at least one Steam Generator.</li> <li>• Feedwater flow into at least one SG.</li> <li>• Total feedwater flow is at least 200 GPM.</li> </ul>



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**CRITICAL TASK SHEET**

Critical Task:	Stop feed flow to the faulted Steam Generator before the end of the scenario.
Safety Significance:	Failure to stop feed flow to a Steam Generator that is faulted into Containment and can NOT be isolated will result in a challenge to the Containment Barrier.
Plant Conditions:	<ul style="list-style-type: none"> <li>• One faulted Steam Generator.</li> <li>• The fault is into Containment.</li> <li>• The fault can NOT be isolated.</li> <li>• A Red/Orange Path in Integrity CSF is likely and can NOT be prevented by crew actions.</li> <li>• Subcriticality, Core Cooling, and Heat Sink CSFs are green or yellow.</li> </ul>
Cues:	<ul style="list-style-type: none"> <li>• A single Steam Generator depressurizing in an uncontrolled manner or completely depressurized.</li> <li>• Main feedwater or auxiliary feedwater continues to be delivered to the faulted SG.</li> </ul>
Performance Indicator:	<p>Close/Secure the following valves/pumps aligned to the faulted Steam Generator (as necessary):</p> <ul style="list-style-type: none"> <li>• AFW Pump Discharge Valve(s)</li> <li>• AFW Pump(s)</li> <li>• Main and Bypass Feedwater valve(s)</li> <li>• MFW Pump(s)</li> </ul>
Feedback:	<ul style="list-style-type: none"> <li>• AFW flow to the faulted Steam Generator is secured.</li> <li>• SG Feedwater Flow to the faulted Steam Generator is secured.</li> </ul>

## SCENARIO OVERVIEW:

### INITIAL CONDITIONS:

- Exposure: MOC
- Power: 90%
- Boron: (CB): 856 ppm
- Temperature: 559°F
- Pressure: 2235 psig
- Xenon: Equilibrium
- Rods: "D" @ 208
- Generator: 522 MW

### EQUIPMENT OOS

- 13 Charging Pump
- N51 and N52 Displays

### SEQUENCE OF EVENTS:

#### Event 1: Raise SI Accumulator Pressure

- The crew will raise 12 Safety Injection Accumulator pressure per 1C18.

#### Event 2: Raise Reactor Power to 95%

- The crew will place rods in manual.
- The crew will perform alternate dilutions per 1C12.5.
- The crew will operate the turbine to raise load.

#### Event 3: First Stage Pressure Instrument fails LOW

- Rods will automatically step in.
- The crew will place rod control in manual per 1C5 AOP1.
- The crew will perform actions per 1C51.2.
- The SS will enter TS LCO 3.3.1 Conditions A and R.

#### Event 4: Loss of Charging Flow to Regenerative Heat Exchanger

- CV-31328, REGEN HX CHG LINE OUTLET, fails CLOSED.
- Charging flow and pressurizer level lower.
- The crew will secure normal letdown and stop one charging pump.
- The crew will place excess letdown in service.

#### Event 5: Fire Protection Line Break

- Fire header pressure will lower to 90 psig.
- The Screen wash Pump, MD Fire Pump, and DD Fire Pump will start on low fire header pressure.
- Fire header pressure will stabilize at 110 psig.
- The crew will be unable to isolate the fire header leak.
- The crew will secure all fire protection pumps per 1C31 AOP1.

#### Event 6: 11 Steam Generator Faults into Containment

## 2016 ILT NRC SIMULATOR EVALUATION #2, REV. 0

- Pressurizer level and pressure lowers.
- RCS temperature lowers.
- Containment pressure rises.
- The crew will trip the reactor, actuate SI, and enter 1E-0.
- The crew will transition to 1E-2 and isolate 11 Steam Generator.
- If a RED path in Integrity CSF occurs, then a transition to 1FR-P.1 will be necessary.

**Event 7: Loss of Containment Cooling**

- 11 and 13 CFCUs will stop running in FAST and fail to automatically shift to SLOW.
- 12 and 14 CFCUs will fail to start in SLOW or FAST speed.
- 11 and 12 Containment Spray Pumps will fail to automatically start.
- The crew will manually start 11 and 13 CFCUs in SLOW speed and manually start 11 and 12 Containment Spray Pumps per Attachment L of 1E-0 or 1FR-Z.1.

## 2016 ILT NRC SIMULATOR EVALUATION #2, REV. 0

SCENARIO TIME-LINE:			
SEQ	SEQUENCE OF EVENTS / INSTRUCTOR NOTES	CREW POS	EXPECTED STUDENT RESPONSES
	<ol style="list-style-type: none"> <li>1. SIMULATOR PRE-BRIEF:               <ol style="list-style-type: none"> <li>a. The Simulator Pre-Brief is conducted prior to the crew entering the simulator.</li> </ol> </li> <li>2. COMPLETE TURNOVER:               <ol style="list-style-type: none"> <li>a. "UNIT 1 LPEO / PEO TURNOVER LOG."</li> <li>b. PRA Printout.</li> <li>c. Verify crew performs walk down of control boards and the reviews turnover checklists.</li> </ol> </li> </ol>	CREW	Review the following with the off-going operator: <ul style="list-style-type: none"> <li>• "Unit 1 LPEO / PEO Turnover Log"</li> <li>• PRA printout</li> <li>• Walk-down the control boards and ask questions as appropriate</li> </ul>
<b>EVENT 1</b>	Booth Operator: <ol style="list-style-type: none"> <li>1. After the crew has assumed the duty, they will <b>raise 12 Safety Injection Accumulator pressure</b> per 1C18.</li> <li>2. When contacted as the out-plant operator to perform steps 6.5.1 – 6.5.2 of 1C18, wait approximately 2 minutes and report completion.</li> <li>3. When contacted as the out-plant operator to perform step 6.5.6 of 1C18, wait approximately 2 minutes and report completion and d/p is zero.</li> <li>4. When contacted as the out-plant operator to perform steps 6.5.12 and 6.5.13 of 1C18, wait approximately 2 minutes and report completion.</li> <li>5. When contacted as the SI System Engineer, acknowledge completion of raising pressure in 12 SI Accumulator.</li> </ol> Plant Response: <ol style="list-style-type: none"> <li>1. 12 SI Accumulator pressure rises.</li> <li>2. Annunciator 47018-0204, 12 ACC LO PRESS, clears.</li> </ol>	LEAD	<b>1C18, ENGINEERED SAFEGUARDS SYSTEM UNIT 1</b> <ul style="list-style-type: none"> <li>• Direct an out-plant operator to perform steps 6.5.1 – 6.5.3 of 1C18.</li> <li>• Under administrative control, OPEN CV-31444, NITROGEN TO 12 ACCUM, using CS-46220.</li> <li>• Under administrative control, OPEN CV-31440, ACCUM NITROGEN SPLY, using CS-46212.</li> <li>• Direct an out-plant operator to perform step 6.5.6 of 1C18.</li> <li>• When 12 SI accumulator pressure reaches 750 psig, then CLOSE CV-31440, ACCUM NITROGEN SPLY, using CS-46212.</li> <li>• CLOSE CV-31444, NITROGEN TO 12 ACCUM, using CS-46220.</li> <li>• Independently verify CV-31444 is closed.</li> <li>• Independently verify CV-31440 is closed.</li> <li>• Direct an out-plant operator to perform steps 6.5.12 and 6.5.13 of 1C18.</li> <li>• Notify the SI System Engineer of completion of procedure.</li> </ul>

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<p><b>EVENT 2</b></p>	<p>Booth Operator:</p> <ol style="list-style-type: none"> <li>1. After the crew has completed raising pressure in 12 SI Accumulator and/or at the discretion of the lead evaluator, then:             <ol style="list-style-type: none"> <li>a. As the Shift Manager, direct the Unit 1 SS to <b>raise Unit 1 Reactor Power to 95%</b>.</li> </ol> </li> <li>2. If contacted as the duty chemist, acknowledge Unit 1 power will be raised from 90% to 95%.</li> </ol> <p>Plant Response:</p> <ol style="list-style-type: none"> <li>1. Reactor Power rises.</li> <li>2. Generator Load rises.</li> <li>3. RCS Tavg rises.</li> </ol>	<p>RO/SS</p>	<p><b>1C1.4, UNIT 1 POWER OPERATION</b></p> <ul style="list-style-type: none"> <li>• Place CS-46280, ROD BANK SELECTOR, in "MANUAL".</li> <li>• Using the "On Line Control" screen:             <ul style="list-style-type: none"> <li>○ Select LOAD.</li> <li>○ Select 0.5% demand rate.</li> </ul> </li> <li>• Verify the "VPL" control is not Red.</li> <li>• Raise the "VPL" to 101% using the "Valve Limiter" pop-up screen.</li> <li>• Set the "Target" setting to the desired Load using "On Line Control" screen "Target" increase/decrease controls.</li> <li>• Initiate an alternate dilution of the RCS per 1C12.5.</li> <li>• When Tave shows an increase, then select the "Go" control using the "On Line Control" screen.</li> <li>• Adjust the alternate dilution rate or perform alternate dilutions per 1C12.5 to maintain Tave and Tref with the desired <math>\pm 1.5^{\circ}\text{F}</math> band.</li> </ul>
<p><b>EVENT 2 (cont)</b></p>		<p>RO/SS</p>	<p><b>1C12.5, UNIT 1 BORON CONCENTRATION CONTROL</b></p> <ul style="list-style-type: none"> <li>• Verify the RMU integrator is reset.</li> <li>• Set 1YIC-111, RX MU WTR TO BLENDER BATCH INTEGRATOR, to quantity desired.</li> <li>• Place CS-46300, MAKE-UP MODE SELECTOR, to "ALT DIL".</li> <li>• Place CS-46454, BA BLENDER TO VCT INLT CV-31201, to "CLOSE".</li> <li>• If desired, then adjust 1HC-111, RX MU WTR TO BLENDER FLOW CONT, set point to desired flow rate or place in "MANUAL" adjusted for desired flow rate.</li> <li>• Momentarily place CS-46457, BORIC ACID MAKE-UP CONTROL, to "START", to initiate dilution.</li> <li>• When the desired quantity of makeup has been added, then verify automatic makeup stopped as indicated by CS-46457, BORIC ACID MAKE-UP CONTROL, green light LIT.</li> <li>• If additional alternate dilution is desired, then return to step 2.</li> </ul>
		<p>RO/SS</p>	

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SCENARIO TIME-LINE:			
SEQ	SEQUENCE OF EVENTS / INSTRUCTOR NOTES	CREW POS	EXPECTED STUDENT RESPONSES
			<ul style="list-style-type: none"><li>• Verify CS-46454, BA BLENDER TO VCT INLT CV-31201, is selected to "AUTO".</li><li>• Verify 1HC-111, RX MU WTR TO BLENDER FLOW CONT, is in "AUTO" set to 45%.</li><li>• Place CS-46300, MAKE-UP MODE SELECTOR, to "AUTO".</li><li>• Momentarily place CS-46457, BORIC ACID MAKE-UP CONTROL, to "START".</li><li>• Reset the RMU integrator.</li></ul>

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SCENARIO TIME-LINE:			
SEQ	SEQUENCE OF EVENTS / INSTRUCTOR NOTES	CREW POS	EXPECTED STUDENT RESPONSES
EVENT 3	<p>Booth Operator:</p> <ol style="list-style-type: none"> <li>When control rods are back in AUTO and/or at the discretion of the Lead Evaluator, then enter: <b>Trigger 3, Turbine 1<sup>st</sup> Stage Pressure fails LOW.</b></li> <li>If contacted as I&amp;C to trip bistables, inform the crew two I&amp;C Technicians will be available in 45 minutes.</li> <li>If contacted as the Operations Management, acknowledge the report of the failure, and agree to make other SWI O-28 notifications to the NRC, Duty Station Manager, etc.</li> <li>If contacted as the FIN Team Supervisor, inform the crew that you will write a work order and assign an I&amp;C Supervisor to investigate.</li> </ol> <p>Plant Response:</p> <ol style="list-style-type: none"> <li>Control Rods automatically step IN.</li> <li>Tavg will lower due to rod movement.</li> <li>The following annunciators will alarm:               <ol style="list-style-type: none"> <li>47011-0405, FW CONTROL SYSTEM TROUBLE.</li> <li>47013-0305, AUCTIONEERED TAVG-TREF DEVIATION.</li> </ol> </li> </ol>	<p>LEAD/RO</p> <p>LEAD/RO</p> <p>SS</p>	<p><b>1C5 AOP1, UNCONTROLLED ROD MOTION</b></p> <ul style="list-style-type: none"> <li>Check turbine generator load STABLE.</li> <li>Place rods in MANUAL.</li> <li>Check rod motion STOPPED.</li> <li>Determine Turbine First Stage Pressure Instrument failed.</li> <li>Go to 1C51.2.</li> </ul> <p><b>1C51.2, TURBINE 1<sup>ST</sup> STAGE PRESSURE 1P-485-LOW</b></p> <ul style="list-style-type: none"> <li>Place rod control in manual.</li> <li>Control Tave at value appropriate for power level.</li> <li>Place one steam dump interlock bypass to OFF.</li> <li>Place steam dump in pressure mode.</li> <li>Verify steam dump valves are CLOSED.</li> <li>Verify zero output on steam dump controller.</li> <li>Return steam dump interlock bypass to ON.</li> <li>Verify SG level control operating properly in AUTO.</li> <li>Enter TS LCO 3.3.1 Condition A               <ul style="list-style-type: none"> <li>Reference Table 3.3.1-1 Function 16.b.2</li> </ul> </li> <li>Enter TS LCO 3.3.1 Condition R               <ul style="list-style-type: none"> <li>Verify P-7 is in required state in 1 hour OR</li> <li>Be in Mode 2 in 7 hours.</li> </ul> </li> <li>Enter TRM TLCO 3.3.4 Condition A               <ul style="list-style-type: none"> <li>Reference TRM Table 3.3.4-1 Function 3</li> </ul> </li> <li>Trip Bistable (no six hour requirement).</li> </ul>

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<p><b>EVENT 4</b></p>	<p>Booth Operator:</p> <ol style="list-style-type: none"> <li>When the crew has determined the appropriate Technical Specifications for PT-485 failing low, and/or at the discretion of the Lead Evaluator, then enter: <b>Trigger 4, Loss of Charging Flow to Regen HX.</b></li> <li>If contacted as the Operations Management, acknowledge the report of the failure, and agree to make other SWI O-28 notifications to the NRC, Duty Station Manager, etc.</li> <li>If contacted as the FIN Team Supervisor, inform the crew that you will write a work order and assign a Maintenance Supervisor to investigate.</li> <li>If contacted as Duty RP Tech, acknowledge the need to perform special surveys per PINGP 1483 and PINGP 1492.</li> <li>If contacted as Duty Chemist, acknowledge purification is removed from service.</li> </ol> <p>Plant Response:</p> <ol style="list-style-type: none"> <li>Charging Flow lowers.</li> <li>Pressurizer level lowers.</li> <li>VCT level rises.</li> <li>The following annunciators will alarm:             <ol style="list-style-type: none"> <li>47015-0205, CHARGING LINE HI PRESS.</li> <li>47015-0206, 11 RCP LAB SEAL LO DP.</li> <li>47015-0207, 12 RCP LAB SEAL LO DP.</li> <li>47015-0408, LTDN FLOW HI TEMP.</li> <li>47015-0509, REGEN HX LTDN LINE HI PRESS.</li> <li>47015-0608, LTDN RELIEF LINE TO PRT HI TEMP.</li> </ol> </li> </ol>	<p>RO</p> <p>SS</p> <p>RO / LEAD</p>	<p><b>C47015-0205, CHARGING LINE HI PRESS</b></p> <ul style="list-style-type: none"> <li>Verify high charging line pressure at 1PI-133.</li> <li>Verify proper operation of 1HC-142, 11 CHG LINE FLOW CONTROLLER.</li> <li>Verify pressurizer level and programmed level are approximately equal.</li> <li>Switch to "MANUAL" on the charging pump speed controller that is in "AUTO" and adjust as necessary to prevent lifting charging pump relief valves.</li> <li>Determine flow is lost to regenerative heat exchanger.</li> <li>Go to 1C12.1 AOP2.</li> </ul> <p><b>1C12.1 AOP2, LOSS OF CHARGING FLOW TO THE REGEN HX</b></p> <ul style="list-style-type: none"> <li>Determine seal injection has NOT been lost.</li> <li>Verify Reactor Makeup Controller in "AUTO".</li> <li>If VCT level is less than 17%, then verify automatic makeup is initiated.</li> <li>CLOSE the letdown orifice isolation valves:             <ul style="list-style-type: none"> <li>CV-31325</li> <li>CV-31326</li> <li>CV-31327</li> </ul> </li> <li>Close the letdown isolation valves:             <ul style="list-style-type: none"> <li>CV-31226</li> <li>CV-31255</li> </ul> </li> <li>Place speed control for all operating charging pumps in "MANUAL".</li> <li>Stop one of the charging pumps as follows:             <ul style="list-style-type: none"> <li>Reduce charging pump speed and at the same time CLOSE CV-31198, CHG LINE FLOW CONT, to maintain seal injection of 6-10 gpm to each RCP. Continue until the selected charging pump is at minimum speed.</li> <li>Adjust CV-31198, CHG LINE FLOW CONT, until seal injection flow is approximately 9.5 gpm, then stop the selected charging pump.</li> <li>Adjust the speed of the inservice charging pump and CV-31198 to maintain seal injection flow of 6-10 gpm to each RCP. Continue until charging</li> </ul> </li> </ul>
<p><b>EVENT 4 (cont)</b></p>			



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SCENARIO TIME-LINE:			
SEQ	SEQUENCE OF EVENTS / INSTRUCTOR NOTES	CREW POS	EXPECTED STUDENT RESPONSES
		LEAD	<p>line flow control valve is fully CLOSED. Verify high charging line pressure at 1PI-133.</p> <ul style="list-style-type: none"> <li>• Initiate CC flow through Excess Letdown Heat Exchanger by OPENING MV-32095, 11 EXCESS LTDN HX CC INLT/OUTL.</li> <li>• Establish Excess Letdown flow to the VCT.</li> <li>• Position CV-31333, EXCESS LTDN DIVERT TO RCDT, to the "V.C. TK" position.</li> <li>• OPEN CV-31330, EXCESS LTDN HX INLT.</li> <li>• Slowly OPEN CV-31210, EXCESS LTDN FLOW CONT.</li> <li>• Monitor pressurizer level, adjusting Excess Letdown flow as needed with CV-31210.</li> <li>• Notify Duty RP Tech to implement radiation surveys per PINGP 1483, Special Survey Checklist – Mixed Bed OOS and PINGP 1492, Excess Letdown in Service.</li> <li>• Notify Duty Chemist if purification is removed from service.</li> <li>• Minimize load changes.</li> </ul>



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SCENARIO TIME-LINE:			
SEQ	SEQUENCE OF EVENTS / INSTRUCTOR NOTES	CREW POS	EXPECTED STUDENT RESPONSES
	<p>10. When the triggers for securing the MDFP and DDFP are inserted and the Jockey pump has been simulated secured, then enter:  <b>Trigger 13, Fire Protection Header pressure lowering.</b></p> <p>11. If contacted to check if the leak is stopped, then wait 1 minute and report back that the Fire Protection Leak in the Service Building Stairway has stopped.</p> <p>12. If contacted to check the status of the CL Water cross-connect valves, inform the CR that ALL CL Water cross-connect valves are closed.</p> <p>13. If contacted as the Fire Protection Group to assess comp measures, then inform the Control Room you will look into it.</p> <p>14. If contacted as the FIN Team Supervisor, inform the crew that you will write a work order and assign a Maintenance Supervisor to investigate.</p> <p>Plant Response:</p> <p>1. Fire Protection Header pressure will lower until the MDFP and DDFP pumps auto start, then header pressure will rise to a higher than original pressure and stabilize. When the Fire Pumps are secured, fire header pressure will lower to zero or near zero psig. The following annunciators will be received:</p> <ul style="list-style-type: none"> <li>a. 47022-0307, FIRE HEADER LO PRESS.</li> <li>b. 47022-0305, 122 FIRE PUMP RUNNING.</li> </ul>		

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<p><b>EVENT 6</b></p>	<p>Booth Operator:</p> <ol style="list-style-type: none"> <li>1. When the crew has shutdown the Fire Protection System, and/or at the discretion of the Lead evaluator, then enter: <b>Trigger 6, 11 Steam Generator Faults into Containment.</b></li> <li>2. Upon hearing the announcement of Reactor Trip, or when called as the Turbine Building Operator to isolate the Unit 1 MSR's per Attachment J, then:             <ol style="list-style-type: none"> <li>a. Open and run schedule file <b>E-0_Att-J.sch</b> located in X:\\Trex_PI\\Lightning\\Schedule\\EOPs.</li> <li>b. When the isolation is complete, inform the crew the MSR's are isolated.</li> </ol> </li> <li>3. Upon hearing the announcement of Safety Injection, or when called as the Turbine Building Operator to secure the Turbine Building Roof Exhausters, wait approximately 2 minutes and report the Turbine Building Roof Exhausters are all secured.</li> <li>4. If there is NO examinee in the Unit 2 Lead position and Control Room personnel ask if Unit 2 personnel are available to perform Attachment L, then inform the Control Room that Unit 2 personnel are NOT available for performing Attachment L.</li> </ol> <p style="text-align: center;"><b><u>CRITICAL TASKS</u></b></p> <ul style="list-style-type: none"> <li>• <i><b>Establish at least 200 GPM of feedwater flow to the Steam Generators before both Steam Generator Wide Range Levels lower below 9% [20%] (Only applicable if both AFW Pumps trip on low discharge pressure).</b></i></li> <li>• <i><b>Stop feed flow to the faulted Steam Generator before taking actions in emergency operating procedures outside of E-0, E-2, or FR-P.1.</b></i></li> </ul>	<p>LEAD/ RO</p> <p>SS</p> <p>RO</p> <p>SS</p>	<p><b>1E-0, REACTOR TRIP OR SAFETY INJECTION</b></p> <ul style="list-style-type: none"> <li>• Verify Reactor is tripped.</li> <li>• Verify the Main Turbine is tripped.</li> <li>• Determine both Safeguards buses energized.</li> <li>• Determine SI is actuated and required.</li> <li>• Perform Attachment L (see SEG pages 19 &amp; 20).</li> <li>• Check AFW Status.</li> <li>• Check RCS Tavg trending to 547°F.</li> <li>• Check PRZR PORVs and Spray valves closed.</li> <li>• Determine RCP running.</li> <li>• Determine 11 SG is faulted.</li> <li>• Transition to 1E-2.</li> </ul> <p style="background-color: #cccccc;">Transition to 1FR-Z.1 may occur if an orange path in Containment Critical Safety Function has occurred.</p> <p><b>1FR-Z.1, RESPONSE TO HIGH CONTAINMENT PRESSURE</b></p> <ul style="list-style-type: none"> <li>• Verify Containment Isolation Valves are CLOSED.</li> <li>• Verify containment spray actuated.</li> <li>• Determine Containment Spray pumps are NOT running.</li> <li>• Manually start spray pumps.</li> <li>• Verify proper spray system alignment.</li> <li>• Verify FCUs running slow to the dome.</li> <li>• Verify FCU cooling water MVs are OPEN.</li> <li>• Check cooling water header pressure – both greater than 65 psig.</li> <li>• Verify MSIVs and bypass valves are CLOSED.</li> <li>• Isolate feed flow to 11 SG if not already done.</li> <li>• Return to procedure and step in effect.</li> </ul>
<p><b>EVENT 6 (cont)</b></p>	<ol style="list-style-type: none"> <li>5. If contacted as Duty Chemist or Duty RP to check status of secondary radiation levels and/or SG activity levels, then inform the control room that both SG cation column frisks are reading background and secondary radiation levels are normal.</li> </ol>	<p>RO</p>	<p><b>1E-2, FAULTED STEAM GENERATOR ISOLATION</b></p> <ul style="list-style-type: none"> <li>• Check MSIV and Bypass valve on 11 SG closed.</li> <li>• Determine 11 SG is faulted.</li> <li>• Determine 12 SG is NOT faulted.</li> <li>• Isolate 11 SG:             <ul style="list-style-type: none"> <li>○ Isolate main feed line.</li> </ul> </li> </ul>

2016 ILT NRC SIMULATOR EVALUATION #2, REV. 0

SCENARIO TIME-LINE:			
SEQ	SEQUENCE OF EVENTS / INSTRUCTOR NOTES	CREW POS	EXPECTED STUDENT RESPONSES
	<p>6. If contacted by the Control Room to report status of CAT 1 Vent Zone openings, then inform the CR that all CAT 1 Vent Zone openings are closed.</p> <p>7. If Control Room personnel ask for status of Unit 2 Cooling Water/Chilled Water lineup, then inform the Control Room that Unit 2 Cooling Water/Chilled Water valves are in their safeguards positions.</p> <p>8. If Control Room personnel ask for status of Battery Room Temperatures, then inform the Control Room that Battery Room temperatures are 74°F.</p> <p>Plant Response:</p> <ol style="list-style-type: none"> <li>1. PRZR Pressure lowers rapidly.</li> <li>2. CTMT Pressure rises.</li> <li>3. Annunciator 47022-0611, FIRE DETECTION PANEL 121 – FIRE ALARM, alarms.</li> </ol>	<p>SS</p> <p>RO / LEAD</p> <p>SS</p>	<ul style="list-style-type: none"> <li>○ Isolate AFW flow.</li> <li>○ Close steam supply valve to TD AFWP.</li> <li>○ Verify 11 SG PORV closed.</li> <li>○ Verify SGB isolation valves closed.</li> </ul> <ul style="list-style-type: none"> <li>● Determine CST levels are greater than 10000 gallons.</li> <li>● Determine secondary radiation levels are normal.</li> <li>● Go to 1E-1.</li> </ul> <p><b>1E-1, LOSS OF REACTOR OR SECONDARY COOLANT</b></p> <ul style="list-style-type: none"> <li>● Determine RCPs should NOT be stopped.</li> <li>● Determine 11 SG is faulted and isolated.</li> <li>● Check 12 SG WR level greater than 50%.</li> <li>● Check secondary radiation normal.</li> <li>● Determine PRZR PORVs are closed.</li> <li>● Determine PRZR PORV block valves have power and both are open.</li> <li>● Reset SI and CI.</li> <li>● Establish instrument air to CTMT.</li> <li>● Determine offsite power available to charging pumps and at least one pump is running.</li> <li>● Determine SI should be terminated.</li> <li>● Go to 1ES-0.2.</li> </ul>

<p><b>EVENT 7</b></p>	<p>Booth Operator:</p> <ol style="list-style-type: none"> <li>When the reactor is tripped, then verify the following is automatically inserted: <b>AUTO Trigger 7, Loss of Containment Cooling.</b></li> <li>If contacted as an out-plant operator to open CFCU bypass valves, then wait 4 minutes and enter: <b>Trigger 17, CFCU Cooling Water Return Orifice Bypass Valves OPEN</b>, and inform the control room that CFCU CL bypass valves are open.</li> </ol> <p style="text-align: center;"><b><u>CRITICAL TASKS</u></b></p> <p><i>Manually actuate containment cooling as necessary to prevent containment pressure from exceeding 46 psig.</i></p> <p style="text-align: center;"><b><u>TABLE 1</u></b></p> <table border="1" data-bbox="296 756 1077 1174"> <thead> <tr> <th>CS NUMBER</th> <th>COMPONENT</th> <th>DESIRED POSITION</th> </tr> </thead> <tbody> <tr> <td>46018</td> <td>11 CFCU</td> <td>SLOW</td> </tr> <tr> <td>46019</td> <td>13 CFCU</td> <td>SLOW</td> </tr> <tr> <td>46039</td> <td>MV-32144</td> <td>CLOSE</td> </tr> <tr> <td>46144</td> <td>MV-32159</td> <td>CLOSE</td> </tr> <tr> <td>46519</td> <td>MV-32036</td> <td>CLOSE</td> </tr> <tr> <td>46509</td> <td>MV-32037</td> <td>CLOSE</td> </tr> <tr> <td>46336</td> <td>12 DDCLWP MAN/AUTO</td> <td>MANUAL</td> </tr> <tr> <td>46053</td> <td>12 DDCLWP</td> <td>START</td> </tr> <tr> <td>46537</td> <td>22 DDCLWP MAN/AUTO</td> <td>MANUAL</td> </tr> <tr> <td>46523</td> <td>22 DDCLWP</td> <td>START</td> </tr> </tbody> </table> <p>NOTE: 12 and 14 CFCUs will fail to restart.</p>	CS NUMBER	COMPONENT	DESIRED POSITION	46018	11 CFCU	SLOW	46019	13 CFCU	SLOW	46039	MV-32144	CLOSE	46144	MV-32159	CLOSE	46519	MV-32036	CLOSE	46509	MV-32037	CLOSE	46336	12 DDCLWP MAN/AUTO	MANUAL	46053	12 DDCLWP	START	46537	22 DDCLWP MAN/AUTO	MANUAL	46523	22 DDCLWP	START	<p>LEAD</p>	<p>The crew may restore Containment Cooling using 1FR-Z.1, RESPONSE TO HIGH CONTAINMENT PRESSURE, due to an orange or red path in the Containment Critical Safety Function.</p> <p><b>1E-0 ATTACHMENT L: SI ALIGNMENT VERIFICATION</b></p> <ul style="list-style-type: none"> <li>Verify both trains of SI actuated:             <ul style="list-style-type: none"> <li>Both RHR pumps or both SI pumps – RUNNING.</li> </ul> </li> <li>"SI NOT READY" lights - NOT LIT.</li> <li>"SI ACTIVE" lights - LIT FOR PLANT CONDITIONS.             <ul style="list-style-type: none"> <li><b>Actuate and align CL components per Table 1.</b></li> </ul> </li> <li>"CONTAINMENT ISOLATION" lights - LIT FOR PLANT CONDITIONS.</li> <li>Check Category 1 Vent Zone Boundary.</li> <li>Close MV-32115, 122 SFP HX INLT HDR MV B.</li> <li>Check Cooling Water Header Pressures - BOTH GREATER THAN 65 PSIG.</li> <li>Verify Plant Announcements Complete.</li> <li>Check If Main Steamlines Are Isolated.</li> <li>Determine MSIVs, Bypass Valves, and Containment Instrument Air Valves are already closed.</li> <li>Verify SI Flow.</li> <li>Verify RHR Flow.</li> <li>Verify Containment Spray is actuated (if necessary).             <ul style="list-style-type: none"> <li><b>11 &amp; 12 CS pumps do NOT start automatically</b></li> <li><b>Manually start 11 &amp; 12 CS pumps.</b></li> </ul> </li> <li>Check RCP Cooling.</li> <li>Verify Local Actions Complete.</li> <li>Verify Generator Breakers – OPEN.</li> <li>Verify All Heater Drain Pumps – STOPPED.</li> <li>Check Turbine reheat and intercept valves CLOSED.</li> <li>Open turbine drain valves.</li> </ul>
CS NUMBER	COMPONENT	DESIRED POSITION																																		
46018	11 CFCU	SLOW																																		
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46537	22 DDCLWP MAN/AUTO	MANUAL																																		
46523	22 DDCLWP	START																																		
<p><b>EVENT 7 (cont)</b></p>	<p>Plant Response:</p> <ol style="list-style-type: none"> <li>Containment Spray pumps do not start automatically.</li> <li>12 and 14 CFCU fail to automatically or manually start.</li> <li>11 and 13 CFCU fail to automatically start.</li> <li>SI to Cooling Water signal fails to actuate.</li> </ol>	<p>LEAD</p>	<ul style="list-style-type: none"> <li>Verify Main Feedwater Alignment:             <ul style="list-style-type: none"> <li>Both main feedwater pumps – STOPPED.</li> <li>Main and bypass FRVs – CLOSED.</li> </ul> </li> <li>Verify All Condensate Pumps – STOPPED.</li> <li>Verify Steam Dump in "STM PRESS" Mode.</li> <li>Verify Unit 1 Cooling Water/Chilled Water Alignment:</li> </ul>																																	

2016 ILT NRC SIMULATOR EVALUATION #2, REV. 0

SCENARIO TIME-LINE:			
SEQ	SEQUENCE OF EVENTS / INSTRUCTOR NOTES	CREW POS	EXPECTED STUDENT RESPONSES
	<p>5. Containment pressure rises and will exceed 46 psig without operator action.</p> <p style="text-align: center;"><b><u>EMERGENCY PLAN CLASSIFICATION</u></b></p> <p><b><i>NOTIFICATION OF UNUSUAL EVENT – FU1 due to potential loss of Containment fission product barrier due to Containment pressure greater than 23 psig with less than one full train of depressurization equipment operating.</i></b></p> <p><b><i>SITE AREA EMERGENCY – a RED path in RCS Integrity CSF may occur due to the rapid cooldown from the faulted steam generator. If this occurs, then FS1 is met due to potential loss of RCS fission product barrier and potential loss of Containment fission product barrier.</i></b></p>		<ul style="list-style-type: none"> <li>○ CFCU control switches - "SLOW".</li> <li>○ CFCU dampers - ALIGNED TO DOME.</li> <li>○ Unit 1 cooling water/chilled water valves closed.</li> <li>○ Unit 1 CRDM shroud cooling supply and return valves – CLOSED.</li> <li>○ CFCU cooling water supply and return valves – OPEN.</li> <li>○ CFCU chilled water supply and return valves – CLOSED.</li> <li>● Verify 11 Safeguards Screenhouse Ventilation lineup.</li> <li>● Verify Control Room Ventilation Alignment:             <ul style="list-style-type: none"> <li>○ Chillers and fans – RUNNING.</li> <li>○ Control room chiller suction/discharge tie closed - STATUS LIGHT LIT.</li> </ul> </li> <li>● Verify Unit 2 Cooling/Chilled Water Alignment.</li> <li>● Verify 21 Safeguards Screenhouse Ventilation lineup.</li> <li>● Verify 11 and 12 Battery Charger Operation is normal.</li> <li>● Verify Battery Room temps less than 84°F.</li> <li>● Check status of Spent Fuel Cooling.</li> <li>● Check Status of Notifications.</li> <li>● Notify SS Of Any Discrepancies.</li> </ul>
<b>END</b>	<p>Once the crew has isolated 11 Steam Generator and restored Containment Cooling and/or at the discretion of the Lead Evaluator, then place the simulator in FREEZE. Inform the crew that training has the duty.</p>		

## 2016 ILT NRC SIMULATOR EVALUATION #2, REV. 0

<b>UNIT 1 LPEO / PEO TURNOVER LOG</b>
---------------------------------------

DATE:

DAY/NIGHT SHIFT: Day

CAT 1 VENT OPENINGS: 0 ft<sup>2</sup>

SYSTEM CONDITION: GREEN

<b>SAFEGUARDS EQUIPMENT OOS/TECH SPEC REQUIRED ACTION STATEMENTS</b>
--

N51 and N52 displays are out of service.

- TS LCO 3.3.3 Condition A was entered with 23 days remaining.
- TS LCO 3.3.3 Condition D was entered with 5 days remaining.
- N51 and N52 counts can be viewed in ERCS.

<b>PROTECTED EQUIPMENT</b>
----------------------------

NONE

<b>RAD MONITORS OOS</b>	<b>ANNUNCIATORS OOS</b>
-------------------------	-------------------------

NONE

NONE

<b>OUTSTANDING SP'S</b>	<b>FIRE DET / PROT EQP IMPAIRMENTS</b>
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NONE

NONE

<b>OTHER EQUIPMENT OOS / STATUS</b>
-------------------------------------

- |   |   |   |
|---|---|---|
| <ul style="list-style-type: none"> <li>• Exposure: MOC</li> <li>• Power: 90%</li> <li>• Boron: (CB): 856 ppm</li> <li>• Temperature: 559°F</li> </ul> | <ul style="list-style-type: none"> <li>• Pressure: 2235 psig</li> <li>• Xenon: Equilibrium</li> <li>• Rods: "D" @ 208</li> <li>• Generator: 522 MW</li> </ul> | <ul style="list-style-type: none"> <li>• 13 Charging Pump is out of service.</li> <li>• Two 40 GPM Letdown Orifices are in service.</li> <li>• Backup Pressurizer Heaters are ON.</li> <li>• 12 SI Accumulator pressure is ~ 715 psig.</li> </ul> |
|---|---|---|

<b>MAJOR EQUIPMENT REPAIRED / RETURNED TO SERVICE</b>
---

Unit 1 is at reduced power due to 15 Feedwater Heater being out of service for several days. 15 Feedwater Heater is repaired and returned to service.

<b>OPERATIONAL PLANS FOR COMING SHIFT</b>
---

- Prior to entering the simulator:
  - Perform a Pre-Job Brief for raising 12 SI Accumulator pressure.
  - Review the reactivity plan.
  - Perform a Pre-Job Brief for load increase.
- After turnover, raise 12 Safety Injection Accumulator pressure per 1C18.
- An out-plant operator has already been briefed on raising 12 SI Accumulator.
- The out-plant operator is standing by on a radio.
- When directed by the Shift Manager, increase load per steps 6.1.9 – 6.1.10.I of 1C1.4.
- Suspend the load increase at 95% per step 6.1.10.J of 1C1.4.
- Steps 6.1.1 – 6.1.8 of 1C1.4 are complete.
- There are no ramp rates or fuel conditioning limitations.
- Dilute 10 gallons 1-2 times per shift for temperature control.

<b>NEW PROCEDURES / INSTRUCTIONS</b>
--------------------------------------

NONE



## Reactivity Plan

1. Load INCREASE from 90% to 95%.

2. Current conditions:

Power level:	90% (522 MW)
Xenon:	Equilibrium
Control Rod Position:	Bank D @ 208 steps
Boron Concentration:	856 ppm
Core Exposure:	11000 MWD/MTU

3. Reactivity Plan:

Target:	Turbine Load: 548 MW (95%)
Rate:	0.50%/minute
Control Mode:	LOAD control with Rod Control in MANUAL
Boration/Dilution:	333 gallon DILUTION (batch)
Final Control Rod Position:	Bank D @ 213 steps

4. Reactivity Prediction:

Change in Power Defect:	-75 pcm (Figure C1-7A)
Differential Boron Worth:	-6.55 pcm/ppm (Figure C1-11A)
Differential Rod Worth:	2.5 pcm/step (Figure C1-4A)
Calculated RCS PPM change:	-10 ppm (62.5 pcm ÷ -6.55 pcm/ppm)
Calculated Rod Step change:	5 steps (-12.5 pcm ÷ 2.5 pcm/step)



## SIMULATOR EXERCISE GUIDE (SEG)

SITE: PRAIRIE ISLAND

SEG # PI-ILT-NRC-1603S

SEG TITLE: 2016 ILT NRC SIMULATOR EVALUATION #3

REV. # 0

PROGRAM: INITIAL LICENSE OPERATOR TRAINING #: FL-ILT

COURSE: INITIAL LICENSE OPERATOR TRAINING #: FL-ILT

TOTAL TIME: 2.0 HOURS

Additional site-specific signatures may be added as desired.

<b>Developed by:</b>	<b>Shawn Sarrasin</b> <i>Instructor</i>	<b>11/23/2015</b> <i>Date</i>
<b>Reviewed by:</b>	<b>Fred Collins</b> <i>Instructor</i> <i>(Simulator Scenario Development Checklist.)</i>	<b>12/28/2015</b> <i>Date</i>
<b>Validated by:</b>	<b>Fred Collins</b> <i>Validation Lead Instructor</i> <i>(Simulator Scenario Validation Checklist.)</i>	<b>12/28/2015</b> <i>Date</i>
<b>Approved by:</b>	<b>Mike Petersen</b> <i>Training Supervision</i>	<b>3/25/2016</b> <i>Date</i>

## Guide Requirements

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### Evaluation Objectives:

Evaluate the crews ability to:

1. Swap Component Cooling Water Pumps per 1C14.
2. Perform a load increase from 30% to 40% power per 1C1.4.

Evaluate the crews ability to diagnose and respond to a:

3. Pressurizer Pressure Instrument failing LOW per 1C51.3.
  4. Bus 15 Load Sequencer failure per 1C20.7 AOP2.
  5. Loss of Feedwater per C47010-0101, 1E-0, and 1ES-0.1.
  6. Failure of the Reactor to automatically trip per 1E-0.
  7. Large Break LOCA per 1E-0 and 1E-1.
  8. Loss of Component Cooling per Attachment L of E-0.
- 

### Training Resources:

1. Full Scope Simulator
  2. NRC Evaluation Team
  3. Booth Operator (Backup Communicator)
  4. Primary Communicator
- 

### Related PRA Information:

#### **Initiating Event with Core Damage Frequency:**

TRANSIENT (4.2%)

LOCA (27.3%)

#### **Important Components:**

PRZR (CHNL III-BLU) P XMTR

BUS 15

11 CC PMP

12 CC PMP

#### **Important Operator Actions with Task Number:**

NONE

## QUANTITATIVE ATTRIBUTES

### **Malfunctions:**

*Before EOP Entry:*

1. 1PT-431, Blue Channel Pressurizer Pressure Transmitter, fails LOW.
2. Failure of Bus 15 Load Sequencer.
3. 11 Main Feed Pump Lockout.

*After EOP Entry:*

1. Reactor Fails to automatically trip.
2. Failure of CC Pumps to automatically start.

### **Abnormal Events:**

1. Controlling Channel Pressurizer Pressure Instrument Failure.
2. Bus 15 Load Sequencer Out of Service.
3. Loss of Main Feedwater.
4. Loss of Component Cooling.

### **Major Transients:**

1. Large Break LOCA.

### **Critical Tasks:**

1. Manually trip the reactor from the Control Room before both Steam Generator Wide Range Levels lower below 9%.
2. Manually start at least one CC Pump before the end of the scenario.

**CRITICAL TASK SHEET**

Critical Task:	Manually trip the reactor from the Control Room before both Steam Generator Wide Range Levels lower below 9%.
Safety Significance:	<p>If the main turbine trips and the reactor fails to automatically trip, then the steam dumps and/or SG PORVs will draw steam from the Steam Generators. This steam will not return to the main condenser and hotwell. This results in rapidly lowering hotwell level, eventual trip of the Main Feedwater Pumps, and loss of feedwater to the Steam Generators.</p> <p>During a loss of feedwater to the Steam Generators, the turbine, steam dumps, or SG PORVs are drawing steam from the Steam Generators. This causes Steam Generator levels to rapidly lower. Once the SGs are dry, the heat removal capability of the RCS is lost. This leads to RCS pressure increase and RCS boundary failure.</p>
Plant Conditions:	<ul style="list-style-type: none"> <li>• At least one of the following occurs: <ul style="list-style-type: none"> <li>○ Loss of normal feedwater to the Steam Generators.</li> <li>○ Main Turbine Trip.</li> </ul> </li> <li>• The reactor fails to automatically trip.</li> <li>• Rods fail to automatically insert.</li> <li>• Reactor Power is greater than 5%.</li> <li>• At least one of the following is drawing steam from the SGs: <ul style="list-style-type: none"> <li>○ Main Turbine.</li> <li>○ Steam Dumps.</li> <li>○ SG PORVs.</li> </ul> </li> </ul>
Cues:	<ul style="list-style-type: none"> <li>• Steam Generator levels lowering.</li> <li>• Both Reactor Trip breakers closed.</li> </ul>
Performance Indicator:	<ul style="list-style-type: none"> <li>• Opening the Reactor Trip Breakers by operating one of the following Reactor Trip Switches: <ul style="list-style-type: none"> <li>○ CS-46331.</li> <li>○ CS-46450.</li> </ul> <p style="text-align: center;">-OR-</p> </li> <li>• Inserting all control rods by operating CS-46447, AMSAC/DSS Control Switch.</li> </ul>
Feedback:	<ul style="list-style-type: none"> <li>• Control rods at bottom of core.</li> <li>• Neutron flux decreasing.</li> </ul>

**CRITICAL TASK SHEET**

Critical Task:	Manually start at least one CC Pump before the end of the scenario.
Safety Significance:	Operation of the ECCS injection pumps without Component Cooling Water could lead to pump failure or damage. This would result in a degraded emergency core cooling system (ECCS) capacity.
Plant Conditions:	<ul style="list-style-type: none"> <li>• Safety Injection.</li> <li>• Both Component Cooling Water Pumps are NOT running.</li> <li>• At least one Component Cooling Water Pump can be started from the Control Room.</li> </ul>
Cues:	<ul style="list-style-type: none"> <li>• Indication that Safety Injection actuated.</li> <li>• “SI ACTIVE” lights are NOT lit for both CC Pumps.</li> <li>• Component Cooling Water Discharge pressure reads zero.</li> <li>• Component Cooling Water Low Flow alarms to ECCS Pumps.</li> </ul>
Performance Indicator:	<p>Starting one or both CC Pumps by operating the following switches:</p> <ul style="list-style-type: none"> <li>• CS-46036, 11 CC WTR PUMP.</li> <li>• CS-46037, 12 CC WTR PUMP.</li> </ul>
Feedback:	<ul style="list-style-type: none"> <li>• “SI ACTIVE” lights are LIT for at least one CC Pump.</li> <li>• Component Cooling Water Low Flow alarm clears for at least one train of Safeguards components.</li> </ul>

## SCENARIO OVERVIEW:

### INITIAL CONDITIONS:

- Exposure: MOC
- Power: 30%
- Boron: (CB): 1130 ppm
- Temperature: 550°F
- Pressure: 2235 psig
- Xenon: Equilibrium
- Rods: "D" @ 162
- Generator: 137 MW

### EQUIPMENT OOS

- 11 RHR Pump
- 121 AIR COMPRESSOR
- N51 and N52 Displays

### SEQUENCE OF EVENTS:

#### Event 1: Swap Component Cooling Water Pumps

- The crew will start 12 CC Pump and stop 11 CC Pump per 1C14.

#### Event 2: Controlling Pressurizer Pressure Channel fails LOW

- PT-431 fails low.
- Both spray valves close and PRZR heaters energize.
- The crew will take manual control of PRZR pressure and select WHITE/RED on selector switch.
- The Shift Supervisor will address TS LCO 3.3.1 and TS LCO 3.3.2.

#### Event 3: Perform a Load Increase from 30% to 40%

- The crew will place rods in manual.
- The crew will perform alternate dilutions per 1C12.5.
- The crew will operate the turbine to raise load.

#### Event 4: Failure of Bus 15 Load Sequencer

- The crew will place Bus 15 Voltage Restoration in manual.
- The crew will take D1 Diesel Generator in Pullout.
- The Shift Supervisor will address TS LCO 3.8.9.

#### Event 5: Reactor Fails to Automatically Trip on a Loss of Main Feedwater

- 11 Main Feedwater Pump lockout.
- The Main Turbine will trip.
- The Reactor will fail to automatically trip.
- The crew will manually trip the reactor and enter 1E-0.

### **Event 6: Large Break LOCA**

- After the crew transitions to 1ES-0.1, a large break LOCA occurs on the B Hot Leg.
- Containment Pressure rises, RCS pressure and Pressurizer level rapidly lowers.
- The crew will transition back to 1E-0.
- The crew will transition into and out of 1FR-P.1 when a red path in integrity CSF occurs.
- The crew will diagnose a Loss of Coolant Accident and transition to 1E-1.

### **Event 7: Loss of Component Cooling**

- After the Safety Injection, both Component Cooling Water Pumps will fail to automatically start.
- The crew will manually start Component Cooling Water Pumps per Attachment L of 1E-0.



## 2016 ILT NRC SIMULATOR EVALUATION #3, REV. 0

SCENARIO TIME-LINE:			
SEQ	SEQUENCE OF EVENTS / INSTRUCTOR NOTES	CREW POS	EXPECTED STUDENT RESPONSES
	1. SIMULATOR PRE-BRIEF: a. The Simulator Pre-Brief is conducted prior to the crew entering the simulator. 2. COMPLETE TURNOVER: a. "UNIT 1 LPEO / PEO TURNOVER LOG." b. PRA Printout. c. Verify crew performs walk down of control boards and the reviews turnover checklists.	CREW	Review the following with the off-going operator: <ul style="list-style-type: none"> <li>• "Unit 1 LPEO / PEO Turnover Log"</li> <li>• PRA printout</li> <li>• Walk-down the control boards and ask questions as appropriate</li> </ul>
<b>EVENT 1</b>	Booth Operator: 3. After the crew has assumed the duty, they will <b>swap Component Cooling Water Pumps</b> per 1C14. 4. When contacted as the out-plant operator to perform step 5.2.1 of 1C14, then acknowledge order. Wait approximately 1 minute and report bearing oil level is normal and there is no seal leakage. 5. If contacted as an out-plant operator to perform a sweep of Bus 16 Room, then wait approximately 1 minute and report that Bus 16 Room is clear of personnel. 6. When contacted as the out-plant operator to perform step 5.2.4 of 1C14, then acknowledge order. Wait approximately 2 minutes, then report step 5.2.4 is completed SAT. 7. After the crew indicates they will wait 10 minutes prior to stopping 11 CC Pump, then inform the crew TIME COMPRESSION is being used and that 10 minutes has elapsed.  Plant Response: 1. 12 CC Heat Exchanger flowrate rises. 2. 11 CC Heat Exchanger flowrate lowers.	LEAD	<b>1C14, COMPONENT COOLING SYSTEM - UNIT 1</b> <ul style="list-style-type: none"> <li>• Notify the Aux Building Operator to check the following on 12 CC Pump.</li> <li>• Bearing oil level in sight glass.</li> <li>• No seal leakage.</li> <li>• Start 12 CC Pump using CS-46037.</li> <li>• Verify MV-32146, 12 CC HX CLG WTR INLT, is OPEN.</li> <li>• Direct an out-plant operator to perform step 5.2.4 of 1C14.</li> <li>• Operate both CC pumps for at least ten minutes.</li> <li>• Determine single pump operation is desired and go to section 5.3.</li> <li>• Determine B Train RHR is NOT being used for shutdown cooling.</li> <li>• Place and hold CS-46036, 11 CC WTR PUMP, in "STOP" until CC system pressure stabilizes above 75 psig.</li> </ul>

## 2016 ILT NRC SIMULATOR EVALUATION #3, REV. 0

SCENARIO TIME-LINE:			
SEQ	SEQUENCE OF EVENTS / INSTRUCTOR NOTES	CREW POS	EXPECTED STUDENT RESPONSES
EVENT 2	<p>Booth Operator:</p> <ol style="list-style-type: none"> <li>After the crew has assumed the duty and/or at the discretion of the lead evaluator, then enter: <b>Trigger 2, PRZR Pressure Blue Channel fails LOW.</b></li> <li>If contacted as I&amp;C to trip bistables, inform the crew two I&amp;C Technicians will be available in 45 minutes.</li> <li>If contacted as the Operations Management, acknowledge the report of the failure, and agree to make other SWI O-28 notifications to the NRC, Duty Station Manager, etc. as asked.</li> <li>If contacted as the FIN Team Supervisor, inform the crew that you will write a work order and assign an I&amp;C Supervisor to investigate.</li> </ol> <p>Plant Response:</p> <ol style="list-style-type: none"> <li>PRZR spray valves close.</li> <li>PRZR Pressure rises.</li> <li>Tavg rises.</li> <li>The following annunciators are received: <ol style="list-style-type: none"> <li>47012-0108, PRZR LO PRESS SI CHANNEL ALERT.</li> <li>47012-0408, PRZR HI/LO PRESS CHANNEL ALERT.</li> </ol> </li> </ol>	<p>LEAD/ RO</p> <p>SS</p> <p>LEAD</p> <p>SS</p>	<p><b>C47012-0108, PRZR LO PRESS SI CHANNEL ALERT</b></p> <ul style="list-style-type: none"> <li>Check PRZR pressure.</li> <li>Verify all heaters on.</li> <li>Verify sprays closed.</li> <li>If necessary, then control pressure in manual.</li> <li>Refer to 1C51.3.</li> </ul> <p><b>1C51.3, PRESSURIZER PRESSURE 1P-431 – LOW</b></p> <ul style="list-style-type: none"> <li>If the Blue channel is selected on the PRZR Pressure Control Selector Switch, then: <ul style="list-style-type: none"> <li>Place PRZR Press Cont in MANUAL and stabilize pressure.</li> <li>Select 2-1 (WHITE/RED) on channel sel sw</li> <li>When pressure returned to normal with no deviation from setpoint, then return pressure control to automatic.</li> </ul> </li> <li>Verify PRZR Press Rec. not selected to Blue channel.</li> <li>Enter TS LCO 3.3.1 Condition A <ul style="list-style-type: none"> <li>Reference Table 3.3.1-1 immediately.</li> </ul> </li> <li>Enter TS LCO 3.3.1 Condition E <ul style="list-style-type: none"> <li>Place channel in trip in 6 hours OR</li> <li>Be in Mode 3 in 12 hours</li> </ul> </li> <li>Enter TS LCO 3.3.1 Condition K <ul style="list-style-type: none"> <li>Place channel in trip in 6 hours OR</li> <li>Reduce thermal power to &lt;P-7/P-8 in 12 hours</li> </ul> </li> <li>Enter TS LCO 3.3.2 Condition A <ul style="list-style-type: none"> <li>Reference Table 3.3.2-1 immediately.</li> </ul> </li> <li>Enter TS LCO 3.3.2 Condition D <ul style="list-style-type: none"> <li>Place channel in trip in 6 hours OR</li> <li>Be in Mode 3 in 12 hours AND</li> <li>Be in Mode 4 in 18 hours</li> </ul> </li> <li>Trip bistables.</li> </ul>



2016 ILT NRC SIMULATOR EVALUATION #3, REV. 0

SCENARIO TIME-LINE:			
SEQ	SEQUENCE OF EVENTS / INSTRUCTOR NOTES	CREW POS	EXPECTED STUDENT RESPONSES
			<ul style="list-style-type: none"><li>• Verify CS-46454, BA BLENDER TO VCT INLT CV-31201, is selected to "AUTO".</li><li>• Verify 1HC-111, RX MU WTR TO BLENDER FLOW CONT, is in "AUTO" set to 45%.</li><li>• Place CS-46300, MAKE-UP MODE SELECTOR, to "AUTO".</li><li>• Momentarily place CS-46457, BORIC ACID MAKE-UP CONTROL, to "START".</li><li>• Reset the RMU integrator.</li></ul>

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SCENARIO TIME-LINE:			
SEQ	SEQUENCE OF EVENTS / INSTRUCTOR NOTES	CREW POS	EXPECTED STUDENT RESPONSES
EVENT 4	<p>Booth Operator:</p> <ol style="list-style-type: none"> <li>When the lead evaluator is satisfied with the reactivity manipulation, then enter: <b>Trigger 4, Failure of Bus 15 Load Sequencer.</b></li> <li>If contacted as an out-plant operator to investigate Bus 15 Load Sequencer, then wait approximately 1 minute and report the following:               <ol style="list-style-type: none"> <li>Blocking Relay Switch is in NORMAL.</li> <li>PLC Key Switch is in RUN and NOT in REMOTE.</li> <li>Unable to identify cause of the problem.</li> </ol> </li> <li>When the crew starts to perform SP 2094/2095 or asks Unit 2 to perform SP 2094/2095, then inform the crew that Unit 2 personnel will perform SP 2094 and SP 2095 to verify Unit 2 load sequencers are operable.</li> <li>When the crew starts to perform SP 1118 or asks for an extra operator to perform SP 1118, then inform the crew TIME COMPRESSION is used and SP 1118 is completed SAT.</li> <li>When the crew starts to perform SP 1095 or asks for an extra operator to perform SP 1095, then inform the crew TIME COMPRESSION is used and SP 1095 is completed SAT.</li> <li>When the crew starts to verify grid voltage alarm limits or asks for an extra operator to verify grid voltage alarm limits, then inform the crew TIME COMPRESSION is used and voltage alarm limits have been verified.</li> </ol> <p>Plant Response:</p> <ol style="list-style-type: none"> <li>Annunciator 47024-1001, BUS 15 SEQUENCER NOT IN SERVICE, alarms.</li> <li>Bus 15 Load Sequencer will not load reject during an SI.</li> </ol>	<p>LEAD</p> <p>SS</p> <p>LEAD</p>	<p><b>1C20.7 AOP2, BUS 15 LOAD SEQUENCER OUT OF SERVICE</b></p> <ul style="list-style-type: none"> <li>Place CS-46932, BUS 15 VOLTAGE RESTORATION SEL SW, in "MAN".</li> <li>Place CS-46935, D1 DIESEL GENERATOR, in "PULLOUT".</li> <li>Verify annunciator panel and/or ERCS alarms for BUS 15 voltages are in service.</li> <li>Log D1 DSL GEN inoperable.</li> <li>Check Unit 2 sequencers operable per SP 2094/2095.</li> <li>Log Bus 15 Load Sequencer inoperable.</li> <li>Enter TS LCO 3.3.4 Condition C.</li> <li>Enter TS LCO 3.8.1 Condition B.</li> <li>Log Bus 15 inoperable.</li> <li>Enter TS LCO 3.8.9 Condition A.</li> <li>Perform the applicable portions of SP 1118, Verifying Paths from the grid to Unit 1 buses.</li> <li>Perform SP 1095, Bus 16 Load Sequencer Test to verify Bus 16 load sequencer is operable.</li> <li>Verify Bus 15 is powered from 1RY and Bus 16 is powered from CT11.</li> <li>Verify grid voltage limits are appropriate.</li> <li>Align for block loading.           <ul style="list-style-type: none"> <li>11 and 13 CFCUs in SLOW.</li> <li>121 and 123 Waste Gas Compressors in Pullout.</li> <li>121 Air Compressor in Pullout.</li> <li>Verify 121 Control Room Chiller and Fan running.</li> <li>Start 121 Auxiliary Building Special Ventilation.</li> <li>On D1 Aux Panel, Place CS-55401, D1 AIR COMP CONTROL SW, in "OFF".</li> </ul> </li> <li>Log Bus 15 operable.</li> <li>Exit TS LCO 3.8.9 Condition A.</li> </ul>

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SCENARIO TIME-LINE:			
SEQ	SEQUENCE OF EVENTS / INSTRUCTOR NOTES	CREW POS	EXPECTED STUDENT RESPONSES
EVENT 5	<p>Booth Operator:</p> <ol style="list-style-type: none"> <li>After the crew has placed D1 in pullout and/or at the discretion of the Lead Evaluator, then enter: <b>Trigger 5, Loss of Main Feedwater.</b></li> <li>Upon hearing the announcement of Reactor Trip, or when called as the Turbine Building Operator to isolate the Unit 1 MSRs per Attachment J, then:               <ol style="list-style-type: none"> <li>Open and run schedule file <b>E-0_Att-J.sch</b> located in X:\\Trex_PI\\Lightning\\Schedule\\EOPs.</li> <li>When the isolation is complete, inform the crew the MSR's are isolated.</li> </ol> </li> </ol> <p>Plant Response:</p> <ol style="list-style-type: none"> <li>Annunciator 47010-0101, 11 FW PUMP LOCKOUT.</li> <li>Main Turbine automatically trips.</li> <li>Rapidly lowering levels in both Steam Generators.</li> <li>The reactor will fail to automatically trip.</li> </ol> <p style="text-align: center;"><b><u>CRITICAL TASK</u></b></p> <p><b><i>Manually trip the reactor before both Steam Generator Wide Range levels lower below 9%.</i></b></p> <p style="text-align: center;"><b><u>EMERGENCY PLAN CLASSIFICATION</u></b></p> <p><b><i>ALERT – SA2.1 due to the reactor failing to automatically trip after the turbine automatically tripped on loss of 11 Main Feed Pump and the crew successfully manually tripping the reactor.</i></b></p>	<p>LEAD / RO</p> <p>SS</p> <p>RO / SS</p>	<p><b>1E-0, REACTOR TRIP OR SAFETY INJECTION</b></p> <ul style="list-style-type: none"> <li>Manually trip the reactor.</li> <li>Verify reactor trip</li> <li>Verify turbine trip.</li> <li>Determine Bus 16 is energized and Bus 15 is NOT energized.</li> <li>Direct an operator to perform 1C20.5 AOP1.</li> <li>Determine SI is NOT actuated and NOT required.</li> <li>Go to 1ES-0.1.</li> </ul> <p><b>1ES-0.1, REACTOR TRIP RECOVERY</b></p> <ul style="list-style-type: none"> <li>Announce "Unit 1 Reactor Trip".</li> <li>Transfer Steam Dump to Pressure Mode.</li> <li>Check RCS temperatures.</li> <li>Check Cooling Water Header Pressures greater than 75 psig.</li> <li>Notify Turbine Building Operator to isolate Unit 1 MSRs per Attachment J.</li> <li>Check FW status.</li> <li>Verify all control rods inserted.</li> <li>Check PRZR level and PRZR pressure control.</li> <li>Check SG levels.</li> </ul>



2016 ILT NRC SIMULATOR EVALUATION #3, REV. 0

SCENARIO TIME-LINE:			
SEQ	SEQUENCE OF EVENTS / INSTRUCTOR NOTES	CREW POS	EXPECTED STUDENT RESPONSES
	<p>Unit 2 personnel WILL secure the Diesel Generators and/or Safeguards Cooling Water Pumps.</p> <p>5. When called as the Auxiliary Building Operator to open RD-4-6 and 2RD-4-2, wait 2 minutes and report these valves are open.</p>		<ul style="list-style-type: none"> <li>• Check PRZR PORVs and Block Valves:               <ul style="list-style-type: none"> <li>○ Power to block valves available.</li> <li>○ PRZR PORVs – CLOSED.</li> <li>○ At least ONE block valve OPEN.</li> </ul> </li> <li>• Reset SI and CI.</li> <li>• Establish Instrument Air to Containment.</li> <li>• Check power supply to charging pumps.</li> <li>• Check if Charging Flow has been established.</li> <li>• Determine SI flow should NOT be terminated.</li> <li>• Determine RHR Pumps should NOT be stopped.</li> <li>• Check RCS and SG Pressures.</li> <li>• Stop Diesel Generators and Cooling Water Pumps.</li> <li>• Verify at least one train of recirculation capability.</li> <li>• Check Aux Building Radiation – NORMAL.</li> <li>• Start all containment dome recirculation fans.</li> <li>• Check if outside air can be supplied to CR.</li> <li>• Align Containment FCU Cooling Water Outlet Radiation Monitor R-16 and R-38.</li> <li>• Check Annulus Sump High Level Alarm – OFF.</li> <li>• Determine RCS Cooldown and Depressurization is NOT required.</li> <li>• Prepare for Switchover to Recirculation Phase:               <ul style="list-style-type: none"> <li>○ Stop Spent Fuel Pool Vent System.</li> <li>○ Notify Outplant to perform Attachment K.</li> </ul> </li> <li>• Isolate SI Accumulators.</li> <li>• Go to 1ES-1.2 when RWST level is below 33%.</li> </ul>



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<p><b>EVENT 7</b></p>	<p>Booth Operator:</p> <ol style="list-style-type: none"> <li>1. If contacted by the Control Room to report status of CAT 1 Vent Zone openings, then inform the CR that all CAT 1 Vent Zone openings are closed.</li> <li>2. If Control Room personnel ask for status of Unit 2 Cooling Water/Chilled Water lineup, then inform the Control Room that Unit 2 Cooling Water/Chilled Water valves are in there safeguards positions.</li> <li>3. If Control Room personnel ask for status of Battery Room Temperatures, then inform the Control Room that Battery Room temperatures are 74°F.</li> <li>4. If Control Room personnel ask for status of Spent Fuel Cooling, then inform the Control Room that Spent Fueling level and temperature are normal.</li> </ol> <p>Plant Response:</p> <ol style="list-style-type: none"> <li>1. 11 and 12 CC Pumps will fail to automatically start on SI signal or on low pressure.</li> <li>2. 11 CC pump may still be in pullout due to the loss of power to Bus 15.</li> <li>3. Low CC pressure on both trains.</li> </ol> <p style="text-align: center;"><b><u>CRITICAL TASK</u></b></p> <p><b><i>Manually start at least one CC Pump before the end of the scenario.</i></b></p>	<p>LEAD</p>	<p><b>1E-0 ATTACHMENT L: SI ALIGNMENT VERIFICATION</b></p> <ul style="list-style-type: none"> <li>• Verify Safeguards Component Alignment:</li> <li>• Verify both trains of SI actuated:             <ul style="list-style-type: none"> <li>○ Both RHR pumps or both SI pumps – RUNNING.</li> </ul> </li> <li>• "SI NOT READY" lights - NOT LIT.</li> <li>• "SI ACTIVE" lights - LIT FOR PLANT CONDITIONS.             <ul style="list-style-type: none"> <li>○ <b>Manually start both CC Pumps.</b></li> </ul> </li> <li>• "CONTAINMENT ISOLATION" lights - LIT FOR PLANT CONDITIONS.</li> <li>• Check Category 1 Vent Zone Boundary.</li> <li>• Close MV-32115, 122 SFP HX INLT HDR MV B.</li> <li>• Check Cooling Water Header Pressures - BOTH GREATER THAN 65 PSIG.</li> <li>• Verify Plant Announcements Complete.</li> <li>• Check If Main Steamlines Are Isolated.</li> <li>• Determine MSIVs, Bypass Valves, and Containment Instrument Air Valves do NOT need to be closed.</li> <li>• Verify SI Flow.</li> <li>• Verify RHR Flow.</li> <li>• Verify Containment Spray is actuated (if necessary).</li> <li>• Check RCP Cooling.</li> <li>• Verify Local Actions Complete.</li> <li>• Verify Generator Breakers – OPEN.</li> <li>• Verify All Heater Drain Pumps – STOPPED.</li> <li>• Check Turbine Valves:             <ul style="list-style-type: none"> <li>○ Turbine reheat and intercept valves – CLOSED.</li> <li>○ Open turbine drain valves.</li> </ul> </li> <li>• Verify Main Feedwater Alignment:             <ul style="list-style-type: none"> <li>○ Both main feedwater pumps – STOPPED.</li> <li>○ Main and bypass FRVs – CLOSED.</li> </ul> </li> <li>• Verify All Condensate Pumps – STOPPED.</li> <li>• Verify Steam Dump in "STM PRESS" Mode.</li> <li>• Verify Unit 1 Cooling Water/Chilled Water Alignment:             <ul style="list-style-type: none"> <li>○ CFCU control switches - "SLOW".</li> <li>○ CFCU dampers - ALIGNED TO DOME.</li> <li>○ Unit 1 cooling water/chilled water valves closed.</li> <li>○ Unit 1 CRDM shroud cooling supply and return valves – CLOSED.</li> </ul> </li> </ul>
<p><b>EVENT 7 (cont)</b></p>		<p>LEAD</p>	

2016 ILT NRC SIMULATOR EVALUATION #3, REV. 0

SCENARIO TIME-LINE:			
SEQ	SEQUENCE OF EVENTS / INSTRUCTOR NOTES	CREW POS	EXPECTED STUDENT RESPONSES
			<ul style="list-style-type: none"> <li>○ CFCU cooling water supply and return valves – OPEN.</li> <li>○ CFCU chilled water supply and return valves – CLOSED.</li> <li>● Verify 11 Safeguards Screenhouse Ventilation lineup.</li> <li>● Verify Control Room Ventilation Alignment:                             <ul style="list-style-type: none"> <li>○ Chillers and fans – RUNNING.</li> <li>○ Control room chiller suction/discharge tie closed - STATUS LIGHT LIT.</li> </ul> </li> <li>● Verify Unit 2 Cooling/Chilled Water Alignment.</li> <li>● Verify 21 Safeguards Screenhouse Ventilation lineup.</li> <li>● Verify 11 and 12 Battery Charger Operation is normal.</li> <li>● Verify Battery Room temps less than 84°F.</li> <li>● Check status of Spent Fuel Cooling.</li> <li>● Check Status Of Notifications.</li> <li>● Notify SS Of Any Discrepancies.</li> </ul>
<b>END</b>	Once the crew has restored flow to one train of component cooling and/or at the discretion of the Lead Evaluator, then place the simulator in FREEZE. Inform the crew that training has the duty.		

## 2016 ILT NRC SIMULATOR EVALUATION #3, REV. 0

**SIMULATOR INPUT SUMMARY**

@Time	Event	Action	Description
00:00:00		Insert override DI-46184P to True	11 RHR PUMP OOS
00:00:00		Insert override DI-46184ST to False	11 RHR PUMP OOS
00:00:00		Insert override DI-46096P to True	121 IA COMPRESSOR OOS
00:00:00		Insert malfunction RP02A	FAILURE OF AUTOMATIC REACTOR TRIPS TRAIN A
00:00:00		Insert malfunction RP02B	FAILURE OF AUTOMATIC REACTOR TRIPS TRAIN B
	2	Insert malfunction RX202 to 1500.00000 on event 2	1 PRZR (CHNL III-BLU) P XMTR (1PT-431)
	2	Insert malfunction CC02A	COMPONENT COOLING WATER PUMP #11 FAILS TO START AUTOMATICALLY
	2	Insert malfunction CC02B	COMPONENT COOLING WATER PUMP #12 FAILS TO START AUTOMATICALLY
	2	Insert malfunction M47014:0606B to Off on event 2	AMSAC/DSS BLOCKED ANNUNCIATOR ALARM TURNED OFF
	2	Insert malfunction CP-1Y0501D to NORMAL on event 2	AMSAC/DSS BLOCKED ERCS ALARM TURNED OFF
	2	Insert override DI-46447B to True on event 2	DISABLE AUTO AMSAC/DSS
	4	Insert override DI-46932M to True on event 4	FAILURE OF BUS 15 LOAD SEQUENCER
	4	Insert override DI-46932 to False on event 4	FAILURE OF BUS 15 LOAD SEQUENCER
	5	Insert malfunction FW13A on event 5	11 MFW PUMP LOCKOUT
	5	Insert override DI-46419ST to False on event 5	12 MFW PUMP FAILS TO START
	5	Insert override DI-46280A to False on event 5	RODS FAIL TO INSERT AUTOMATICALLY
	5	Insert override DI-46280:MAN to True on event 5	RODS FAIL TO INSERT AUTOMATICALLY
	6	Insert malfunction RC06B to 25.0 in 300 on event 6	LARGE BREAK LOCA - HOT LEG (B LOOP)

## Simulator Setup:

**NOTE: The time between simulator reset and placing simulator in RUN should be minimized to reduce the difference between the ERCS time and actual time.**

1. If an IC is already created for this scenario, then go to Step 3.
2. If an IC is NOT created for this scenario, then create as follows:
  - a. Reset the Simulator to **IC-1** and place in RUN.
  - b. Place CS-46184, 11 RHR PUMP, to PULL OUT.
  - c. Place CS-46096, 121 AIR COMPRESSOR, to PULL OUT.
  - d. Place all Pressurizer Backup Heaters ON.
  - e. Place a second 40 GPM letdown orifice in service per 1C12.1.
  - f. Verify 11 CC Pump is RUNNING and 12 CC Pump in STANDBY.
  - g. Shift Containment Fan Coil Units to the following lineup:
    - 1) 11 and 13 CFCUs in SLOW to the DOME.
    - 2) 12 and 14 CFCUs in FAST to the GAP/SUP.
  - h. Insert Remote **FW119**, Condenser Spray System, to OUT OF SERVICE.
  - i. Verify TPM is set to NIS.
  - j. If time permits, run simulator for approximately 30 minutes.
  - k. Place simulator in FREEZE.
  - l. If desired, save to **IC-253** or to another available IC.
  - m. Go to step 4.
3. Reset the Simulator to **IC-253** or other IC created from Step 2.
4. Place the simulator in RUN.
5. If available, run schedule file **PI-ILT-NRC-1603S.sch** as follows:
  - a. Locate schedule file.
  - b. Open schedule file by double clicking it.
  - c. Run the schedule file by pressing the "Stopped" button on the toolbar.
  - d. Verify the schedule file is running.
6. If schedule file is NOT available, then insert malfunctions, remotes, and overrides, as specified by the Simulator Input Summary.
7. If desired, start Scenario Based Testing Data Collection Program.
8. Markup steps 6.1.1 – 6.1.8 of 1C1.4 as completed with no load restrictions.
9. Complete the "Simulator Setup Checklist" on next page.

## 2016 ILT NRC SIMULATOR EVALUATION #3, REV. 0

**SIMULATOR SETUP CHECKLIST****Before Scenario**

- \_\_\_\_\_ Simulator Status:
- |                           |  |
|---------------------------|--|
| _____ 1. "Training Load"  | _____ 2. Step counters "ON"                    |
| _____ 3. Alarm sound "ON" | _____ 4. Steps 1 – 8 on previous page complete |
| _____ 5. Speed: "REAL"    | _____ 6. Simulator running in desired IC       |
- \_\_\_\_\_ Delete the memory on the Yokogawa Model DX1000 recorders by cycling the Recorder Power OFF pushbutton in the simulator instructor's booth.
- \_\_\_\_\_ Verify Schedule File/Summary matches Simulator Input Summary page in the SEG.
- \_\_\_\_\_ Verify Event File matches Simulator Event Summary page in SEG.
- \_\_\_\_\_ Verify that control rod step counters on C panel and ERCS RBU matches the IC conditions.
- \_\_\_\_\_ Boric Acid/RMU integrators set to: BA: 0, RMU: 10, and reset.
- \_\_\_\_\_ MOC  $\Delta I$  sheet displayed on C panel.
- \_\_\_\_\_ MOC Reactivity Briefing sheet available at Reactor Operator Desk.
- \_\_\_\_\_ Turnover sheet/PRA sheet available.
- \_\_\_\_\_ If it is the first scenario of the day, then perform a shutdown and restart of the floor PCs that are connected to the LAN.
- \_\_\_\_\_ Log in on floor PCs using user ID: <pitrgsim> (password is the same as user ID).
- \_\_\_\_\_ Electronic PINGP 577 forms closed on LAN connected PCs.
- \_\_\_\_\_ Board-mounted EAL Tables are cleaned.
- \_\_\_\_\_ Verify Boric Acid and Reactor Makeup Controllers are set properly:
- |                         |
|-------------------------|
| _____ 1. 1HC-110: 24.3% |
| _____ 2. 1HC-111: 44.7% |
- \_\_\_\_\_ Update Control Board Placards:
- |   |   |                                   |
|---|---|-----------------------------------|
| _____ 1. NRC Code Placard   | a. NRC Current Authentication Code call date updated to current date. | b. Today's Date.                  |
| _____ 2. High Flux At Shutdown Alarm Setpoint placards: 7200 cps.           |   |                                   |
| _____ 3. Feedwater regulating valve position placard set to current values. |   |                                   |
| _____ 4. Recommended SG Blowdown flow set to current values.                |   |                                   |
| _____ 5. CVCS panel placard:  | a. RCS boron – 825 ppm.   | b. RCS H <sub>2</sub> – 25 cc/kg. |
|   | c. Turbine Reference Value and Mode – matched with DEHC.              |                                   |
| _____ 6. Shift Reactivity Guidance placard:                                 | a. BA: 3.6 gallons  | b. RMU: 67 gallons                |
|   | c. Dilutions @ 10 gal RMU, 1-2 times per shift.                       |                                   |

## 2016 ILT NRC SIMULATOR EVALUATION #3, REV. 0

\_\_\_\_\_ Magnetic placards in place:

- \_\_\_ 1. Blowdown 46470 "SGB To CDSR"
- \_\_\_ 2. H2 in VCT Space
- \_\_\_ 3. H<sub>2</sub> PRESS 25-35 PSIG
- \_\_\_ 4. 11 BA TANK "Lined Up For Service"
- \_\_\_ 5. 11 BA PUMP "Lined Up to 11 BA Tank"
- \_\_\_ 6. 12 BA PUMP "Lined Up to 11 BA Tank"
- \_\_\_ 7. CC to SFP MV-32115 "In Service"
- \_\_\_ 8. CC to SFP MV-32117 "Standby"

\_\_\_\_\_ Pink Status Control Tags in place:

- \_\_\_ 1. CS-46425, 12 MDAFWP
- \_\_\_ 2. CS-46930, D2 DIESEL GENERATOR
- \_\_\_ 3. CS-46523, 22 CLG WTR PUMP
- \_\_\_ 4. CS-46185, 12 RHR PUMP
- \_\_\_ 5. CS-46179, 12 SI PUMP
- \_\_\_ 6. CS-46037, 12 CC WTR PUMP

\_\_\_\_\_ Yellow Caution Tags are in place:

- \_\_\_ 1. CS-46184, 11 RHR PUMP
- \_\_\_ 2. CS-46096, 121 AIR COMPRESSOR

\_\_\_\_\_ ERCS driven recorders are on-scale (RCS temperature scaled 545° F to 555° F).

\_\_\_\_\_ ERCS alarm screen operating and alarms reset.

\_\_\_\_\_ All ERCS terminals operating and set as follows:

CONF	VARS	R02	Alarm Summary Page
CONE1	Group OP31_U1	R03	AFD
CONC	SAS (XS11)	R04	TPM
CONG1	Group QP CCDATA	R05	QP LOADFOLL
ERCS-R01	Group RADMON_U1	R06	Alarm Summary Page

\_\_\_\_\_ ERCS single point displays:

CONB	1T0499A	1U1613A
CONE2	1Q0340A	1V4501A

\_\_\_\_\_ ERCS TPM set (Calorimetric - Auto Scaling - LEFM).

\_\_\_\_\_ Verify that copy machine and printers are loaded with paper.

\_\_\_\_\_ Pens/Paper/Markers available on the simulator.

\_\_\_\_\_ Set Turbine Control HMI Displays as follows:

- \_\_\_ 1. U1 E-H Turb Cont STA 2 (48087) to **Control Valve Overview**
- \_\_\_ 2. U1 Turb Aux Cont (48088) to **Turb Overview**
- \_\_\_ 3. U1 E-H Turb Cont STA 1 (48086) to **On Line Control**

\_\_\_\_\_ Verify DEHC VPL set ~0.1 to 0.2 above current valve position (not on limiter).

\_\_\_\_\_ DEHC alarms cleared.

\_\_\_\_\_ Verify TPM is set to NIS.

\_\_\_\_\_ Headsets turned on as necessary.

\_\_\_\_\_ Procedure checklist completed. See following page.

\_\_\_\_\_ Peer Check performed for simulator setup.



## 2016 ILT NRC SIMULATOR EVALUATION #3, REV. 0

**Post-Scenario Checklist**

\_\_\_\_\_ EOOS computer is cleared of information added during the scenario.

\_\_\_\_\_ Computer generated PINGP 577 cleared.

\_\_\_\_\_ Procedure checklist completed. See previous page.

\_\_\_\_\_ Remove Pink Status Control Tags from the following equipment:

- \_\_\_ 1. CS-46425, 12 MDAFWP
- \_\_\_ 2. CS-46930, D2 DIESEL GENERATOR
- \_\_\_ 3. CS-46523, 22 CLG WTR PUMP
- \_\_\_ 4. CS-46185, 12 RHR PUMP
- \_\_\_ 5. CS-46179, 12 SI PUMP

\_\_\_\_\_ Magnetic placards removed:

- \_\_\_ 1. NONE

\_\_\_\_\_ Remove Yellow Caution Tags from the following equipment:

- \_\_\_ 1. CS-46184, 11 RHR PUMP
- \_\_\_ 2. CS-46096, 121 AIR COMPRESSOR

\_\_\_\_\_ Board-mounted EAL Table is cleaned.

\_\_\_\_\_ All books, note pads, and calculators put away.

**End Of Day Checklist**

\_\_\_\_\_ Signs/placards removed and put away unless normal simulator configuration.

\_\_\_\_\_ If desired, floor PCs logged off if simulator will not be used again that day.

\_\_\_\_\_ Instructor station returned to normal with all books, paper, and etc. put away.

\_\_\_\_\_ Headsets turned off and put away if simulator will not be used again that day.

\_\_\_\_\_ Simulator reset to IC-10 unless another IC will be used for further training.

\_\_\_\_\_ Simulator placed in DORT if simulator will not be used again that day.

\_\_\_\_\_ Verify the following placards are erased:

- CVCS panel
- Shift Reactivity Guidance
- NRC Authentication Code



## 2016 ILT NRC SIMULATOR EVALUATION #3, REV. 0

RETENTION: 7 Days

<b>UNIT 1 LPEO / PEO TURNOVER LOG</b>
---------------------------------------

DATE:

DAY/NIGHT SHIFT: Day

CAT 1 VENT OPENINGS: 0 ft<sup>2</sup>

SYSTEM CONDITION: GREEN

<b>SAFEGUARDS EQUIPMENT OOS/TECH SPEC REQUIRED ACTION STATEMENTS</b>
--

- |  |
|--|
| <ol style="list-style-type: none"> <li>1. 11 RHR Pump is OOS for corrective maintenance.             <ul style="list-style-type: none"> <li>• TS LCO 3.5.2 Condition A was entered with 48 hours remaining.</li> </ul> </li> <br/> <li>2. N51 and N52 displays are OOS.             <ul style="list-style-type: none"> <li>• TS LCO 3.3.3 Condition A was entered with 23 days remaining.</li> <li>• TS LCO 3.3.3 Condition D was entered with 5 days remaining.</li> <li>• N51 and N52 counts can be viewed in ERCS.</li> </ul> </li> </ol> |
|--|

<b>PROTECTED EQUIPMENT</b>
----------------------------

12 MD AFW PUMP	12 RHR PUMP	12 CC PUMP
D2 DIESEL GENERATOR	12 SI PUMP	22 CLG WATER PUMP

<b>RAD MONITORS OOS</b>	<b>ANNUNCIATORS OOS</b>
-------------------------	-------------------------

NONE

NONE

<b>OUTSTANDING SP'S</b>	<b>FIRE DET / PROT EQP IMPAIRMENTS</b>
-------------------------	--

NONE

NONE

<b>OTHER EQUIPMENT OOS / STATUS</b>
-------------------------------------

- |  |   |   |
|--|---|---|
| <ul style="list-style-type: none"> <li>• Exposure: MOC</li> <li>• Power: 30%</li> <li>• Boron: (CB): 1130 ppm</li> <li>• Temperature: 550°F</li> </ul> | <ul style="list-style-type: none"> <li>• Pressure: 2235 psig</li> <li>• Xenon: Equilibrium</li> <li>• Rods: "D" @ 162</li> <li>• Generator: 137 MW</li> </ul> | <ul style="list-style-type: none"> <li>• 121 Instrument Air Compressor is out of service.</li> <li>• Two 40 GPM letdown orifices are in service.</li> <li>• Backup Pressurizer Heaters are ON.</li> </ul> |
|--|---|---|

<b>MAJOR EQUIPMENT REPAIRED / RETURNED TO SERVICE</b>
---

- |  |
|--|
| <ul style="list-style-type: none"> <li>• Unit 1 was returned on-line two days ago from a forced outage.</li> <li>• A 30% Chemistry hold is in effect.</li> </ul> |
|--|

<b>OPERATIONAL PLANS FOR COMING SHIFT</b>
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- |   |
|---|
| <ul style="list-style-type: none"> <li>• Prior to entering the simulator:             <ul style="list-style-type: none"> <li>○ Perform a Pre-Job Brief for starting 12 CC Pump and stopping 11 CC Pump.</li> <li>○ Review the reactivity plan.</li> <li>○ Perform a Pre-Job Brief for load increase.</li> </ul> </li> <li>• After turnover, swap CC Pumps so that 12 CC Pump is running and 11 CC Pump is in standby per 1C14.</li> <li>• An out-plant operator has already been briefed on swapping CC Pumps.</li> <li>• The out-plant operator is standing by on a radio.</li> <li>• When directed by the Shift Manager, increase load per steps 6.1.9 – 6.1.10.I of 1C1.4.</li> <li>• Suspend the load increase at 40% per step 6.1.10.J of 1C1.4.</li> <li>• Steps 6.1.1 – 6.1.8 of 1C1.4 are complete.</li> <li>• There are no ramp rates or fuel conditioning limitations.</li> <li>• Dilute 10 gallons 1-2 times per shift for temperature control.</li> </ul> |
|---|

<b>NEW PROCEDURES / INSTRUCTIONS</b>
--------------------------------------

NONE

## Reactivity Plan

1. Load INCREASE from 30% to 40%.

2. Current conditions:

Power level:	30% (137 MW)
Xenon:	Equilibrium
Control Rod Position:	Bank D @ 162 steps
Boron Concentration:	1130 ppm
Core Exposure:	11000 MWD/MTU

3. Reactivity Plan:

Target:	Turbine Load: 198 MW (40%)
Rate:	0.50% /minute
Control Mode:	LOAD control with Rod Control in MANUAL
Boration/Dilution:	540 gallon DILUTION (batch)
Final Control Rod Position:	Bank D @ 169 steps

4. Reactivity Prediction:

Change in Power Defect:	-162 pcm (Figure C1-7A)
Differential Boron Worth:	-6.65 pcm/ppm (Figure C1-11A)
Differential Rod Worth:	4.6 pcm/step (Figure C1-4A)
Calculated RCS PPM change:	-40 ppm (130 pcm ÷ -6.65 pcm/ppm)
Calculated Rod Step change:	7 steps (-32 pcm ÷ 4.6 pcm/step)



# SIMULATOR EXERCISE GUIDE (SEG)

**SITE: PRAIRIE ISLAND**

**SEG # PI-ILT-NRC-1604S**

**SEG TITLE: 2016 ILT NRC SIMULATOR EVALUATION #4**

**REV. # 0**

**PROGRAM: INITIAL LICENSE OPERATOR TRAINING #: FL-ILT**

**COURSE: INITIAL LICENSE OPERATOR TRAINING #: FL-ILT**

**TOTAL TIME: 2.0 HOURS**

Additional site-specific signatures may be added as desired.

<b>Developed by:</b>	<b>Shawn Sarrasin</b> <i>Instructor</i>	<b>12/21/2015</b> <i>Date</i>
<b>Reviewed by:</b>	<b>Fred Collins</b> <i>Instructor</i> <i>(Simulator Scenario Development Checklist.)</i>	<b>1/20/2016</b> <i>Date</i>
<b>Validated by:</b>	<b>Fred Collins</b> <i>Validation Lead Instructor</i> <i>(Simulator Scenario Validation Checklist.)</i>	<b>1/20/2016</b> <i>Date</i>
<b>Approved by:</b>	<b>Mike Petersen</b> <i>Training Supervision</i>	<b>3/25/2016</b> <i>Date</i>

## Guide Requirements

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### Evaluation Objectives:

Evaluate the crews ability to:

1. Raise Reactor Power to the POAH per 1C1.2-M2.
2. Secure 12 MDAFW Pump per 1C28.1.
3. Transfer ECCS to recirculation mode per 1ES-1.1.

Evaluate the crews ability to diagnose and respond to a:

4. Containment Fan Coil Unit Failure per C47019-0404 and 1C19.2.
  5. Pressurizer Pressure Instrument failing high per 1C51.3.
  6. Large Break LOCA per 1E-0 and 1E-1.
  7. Failure of Safety Injection to automatically actuate per 1E-0.
  8. Failure of Feedwater Components to automatically align on a Safety Injection Signal per Attachment L of 1E-0.
- 

### Training Resources:

1. Full Scope Simulator
  2. NRC Evaluation Team
  3. Booth Operator (Backup Communicator)
  4. Primary Communicator
- 

### Related PRA Information:

**Initiating Event with Core Damage Frequency:**  
LOCA (27.3%)

**Important Components:**

12 MD AFW PMP  
PRZR (CHNL III-BLU) P XMTR  
SI RELAY TRAIN A  
SI RELAY TRAIN B

**Important Operator Actions with Task Number:**

NONE

## QUANTITATIVE ATTRIBUTES

### **Malfunctions:**

#### *Before EOP Entry:*

1. 11 CFCU trips on overload.
2. 1PI-431, Blue Channel Pressurizer Pressure Transmitter, fails HIGH.

#### *After EOP Entry:*

1. Train A and B Safety Injection fails to automatically actuate.
2. Feedwater Components fail to automatically align after SI Signal.

### **Abnormal Events:**

1. Instrument Failure Guide.
2. Alarm Response Procedure for CFCU Trip.

### **Major Transients:**

1. Large Break LOCA.
2. Transfer ECCS to recirculation mode.

### **Critical Tasks:**

1. Manually actuate at least one train of SI-actuated safeguards equipment before core exit temperatures exceed 700°F.
2. Transfer to cold leg recirculation and establish ECCS recirculation flow before an ORANGE or RED path in Core Cooling CSF occurs.

## 2016 ILT NRC SIMULATOR EVALUATION #4, REV. 0

**CRITICAL TASK SHEET**

Critical Task:	Manually actuate at least one train of SI-actuated safeguards equipment before core exit temperatures exceed 700°F.
Safety Significance:	Failure to actuate safeguards equipment during an accident condition will lead to a loss of water inventory in the core. With no water or low water level in the core, the fuel will heat up and result in damage to the fuel cladding barrier.
Plant Conditions:	<ul style="list-style-type: none"> <li>• Reactor Trip</li> <li>• One of the following accidents: <ul style="list-style-type: none"> <li>○ LOCA</li> <li>○ Unisolable Steam Line Break</li> <li>○ SGTR</li> </ul> </li> <li>• Both trains of Safety Injection fail to automatically actuate.</li> <li>• Safety Injection can be manually actuated from the Control Room.</li> </ul>
Cues:	<ul style="list-style-type: none"> <li>• Any of the following has occurred or is imminent: <ul style="list-style-type: none"> <li>○ Pressurizer pressure less than 1830 psig.</li> <li>○ Any Steam Generator pressure less than 530 psig.</li> <li>○ Containment pressure greater than 3.5 psig.</li> </ul> </li> <li>• SI-actuated Safeguards equipment is NOT running or repositioned.</li> </ul>
Performance Indicator:	<ul style="list-style-type: none"> <li>• Operating one of the following Safety Injection Actuation Switches: <ul style="list-style-type: none"> <li>○ CS-46180.</li> <li>○ CS-46408.</li> </ul> <p style="text-align: center;">-OR-</p> </li> <li>• Manually starting at least one train of ECCS pumps. This option may result in other Critical Tasks becoming applicable.</li> </ul>
Feedback:	At least one train of ECCS pumps running.

## 2016 ILT NRC SIMULATOR EVALUATION #4, REV. 0

**CRITICAL TASK SHEET**

Critical Task:	Transfer to cold leg recirculation and establish ECCS recirculation flow before an ORANGE or RED path in Core Cooling CSF occurs.
Safety Significance:	If the ECCS system is not transferred to recirculation mode, a loss of the ECCS pumps will occur when RWST level is lost. Subsequently, if recirculation is not established, a loss of water inventory in the core will occur and fuel temperatures will rise. This will result in damage to the fuel cladding barrier.
Plant Conditions:	<ul style="list-style-type: none"> <li>• Large Break LOCA inside Containment.</li> <li>• RWST level is less than 33%.</li> <li>• Containment level greater than 2 feet OR Sump B level greater than 75%.</li> <li>• At least one train of ECCS recirculation equipment is available and can be operated from the Control Room.</li> </ul>
Cues:	<ul style="list-style-type: none"> <li>• SI Actuation.</li> <li>• RWST level less than 33%.</li> <li>• Containment Level greater than 2 feet.</li> <li>• Sump B level greater than 75%.</li> </ul>
Performance Indicator:	<p>Manipulation of the following controls, as required, to align at least one train of ECCS to cold leg recirculation:</p> <ul style="list-style-type: none"> <li>• Close RWST to RHR Isolation Valve.</li> <li>• Close at least one SI Test Line to RWST Valve.</li> <li>• Open CC to RHR HX.</li> <li>• Open Sump B to RHR Isolation Valve.</li> <li>• Restart RHR Pump.</li> </ul>
Feedback:	RHR flow for the train aligned for recirculation.

## SCENARIO OVERVIEW:

### INITIAL CONDITIONS:

- Exposure: MOC
- Power:  $1 \times 10^{-8}$  amps
- Boron: (CB): 1332 ppm
- Temperature: 549°F
- Pressure: 2235 psig
- Xenon: Xe Free
- Rods: "D" @ 140
- Generator: 0 MW

### EQUIPMENT OOS

- N51 and N52 Displays

### SEQUENCE OF EVENTS:

#### Event 1: Raise Reactor Power to the Point of Adding Heat

- Reactor power is at  $1 \times 10^{-8}$  amps.
- Rods will be stepped out to establish a positive startup rate.
- Power will rise to between 0.5% and 2%.
- Rods will be stepped in to level power out.

#### Event 2: Secure 12 MDAFW Pump

- The crew will stop 12 MD AFW Pump per 1C28.1.

#### Event 3: Loss of the 11 Containment Fan Coil Unit

- 11 CFCU trips on overload.
- The crew responds by realigning 12 CFCU to support.
- The SS will enter TS LCO 3.6.5 Condition C.

#### Event 4: 1PT-431, Blue Channel Pressurizer Pressure, fails HIGH.

- PT-431 slowly drifts to max.
- Both Pressurizer spray valves will fully open and Pressurizer heaters will de-energize.
- The crew will take manual control of spray valves and close them.
- The crew will respond per C47 and 1C51.3 to change the controlling pressure channel and restore pressure.
- The SS will enter the following:
  - TS LCO 3.3.1 Condition A and E.
  - TS LCO 3.3.2 Condition A and D.

#### Event 5: Large Break LOCA



**2016 ILT NRC SIMULATOR EVALUATION #4, REV. 0**

- Safety Injection fails to automatically actuate.
- The crew will manually actuate Safety Injection.
- Containment Pressure rises, RCS pressure and Pressurizer level rapidly lowers.
- The crew will transition back to 1E-0.
- The crew will transition into and out of 1FR-P.1 when a red path in integrity CSF occurs.
- All feedwater components will fail to automatically align for Safety Injection.
- The crew will manually align feedwater components per Attachment L of 1E-0.
- The crew will diagnose a Loss of Coolant Accident and transition to 1E-1.
- When RWST level lowers to 33%, the crew will place one train of ECCS on recirculation per 1ES-1.2.
- The evaluation will be terminated once one train of ECCS is on recirculation.

## 2016 ILT NRC SIMULATOR EVALUATION #4, REV. 0

SCENARIO TIME-LINE:			
SEQ	SEQUENCE OF EVENTS / INSTRUCTOR NOTES	CREW POS	EXPECTED STUDENT RESPONSES
	1. SIMULATOR PRE-BRIEF: a. The Simulator Pre-Brief is conducted prior to the crew entering the simulator. 2. COMPLETE TURNOVER: a. "UNIT 1 LPEO / PEO TURNOVER LOG." b. PRA Printout. c. Verify crew performs walk down of control boards and the reviews turnover checklists.	CREW	Review the following with the off-going operator: <ul style="list-style-type: none"> <li>• "Unit 1 LPEO / PEO Turnover Log"</li> <li>• PRA printout</li> <li>• Walk-down the control boards and ask questions as appropriate</li> </ul>
<b>EVENT 1</b>	Booth Operator: 1. After the crew has assumed the duty, they will raise power to the Point of Adding Heat.	RO/SS	<b>1C1.2, UNIT 1 STARTUP PROCEDURE</b> <ul style="list-style-type: none"> <li>• Raise reactor power to the point of adding heat using manual rod control or boron concentration change.</li> <li>• When one or more intermediate range indicates greater than <math>1 \times 10^{-9}</math> amps, then verify ERCS is in Mode 2, STARTUP.</li> <li>• Maintain reactor power between 0.5 and 2.0%.</li> </ul>

## 2016 ILT NRC SIMULATOR EVALUATION #4, REV. 0

SCENARIO TIME-LINE:			
SEQ	SEQUENCE OF EVENTS / INSTRUCTOR NOTES	CREW POS	EXPECTED STUDENT RESPONSES
<b>EVENT 2</b>	<p>Booth Operator:</p> <ol style="list-style-type: none"> <li>1. After the crew has raised power to the Point of Adding Heat, they will secure 12 MD AFW Pump per assumed the duty, they will raise power to the Point of Adding Heat.</li> <li>2. When directed as an out-plant operator to verify, 12 MD AFW Pump has stopped, CV-31154 has closed, and Auxiliary lube oil pump is running, then wait approximately 2 minutes and report 12 MD AFW Pump is stopped, CV-31154 is closed, and Auxiliary lube oil pump is running.</li> <li>3. When directed as an out-plant operator to stop 12 MD AFW Pump Aux Lube Oil Pump, then wait approximately 3 minutes and report Aux Lube Oil Pump has been stopped.</li> <li>4. If contacted as the duty chemist, acknowledge 12 MD AFW Pump has been stopped.</li> </ol>	LEAD	<p><b>1C28.1, AUXILIARY FEEDWATER SYSTEM UNIT 1</b></p> <ul style="list-style-type: none"> <li>• CLOSE MV-32381, 12 MD AFWP TO 11 STM GEN, using CS-46316.</li> <li>• CLOSE MV-32382, 12 MD AFWP TO 12 STM GEN, using CS-46317.</li> <li>• Stop 12 MD AFW Pump using CS-46425.</li> <li>• Direct an out-plant operator to verify locally: <ul style="list-style-type: none"> <li>○ 12 MD AFW Pump has stopped.</li> <li>○ CV-31154, 12 MD AFW PMP RECIRC/L-O CLG CV, has CLOSED.</li> <li>○ Auxiliary lube oil pump is running.</li> </ul> </li> <li>• Direct an out-plant operator to locally stop 12 MD AFW Pump Aux Lube Oil Pump when 12 MD AFW Pump stops rotating.</li> <li>• OPEN MV-32381, 12 MD AFWP TO 11 STM GEN, using CS-46316.</li> <li>• OPEN MV-32382, 12 MD AFWP to 12 STM GEN, using CS-46317.</li> <li>• Independently verify MV-32381 and MV-32382 are OPEN.</li> <li>• Verify SI Not Ready panel light 44102-B9, 12 AFW DISCH VLV CLOSED, is NOT LIT, indicating the discharge valves are OPEN.</li> <li>• Place CS-46439, 12 MD AFWP selector switch in "AUTO".</li> <li>• Independently verify CS-46439 in AUTO.</li> <li>• Notify the Duty Chemist that 12 MD AFW Pump has been stopped.</li> </ul>



2016 ILT NRC SIMULATOR EVALUATION #4, REV. 0

SCENARIO TIME-LINE:			
SEQ	SEQUENCE OF EVENTS / INSTRUCTOR NOTES	CREW POS	EXPECTED STUDENT RESPONSES
EVENT 4	<p>Booth Operator:</p> <ol style="list-style-type: none"> <li>When the crew has responded to the 11 CFCU trip, and/or at the discretion of the Lead Evaluator, then enter: <b>Trigger 4, Blue Channel Pressurizer Pressure fails high.</b></li> <li>If contacted as I&amp;C to trip bistables, inform the crew two I&amp;C Technicians will be available in 45 minutes.</li> <li>If contacted as the Operations Management, acknowledge the report of the failure, and agree to make other SWI O-28 notifications to the NRC, Duty Station Manager, etc. as asked.</li> <li>If contacted as the FIN Team Supervisor, inform the crew that you will write a work order and assign an I&amp;C Supervisor to investigate.</li> </ol> <p>Plant Response:</p> <ol style="list-style-type: none"> <li>Pressurizer Spray valves open.</li> <li>Pressurizer pressure lowers rapidly.</li> <li>The following annunciators are received:               <ol style="list-style-type: none"> <li>47012-0508, PRZR HI/LO PRESS.</li> <li>47012-0608, PRZR CONTROL HI PRESS OR BACKUP HTRS ON</li> </ol> </li> <li>If spray valves are not manually closed, then:               <ol style="list-style-type: none"> <li>Reactor Trip.</li> <li>Safety Injection.</li> </ol> </li> </ol>		<p><b>C47012-0408 PRZR HI/LO PRESS CHANNEL ALERT</b></p> <ul style="list-style-type: none"> <li>Check pressure high or low.</li> <li>If necessary then control pressure in manual.</li> <li>Go to 1C51.3</li> </ul> <p><b>C51.3, PRESSURIZER PRESSURE 1P-431 HIGH</b></p> <ul style="list-style-type: none"> <li>Place Pressurizer Pressure Controller in MANUAL and stabilize pressure.</li> <li>Select position "2-1" (WHITE-RED) on channel selector switch.</li> <li>When pressure returned to normal with no deviation from setpoint, then return pressure control to automatic.</li> <li>Verify Pressurizer Pressure Recorder not selected to Blue channel.</li> <li>Enter TS LCO 3.3.1 Condition A               <ul style="list-style-type: none"> <li>Reference Table 3.3.1-1 immediately.</li> </ul> </li> <li>Enter TS LCO 3.3.1 Condition E               <ul style="list-style-type: none"> <li>Place channel in trip in 6 hours OR</li> <li>Be in Mode 3 in 12 hours</li> </ul> </li> <li>Enter TS LCO 3.3.2 Condition A               <ul style="list-style-type: none"> <li>Reference Table 3.3.2-1 immediately.</li> </ul> </li> <li>Enter TS LCO 3.3.2 Condition D               <ul style="list-style-type: none"> <li>Place channel in trip in 6 hours OR</li> <li>Be in Mode 3 in 12 hours AND</li> <li>Be in Mode 4 in 18 hours</li> </ul> </li> <li>Trip bistables.</li> </ul>



2016 ILT NRC SIMULATOR EVALUATION #4, REV. 0

<p><b>EVENT 5 (cont)</b></p>	<ol style="list-style-type: none"> <li>2. If Control Room personnel ask for status of Unit 2 Cooling Water/Chilled Water lineup, then inform the Control Room that Unit 2 Cooling Water/Chilled Water valves are in their safeguards positions.</li> <li>3. If Control Room personnel ask for status of Battery Room Temperatures, then inform the Control Room that Battery Room temperatures are 74°F.</li> <li>4. If Control Room personnel ask for status of Spent Fuel Cooling, then inform the Control Room that Spent Fuel Pool level and temperatures are normal.</li> </ol>	<p>LEAD</p>	<ul style="list-style-type: none"> <li>• "CONTAINMENT ISOLATION" lights - LIT FOR PLANT CONDITIONS.</li> <li>• Check Category 1 Vent Zone Boundary.</li> <li>• Close MV-32115, 122 SFP HX INLT HDR MV B.</li> <li>• Check Cooling Water Header Pressures - BOTH GREATER THAN 65 PSIG.</li> <li>• Verify Plant Announcements Complete.</li> <li>• Check If Main Steamlines Are Isolated.</li> <li>• Manually close both MSIVs.</li> <li>• If necessary, manually close Containment Instrument Air Valves.</li> <li>• Verify SI Flow.</li> <li>• Verify RHR Flow.</li> <li>• Verify Containment Spray is actuated.</li> <li>• Check RCP Cooling.</li> <li>• Verify Local Actions Complete.</li> <li>• Verify Generator Breakers – OPEN.</li> <li>• Determine Heater Drain Tank Pumps did NOT automatically stop.</li> <li>• <b>Secure any running Heater Drain Tank Pumps.</b></li> <li>• Check Turbine Valves:             <ul style="list-style-type: none"> <li>○ Turbine reheat and intercept valves – CLOSED.</li> <li>○ Open turbine drain valves.</li> </ul> </li> <li>• Verify Main Feedwater Alignment:             <ul style="list-style-type: none"> <li>○ Determine both main feedwater pumps did NOT automatically stop.</li> <li>○ <b>Secure any running Main Feedwater Pumps.</b></li> <li>○ Verify Main and bypass FRVs are CLOSED.</li> </ul> </li> <li>• Determine Condensate Pumps did NOT automatically stop.</li> <li>• <b>Secure any running Condensate Pumps.</b></li> <li>• Verify Steam Dump in "STM PRESS" Mode.</li> <li>• Verify Unit 1 Cooling Water/Chilled Water Alignment:             <ul style="list-style-type: none"> <li>○ CFCU control switches - "SLOW".</li> <li>○ CFCU dampers - ALIGNED TO DOME.</li> </ul> </li> </ul>
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<p><b>EVENT 5</b> (cont)</p>	<p>Booth Operator:</p> <ol style="list-style-type: none"> <li>1. If Control Room personnel ask if Unit 2 personnel are available to secure Diesel Generators and/or Safeguards Cooling Water Pumps, then inform the Control Room that Unit 2 personnel WILL secure the Diesel Generators and/or Safeguards Cooling Water Pumps.</li> <li>2. When called as the Auxiliary Building Operator to open RD-4-6 and 2RD-4-2, wait approximately 2 minutes and report these valves are open.</li> <li>3. When requested to perform Attachment K, then wait approximately 2 minutes and perform the following:             <ol style="list-style-type: none"> <li>a. Enter <b>Trigger 15, Att. K Out-Plant Actions</b>.</li> <li>b. When all items from Trigger 15 have been entered, then inform Control Room Attachment K is complete.</li> </ol> </li> </ol>	<p>RO / SS</p>	<ul style="list-style-type: none"> <li>○ Unit 1 cooling water/chilled water valves closed.</li> <li>○ Unit 1 CRDM shroud cooling supply and return valves – CLOSED.</li> <li>○ CFCU cooling water supply and return valves – OPEN.</li> <li>○ CFCU chilled water supply and return valves – CLOSED.</li> <li>● Verify 11 Safeguards Screenhouse Ventilation lineup.</li> <li>● Verify Control Room Ventilation Alignment:             <ul style="list-style-type: none"> <li>○ Chillers and fans – RUNNING.</li> <li>○ Control room chiller suction/discharge tie closed - STATUS LIGHT LIT.</li> </ul> </li> <li>● Verify Unit 2 Cooling/Chilled Water Alignment.</li> <li>● Verify 21 Safeguards Screenhouse Ventilation lineup.</li> <li>● Verify 11 and 12 Battery Charger Operation is normal.</li> <li>● Verify Battery Room temps less than 84°F.</li> <li>● Check status of Spent Fuel Cooling.</li> <li>● Check Status Of Notifications.</li> <li>● Notify SS Of Any Discrepancies.</li> </ul> <p><b>1E-1, LOSS OF REACTOR OR SECONDARY COOLANT</b></p> <ul style="list-style-type: none"> <li>● Determine RCPs are already stopped.</li> <li>● Check SGs NOT faulted and NOT ruptured.</li> <li>● Check PRZR PORVs and Block Valves:             <ul style="list-style-type: none"> <li>○ Power to block valves available.</li> <li>○ PRZR PORVs – CLOSED.</li> <li>○ At least ONE block valve OPEN.</li> </ul> </li> <li>● Reset SI and CI.</li> <li>● Establish Instrument Air to Containment.</li> <li>● Check power supply to charging pumps.</li> <li>● Check if Charging Flow has been established.</li> <li>● Determine SI flow should NOT be terminated.</li> <li>● Determine RHR Pumps should NOT be stopped.</li> <li>● Check RCS and SG Pressures.</li> <li>● Stop Diesel Generators and Cooling Water Pumps.</li> <li>● Verify at least one train of recirculation capability.</li> <li>● Check Aux Building Radiation – NORMAL.</li> </ul>
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2016 ILT NRC SIMULATOR EVALUATION #4, REV. 0

SCENARIO TIME-LINE:			
SEQ	SEQUENCE OF EVENTS / INSTRUCTOR NOTES	CREW POS	EXPECTED STUDENT RESPONSES
			<ul style="list-style-type: none"><li>Determine RHR flow is greater than 950 gpm.</li></ul>
<b>END</b>	When one train of ECCS has been placed in the recirculation mode, or at the discretion of the Lead Evaluator, then place the simulator in FREEZE.		

## 2016 ILT NRC SIMULATOR EVALUATION #4, REV. 0

RETENTION: 7 Days

<b>UNIT 1 LPEO / PEO TURNOVER LOG</b>
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DATE:

DAY/NIGHT SHIFT: Day

CAT 1 VENT OPENINGS: 0 ft<sup>2</sup>

SYSTEM CONDITION: GREEN

<b>SAFEGUARDS EQUIPMENT OOS/TECH SPEC REQUIRED ACTION STATEMENTS</b>
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- |   |
|---|
| 1. N51 and N52 displays are OOS. <ul style="list-style-type: none"> <li>• TS LCO 3.3.3 Condition A was entered with 23 days remaining.</li> <li>• TS LCO 3.3.3 Condition D was entered with 5 days remaining.</li> <li>• N51 and N52 counts can be viewed in ERCS.</li> </ul> |
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<b>PROTECTED EQUIPMENT</b>
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NONE
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<b>RAD MONITORS OOS</b>	<b>ANNUNCIATORS OOS</b>
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NONE	NONE
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<b>OUTSTANDING SP'S</b>	<b>FIRE DET / PROT EQP IMPAIRMENTS</b>
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NONE	NONE
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<b>OTHER EQUIPMENT OOS / STATUS</b>
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- |  |  |   |
|--|--|---|
| <ul style="list-style-type: none"> <li>• Exposure: MOC</li> <li>• Power: 1x10<sup>-8</sup> amps (MODE 2)</li> <li>• Boron: (CB): 1332 ppm</li> <li>• Temperature: 549°F</li> </ul> | <ul style="list-style-type: none"> <li>• Pressure: 2235 psig</li> <li>• Xenon: Xe Free prior to startup</li> <li>• Rods: "D" @ 140</li> <li>• Generator: 0 MW</li> </ul> | <ul style="list-style-type: none"> <li>• Two 40 GPM Letdown Orifices are in service.</li> <li>• Backup Pressurizer Heaters are ON.</li> </ul> |
|--|--|---|

<b>MAJOR EQUIPMENT REPAIRED / RETURNED TO SERVICE</b>
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NONE
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<b>OPERATIONAL PLANS FOR COMING SHIFT</b>
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- |   |
|---|
| <ul style="list-style-type: none"> <li>• Prior to entering the simulator, perform a Pre-Job Brief for the following:             <ul style="list-style-type: none"> <li>○ Raising reactor power to the POAH per section 5.4 of 1C1.2 – M2.</li> <li>○ Securing 12 MDAFW Pump per step 5.6.10.A of 1C1.2-BOP and section 5.4 of 1C28.1.                 <ul style="list-style-type: none"> <li>▪ Out-plant operator is already briefed on evolution.</li> </ul> </li> </ul> </li> <li>• After turnover, raise Reactor Power to the POAH.</li> <li>• After Reactor Power is at the POAH, secure 12 MDAFW Pump.</li> <li>• Sections 5.1 – 5.6.9 of 1C1.2 – BOP, UNIT 1 BALANCE OF PLANT SYSTEMS STARTUP, are complete.</li> <li>• Sections 5.1 – 5.4.1 of 1C1.2 – M2, UNIT 1 STARTUP TO MODE 2, are complete.</li> </ul> |
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<b>NEW PROCEDURES / INSTRUCTIONS</b>
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Once reactor power is at POAH, maintain reactor power between 0.5% and 2.0% (MODE 2).
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