

**PP&L-SUSQUEHANNA  
TRAINING CENTER**

**SIMULATOR SCENARIO**

**Scenario Title:** Small RPV Break with Loss of High Pressure Injection

**Scenario Duration:** 90 Minutes

**Scenario Number:** 2001 01 NRC Exam Scenario, 01NRC

**Revision/Date:** Rev. 0, 06/20/01

**Course:** Operator License Training

**Operational Activities:**

HPCI Isolation Valve Failure  
Feedwater Heater Tube Leak  
Power Reduction  
FWLC Failure

Generator Lockout  
Primary System Break in the Drywell  
RCIC Failure  
Rapid Depressurization

**Prepared By:**

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Instructor

6/20/01  
Date

**Reviewed By:**

  
Nuclear Operations Training Supervisor

6/26/01  
Date

**Approved By:**

  
Supervising Manager/Shift Supervisor

6-28-01  
Date

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## SCENARIO SUMMARY

The crew assumes the shift with the plant operating at 100% power. During a routine surveillance HPCI Valve Testing Surveillance SO-152-004 the outboard HPCI steam isolation valve HV-152-F003 will bind in the almost closed position causing the valve breaker to trip on thermal overload. The Crew will respond IAW Alarm Response procedures and Technical Specifications. A Maintenance investigation will reveal that the valve stem is bent. The Crew will declare HPCI inoperable and enter a 14-day LCO (T.S. 3.5.1.D and 3.6.1.3 actions A.1 and A.2).

A tube leak in the 3B Feedwater Heater will cause the 3B heater Drain Valve and Dump Valve to open, and Heater High Level alarms. The crew will enter ON-147-002, Loss of Feedwater Heater String and ON-100-104, Power greater than 100%. Entry into the procedure will require a power reduction and eventual isolation of the heater string.

After the power reduction, the "C" Reactor Feedwater Pump (RFPT) Controller will fail as-is. This will cause a signal failure alarm and RFPT lockup. The operator must manually control the "A" RFPT.

After the RFPT Controller failure has been addressed there will be a spurious trip of the Main Generator Primary Lockout. The lockout will cause a turbine trip and scram. Operators will enter EO-100-102, RPV Control. The RPV pressure transient from the turbine/generator trip will break a RWCU line in the Drywell. The resulting High Drywell pressure will require entry into EO-100-103, Primary Containment Control and cause a Plant Aux Loadshed. The loadshed will result in a loss of Condensate, Feedwater, Service Water and Circulating Water pumps. This loss of high pressure injection will cause RPV level to lower.

RCIC will fail to automatically start, likewise the Manual Initiation Pushbutton will NOT initiate RCIC. RCIC may be started using a component by component start as outlined in OP-150-001. RCIC will subsequently trip on overspeed and require resetting, but will continue to trip on overspeed. RPV level will lower to -161" (TAF) requiring an RPV Rapid Depressurization to allow the use of low pressure injection systems. ADS auto logic is failed, requiring manual initiation to open the valves.

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## SCENARIO OBJECTIVES

The SRO will:

1. Direct the PCO to Perform SO-152-004, "Quarterly HPCI Valve Exercising." (52.OP.009).
2. Ensure Plant Operates in Accordance With the Operating License and Technical Specifications. (00.TS.001).
3. Apply Technical Specification Requirements. (00.TS.003).
4. Implement Operations Standards for System and Equipment Operation, OP-AD-001. (00.AD.131).
5. Implement Alarm Response Procedures. (00.AR.005).
6. Respond to a loss of Feedwater heating in accordance with ON-147-002. (47.ON.005)
7. Respond to RPV Vessel Level Control Malfunctions IAW ON-145-001, REACTOR VESSEL LEVEL CONTROL SYSTEM MALFUNCTION (Section 3.10) (45.ON.006).
8. Respond to a leak inside the Drywell from Mode 1 in accordance EO-100-103, Primary Containment Control. (00.EO.010).
9. Implement the Emergency Plan, and assume the duties of the Emergency Director (00.EP.005).
10. Classify the emergency as conditions indicate (00.EP.001).
11. Ensure initiation of ESF equipment if automatic operation was not properly initiated.
12. Implement Scram (00.ON.018).
13. Implement RPV control (00.EO.026).
14. Implement Rapid Depressurization (00.EO.030).
15. Ensure that required actions per Technical Specifications/Technical Requirements are met when a LCO/TRO is entered (00.TS.003).

The ROs will:

1. Perform SO-152-004, "Quarterly HPCI Valve Exercising." (52.OP.009).
2. Comply with Technical Specification Requirements. (00.TS.003).
3. Implement Alarm Response Procedures. (00.AR.005).
4. Respond to a loss of feedwater heating in accordance with ON-147-002. (47.ON.005)
5. Respond to RPV Vessel Level Control Malfunctions IAW ON-145-001, REACTOR VESSEL LEVEL CONTROL SYSTEM MALFUNCTION (Section 3.10) (45.ON.006).
6. Respond to a leak inside the Drywell from Mode 1 in accordance EO-100-103, Primary Containment Control. (00.EO.010).
7. Perform Scram (00.ON.018).
8. Perform RPV Control (00.EO.026).
9. Perform Automatic/Manual Startup of RCIC System IAW OP-150-001. (50.OP.010)
10. Perform Rapid Depressurization (00.EO.030).
11. Perform Manual Operation of ADS IAW OP-183-001. (83.OP.001).

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<b>CRITICAL TASKS</b>
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- ★ Performs Rapid Depressurization when RPV level cannot be maintained above -161 inches (TAF).
- ★ Restores and maintains RPV Level greater than -161 inches (TAF).

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SCENARIO REFERENCES
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1. HPCI Surveillance and Valve Failure:

- |     |             |                                 |
|-----|-------------|---------------------------------|
| 1.1 | SO-152-004  | QUARTERLY HPCI VALVE EXERCISING |
| 1.2 | Tech. Spec. | 3.5.1, 3.6.1.3                  |

2. Tube Leak in 3B Heater:

- |     |            |  |
|-----|------------|--|
| 2.1 | OP-147-001 | FEEDWATER HEATERS                      |
| 2.2 | ON-147-002 | LOSS OF FEEDWATER HEATER STRING        |
| 2.3 | ON-100-104 | REACTOR POWER GREATER THAN 100 PERCENT |

3. Power Reduction:

- |     |            |                 |
|-----|------------|-----------------|
| 3.1 | GO-100-012 | POWER MANEUVERS |
|-----|------------|-----------------|

4. "C" Feedwater Controller Failure:

- |     |            |                                      |
|-----|------------|--------------------------------------|
| 4.1 | ON-145-001 | RPV LEVEL CONTROL SYSTEM MALFUNCTION |
| 4.2 | AR-101-B16 | RFPT CONTROL SIGNAL FAILURE          |

5. Generator Lockout / Turbine Trip / Scram / RPV Break:

- |     |            |                               |
|-----|------------|-------------------------------|
| 5.1 | ON-100-101 | SCRAM                         |
| 5.2 | EO-100-102 | RPV CONTROL                   |
| 5.3 | EO-100-103 | PRIMARY CONTAINMENT CONTROL   |
| 5.4 | OP-149-004 | RHR IN CONTAINMENT SPRAY MODE |

6. RCIC failure to start:

- |     |            |                |
|-----|------------|----------------|
| 6.1 | OP-150-001 | RCIC OPERATION |
|-----|------------|----------------|

7. Rapid Depressurization:

- |     |            |                        |
|-----|------------|------------------------|
| 7.1 | EO-100-112 | RAPID DEPRESSURIZATION |
|-----|------------|------------------------|

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<b>SCENARIO SPECIAL INSTRUCTIONS</b>
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1. Initialize the Simulator to IC-182. Both Units at 100 percent power.
2. Load the following malfunctions and overrides OR use : **restorepref YPP.NRC2001**

IMF RL01:E511K3  
IMF RC150002  
IMF AD183001  
IMF MV09:HV155F003 5 0 100  
IOR ZDIHSB211S30AA AsIs  
IOR ZDIHSB211S31AA AsIs  
IOR ZDIHSB211S30BA AsIs  
IOR ZDIHSB211S31BA AsIs

RCIC Failure to Auto Start  
RCIC Overspeed  
ADS Auto Logic Failure  
HPCI F003 Valve Binds Closed  
ADS Pushbuttons Fail As-is  
ADS Pushbuttons Fail As-is  
ADS Pushbuttons Fail As-is  
ADS Pushbuttons Fail As-is

PB 1 MRF DC188113 OPEN

OPEN FEEDER BREAKER TO HPCI F003

PB 2 MRF DC188113 CLOSE

CLOSE FEEDER BREAKER TO HPCI F003

PB 3 MRF DB106236 OPEN

OPEN FEEDER BREAKER TO HPCI F002

PB 4 IMF HX02:1E103B 8 0 0

8% Tube Leaks on 3B Heater

PB 5 IMF FW145004C

RFPT Control signal Failure

PB 6 DMF FW145004C

DELETE RFPT Control signal Failure

PB 7 IMF EG198004

Spurious Trip of the Main Generator Primary Lockout 86GA

PB 8 IMF RR164010 10 0 0

Rx Vessel Bottom Head Drain Line Leak / Rupture Inside Containment.

PB 9 MMF RR164010 20 2:00

PB 10 MMF RR164010 30 3:00

PB 11 IMF PM03:1P102A

Condensate Pump 1A Overcurrent trip

PB 12 IMF PM03:1P102B

Condensate Pump 1B Overcurrent trip

PB 13 IMF PM03:1P102C

Condensate Pump 1C Overcurrent trip

PB 14 IMF PM03:1P102D

Condensate Pump 1D Overcurrent trip

4. Place the Simulator in RUN.
5. Prepare a copy of SO-152-004 with a Surveillance Authorization coversheet
6. Prepare a turnover package with turnover sheets.
  - Both Units at 100 percent power.
  - Perform SO-152-004, Quarterly HPCI Valve Exercising at beginning of shift.
  - All systems OPERABLE.

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### SCENARIO EVENT FORM

Event No: 1 and 2

Brief Description: HPCI Valve Exercising Surv. and failure of HPCI-F003

POSITION	TIME	STUDENT ACTIVITIES
BOP	5	Perform SO-152-004, QUARTERLY HPCI VALVE EXERCISING
		Recognizes/reports AR-159-B03, HPCI DIV 2 MOV OL OR PWR LOSS BIS annunciator.
		Recognizes/reports HPCI F003 Valve failed to fully close.
		Dispatches NPO to check Breaker.
SRO		Dispatches Electrical/Mechanical Maintenance to investigate HPCI F003 Motor Operator and Breaker.
		Declares HPCI inoperable; consults Technical Specifications, and declares 14-Day LCO IAW TS 3.5.1 ECCS action D and 3.6.1.3 PCIV action A.1 and A.2
		Enters TRO 3.8.2 MOV Thermal Overload Protection when HPCI O/L are bypassed.
		Directs closing/deactivating HPCI F002 valve.

<b>INSTRUCTOR ACTIVITIES, ROLE PLAY, AND INSTRUCTOR'S PERSONAL NOTES</b>
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Event No: 1 and 2

Brief Description: HPCI Valve Exercising Surv. and failure of HPCI-F003

**INSTRUCTOR ACTIVITY:**

Malfunction to bind HPCI F003 is pre-inserted with the preference file.

If/when directed, open breakers for the HPCI Inboard and Outboard Steam Supply valves as necessary by depressing:

**PB 1**

MRF DC188113 OPEN

OPEN FEEDER BREAKER TO HPCI F003

**PB 2**

MRF DC188113 CLOSE

CLOSE FEEDER BREAKER TO HPCI F003

**PB 3**

MRF DB106236 OPEN

OPEN FEEDER BREAKER TO HPCI F002

**ROLE PLAY:**

1. As NPO dispatched to check the breaker for HPCI F003, wait approximately two minutes and report that the Breaker is closed and the thermals were tripped. If asked to visually inspect HPCI F003, report that the valve stem appears to be distorted.
2. As Electrical/Mechanical Maintenance dispatched to investigate the HPCI F003 failure, wait approximately three minutes and report that the valve motor operator is okay; looks like stem is binding. We will give you more information as soon as it becomes available.

### SCENARIO EVENT FORM

Event No: 3

Brief Description: Respond to a tube leak in the 3B Feedwater Heater

POSITION	TIME	STUDENT ACTIVITIES
BOP	20	Responds to Feedwater Heater Local Panel 1C102 alarms and indication on 1C668.
		Diagnoses tube failure and enters ON-147-002, LOSS OF FEEDWATER HEATER STRING
		Enters OP-147-001, FEEDWATER HEATERS Takes actions to remove Heater 3B from service.
		Monitor Main Steam and Offgas radiation levels.
RO		Determines Reactor power is rising above 100%
		Enters ON-100-104, REACTOR POWER GREATER THAN 100 PERCENT
		Restores Reactor power to $\leq 100\%$
SRO		Directs Reactor Power monitored, enters ON-100-104, REACTOR POWER GREATER THAN 100 PERCENT
		Directs implementation of ON-147-002.
		Directs a power reduction to $\leq 75\%$ IAW GO-100-012 and CRC Instructions
		Notifies RX Engineering, Chemistry, Health Physics, Operations Management.
		Directs periodic checks of Power/Flow Map
		Direct monitoring of Main Steam and Offgas radiation levels.
		Initiate request for I&C/Maintenance investigation of FW Heater problem.
		Notify Plant Management of ongoing events.

<b>NOTES:</b>	



<b>INSTRUCTOR ACTIVITIES, ROLE PLAY, AND INSTRUCTOR'S PERSONAL NOTES</b>
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Event No: 3

Brief Description: Respond to a tube leak in the 3B Feedwater Heater

**INSTRUCTOR ACTIVITY:**

When HPCI event has been completed, insert tube leak in the 3B FW HEATER by depressing:

**PB 4**

**IMF HX02:1E103B 8 0 0 Feedwater Heater Tube Leaks on Selected Heater.**

**NOTE:** This loss of FW heating will not result in fuel damage.

**ROLE PLAY:**

1. As the NPO dispatched to investigate the local feedwater panel alarms using local panel graphics for Panel 1C102.
2. As Reactor Engineering when called, inform Shift you will run a new Core Performance Log and will be in the Control Room shortly.
3. As necessary, when contacted as Plant Management, GCC, Chemistry and Health Physics.
4. As necessary, when contacted as I&C/Electrical Maintenance.
5. When directed to isolate Instrument Air to HV10244B by closing valve 1251467, wait a couple of minutes and report that it has been closed; likewise for PCV10244B.

### SCENARIO EVENT FORM

Event No: 4  
Brief Description: Power Reduction

POSITION	TIME	STUDENT ACTIVITIES
RO	30	Immediately reduces Reactor Power to $\leq 75$ percent in accordance with ON-147-002.
		Plots POWER/FLOW conditions on power-to-flow map.
		Monitors Main Steam and Offgas activity levels.
		Monitors Reactor power and feedwater temperatures.
		Notifies GCC of plant status and load capability.
BOP		Maintains EHC Load Set within 100Mwe of actual load.
		Maintains Auto and Manual Voltage regulators balanced.
SRO		Directs power lowered to $\leq 75\%$ IAW GO-100-012 POWER MANEUVERS and CRC Instructions.
		Monitors COLR limits and looks for indication of core instability.
		Makes appropriate management notifications

<b>NOTES:</b>	

**INSTRUCTOR ACTIVITIES, ROLE PLAY,  
AND INSTRUCTOR'S PERSONAL NOTES**

Event No: 4  
Brief Description: Power Reduction

**INSTRUCTOR ACTIVITY:**

None

**ROLE PLAY:**

As necessary

INSTRUCTOR ACTIVITIES, ROLE PLAY,  
SCENARIO EVENT FORM

Event No: 5  
Brief Description: "C" Reactor Feedwater Pump Controller Failure

POSITION	TIME	STUDENT ACTIVITIES
RO	40	Recognize and respond to AR-101-B16 RFPT CONTROL SIGNAL FAILURE
		Report failure to SRO
		Implement ON-145-001, Section 3.8. <ul style="list-style-type: none"> <li>Place LIC-C32-1R601C to MANUAL.</li> <li>Adjust level to 35".</li> <li>Reset Control Signal Failure.</li> <li>Null FW Level Control/Demand Signal.</li> </ul> Place LIC-C32-1R601C to AUTO.
BOP		Maintain plant stability
SRO		Directs implementation of ON-145-001, Section 3.8
		Notifies I&C to support troubleshooting.

NOTES:	

<b>INSTRUCTOR ACTIVITIES, ROLE PLAY, AND INSTRUCTOR'S PERSONAL NOTES</b>
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Event No: 5  
Brief Description: "C" Reactor Feedwater Pump Controller Failure

**INSTRUCTOR ACTIVITY:**

When Feedwater Heater evolution has been adequately addressed, insert "C" Reactor Feedwater Pump Controller Failure by depressing:

**PB 5**  
**IMF FW145004C                      RFPT Control signal Failure**

Following fuse replacement by I&C, remove RFPT Control Signal failure by depressing:

**PB 6**  
**DMF FW145004C                      Delete malfunction RFPT Control signal Failure**

**ROLE PLAY:**

As I&C:  
When notified of problem take 2 minutes then report that a fuse blew in the local controller. Wait until the operator actions have been addressed, then report that it has been replaced. Notify the SRO that the controller may be returned to service.

# SCENARIO EVENT FORM

Event No: 6

Brief Description: Generator Lockout / Turbine Trip / Scram / RPV Break

POSITION	TIME	STUDENT ACTIVITIES
RO		Verify reactor scrammed – All Rods IN, power lowering
		Place Feedwater in Startup Level Control following the Scram.
		Verify proper operation of Turbine Bypass Valves.
BOP		Perform EO-100-102, RPV Control actions as directed
		Report status of Isolations, ECCS Initiations, DG starts
		Recognize/Report failure of RCIC to automatically initiate.
		When directed, Perform Suppression Chamber Spray IAW OP-149-005
		When Directed, initiate Drywell Sprays, limiting flow to between 1000 and 2800 for the first 30 seconds.
		Stop Drywell/Suppression Chamber Sprays before Drywell/Suppression Chamber pressure drops to 0 psig.
		Place RHRSW in Service.
SRO		Implements EO-100-102, RPV Control
		Implements EO-100-103, Primary Containment Control.
		Plot points on the RPV Saturation Curve to ensure RPV Vessel level instruments are operable.

NOTES:	

<b>INSTRUCTOR ACTIVITIES, ROLE PLAY, AND INSTRUCTOR'S PERSONAL NOTES</b>
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**Event No:** 6

**Brief Description:** Generator Lockout / Turbine Trip / Scram / RPV Break

**INSTRUCTOR ACTIVITY:**

When RFPT "C" is returned to Auto control, initiate Generator Lockout / Turbine Trip / Scram / RPV Break by depressing:

**PB 7**

**IMF EG198004**

**Spurious Trip of Main Generator Primary Lockout 86GA**

**PB 8**

**IMF RR164010 10 4:00**

**RPV Bottom Head Drain Line Leak/Rupture (10%) Inside  
Containment ramped over 4 minutes**

Increase RWCU leak as necessary to ensure RPV level reaches TAF and Drywell Sprays will be required by depressing:

**PB 9**

**MMF RR164010 20 2:00**

**RPV Bottom Head Drain Line Leak/Rupture (20%) Inside  
Containment ramped over 2 minutes**

**PB 10**

**MMF RR164010 30 3:00**

**RPV Bottom Head Drain Line Leak/Rupture (30%) Inside  
Containment ramped over 3 minutes**

**ROLE PLAY:**

As necessary





**INSTRUCTOR ACTIVITIES, ROLE PLAY,  
AND INSTRUCTOR'S PERSONAL NOTES**

Event No: 7  
Brief Description: Failure of RCIC to Initiate

**INSTRUCTOR ACTIVITY:**

Ensure the following malfunctions are active:

IMF RL01:E511K3	RCIC Failure to Auto Start
IMF RC150007	RCIC Overspeed

**ROLE PLAY:**

Role play as necessary

SCENARIO EVENT FORM

Event No: 6 (Continued)

Brief Description: RPV Water Level requires Rapid Depressurization

POSITION	TIME	STUDENT ACTIVITIES
BOP		Monitor RPV Level decrease to TAF using Fuel Zone Level Instrumentation
		Recognize/report RPV Water Level cannot be maintained above -161 inches.
SRO		Ensure all available injection sources are started
		Implements EO-100-112 RAPID DEPRESSURIZATION when RPV Level reaches -161 inches,
		<i>Enter EOP to flood RPV due to loss of RPV level indication</i>
BOP	See Note #1	Manually initiate ADS with handswitches.
		Direct NPO to Upper or Lower Relay Room to keep ADS Valves open
RO/BOP		Control injection to maintain RPV level +13 to +54 inches

<b>NOTES:</b>	Note #1: With ADS logic failed, the crew will have to manually initiate ADS or keylock switches from the relay room.

<b>INSTRUCTOR ACTIVITIES, ROLE PLAY, AND INSTRUCTOR'S PERSONAL NOTES</b>
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**Event No:** 6 Continued

**Brief Description:** RPV Water Level requires Rapid Depressurization

**INSTRUCTOR ACTIVITY:**

To Ensure Operators are unable to use Condensate Pumps following Plant Auxiliary Loadshed, trip them on overcurrent if started by depressing:

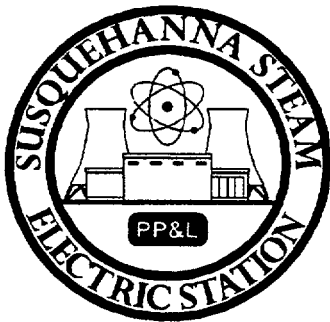
<b>PB 11 IMF PM03:1P102A</b>	<b>1A Condensate Pump overcurrent trip</b>
<b>PB 12 IMF PM03:1P102B</b>	<b>1B Condensate Pump overcurrent trip</b>
<b>PB 13 IMF PM03:1P102C</b>	<b>1C Condensate Pump overcurrent trip</b>
<b>PB 14 IMF PM03:1P102D</b>	<b>1D Condensate Pump overcurrent trip</b>

**ROLE PLAY:**

As Necessary

**TERMINATION CRITERIA:**

Reactor depressurized and RPV level restoration in progress to maintain between +13" and +54".



# PP&L-SUSQUEHANNA TRAINING CENTER

## SIMULATOR SCENARIO

**Scenario Title:** 4 KV Bus Failure and ATWS - Level Power Control

**Scenario Duration:** 90 Minutes

**Scenario Number:** 2001 02 NRC Exam Scenario, 02NRC

**Revision/Date:** Rev. 0, 06/20/01

**Course:** Operator License Training

### Operational Activities:

Remove T-10 From service  
Loss of 4 KV Bus 1D  
Spurious HPCI Initiation  
Power Reduction

"A" APRM Flow Unit Failure  
Loss of Instrument Air  
Hydraulic ATWS - Level Power control

**Prepared By:**

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Instructor

6/20/01

Date

**Reviewed By:**

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Nuclear Operations Training Supervisor

6/26/01  
Date

**Approved By:**

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Supervising Manager/Shift Supervisor

6-28-01  
Date

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## SCENARIO SUMMARY

The Plant is in MODE 1 at 100% power. The crew must transfer loads from Transformer T-10 to SU Bus 20 per OP-003-001 to remove Startup Transformer T-10 from service for a maintenance inspection that's expected to last less than 8 hours.

After the transfer is completed the normal supply breaker to 4KV bus 1A204 (ESS Bus 1D) will trip and the bus will transfer to its alternate source. This momentary loss of power will cause a loss of equipment including RBCCW to the Drywell and B CRD Pump. Entry into ON-155-007, Loss of CRD Flow, will be required to start a CRD Pump.

When the lineups have been restored HPCI will spuriously initiate and CANNOT be controlled using the flow controller. HPCI must be tripped and isolated. Reactor power must be lowered.

After power has been stabilized the A APRM Flow unit will fail downscale causing a half scram requiring bypassing the flow unit and resetting the half scram. A loss of instrument air will require tripping the plant. When the mode switch is placed in Shutdown the rods do not fully insert due to a hydraulic ATWS. As actions progress, the loss of Instrument Air will cause the MSIVs to close and power level will require entry into Level/Power Control.

After the crew controls RPV water level and Reactor power the crew must start inserting control rods using the RMCS and/or venting CRD over-piston volume

After the Crew has demonstrated their ability to insert the control rods and established RPV water level control the Simulator activity is over.

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## SCENARIO OBJECTIVES

### The SRO candidate will:

1. Ensure Plant Operates IAW the Operating License and Technical Specifications (00.TS.001).
2. Ensure that Required Actions per Technical Specifications/Technical Requirements are met when a LCO/TRO is entered (00.TS.003).
3. Inform other shift members and plant management of changes in plant status, potential plant problems or limitations. (00.AD.131).
4. Implement ON-104-204 LOSS OF 4KV ESS BUS 1D (1A204)
5. Direct entry into ON-155-007, Loss of CRD Flow, to restore CRD Flow
6. Implement ON-100-004 REACTOR POWER GREATER THAN 100%
7. Implement ON-164-001 RECIRC DRIVE FLOW INSTRUMENTATION FAILURE (64.ON.009).
8. Implement ON-100-101 SCRAM (00.ON.018).
9. Implement EO-100-102 RPV CONTROL (00.EO.026).
10. Implement EO-100-113 LEVEL / POWER CONTROL (00.EO.031).
11. Implement EO-100-103 PRIMARY CONTAINMENT CONTROL (00.EO.027).
12. Implement GO-100-012 POWER MANEUVERS (00.GO.010).
13. Classify the Emergency IAW EP-PS-100 EMERGENCY DIRECTOR (00.EP.001).

### The RO candidate will:

1. Perform ON-155-007, LOSS OF CRD FLOW, to restart a CRD Pump.
2. Implement ON-164-001 RECIRC DRIVE FLOW INSTRUMENTATION FAILURE (64.ON.009)
3. Perform operation of RHR in Suppression Pool Cooling with a LPCI signal present (49.OP.012).
4. Perform maximizing CRD flow (55.OP.001).
5. Perform ON-100-004 REACTOR POWER GREATER THAN 100%
6. Perform initiation of Standby Liquid Control System (53.OP.003).
7. Perform inserting manual scram with CRD in service (55.OP.006).
8. Perform inhibiting ADS (83.OP.005).
9. Implement Scram (00.ON.018).
10. Implement RPV Control (00.EO.026).
11. Implement Level / Power Control (00.EO.031).
12. Implement Primary Containment Control (00.EO.027).
13. Implement GO-100-012 Power Maneuvers (00.GO.010).
14. Perform overriding HPCI System (52.OP.009).
15. Perform a power change with Recirc or Rods (00.GO.012).
16. Perform overriding Core Spray System (51.OP.004).
17. Perform overriding RHR System (49.OP.011).
18. Perform manual bypass of RWM (31.OP.001).
18. Perform RHRSW System startup Unit 1 RHRSW Pump to Unit 1 Heat Exchanger (16.OP.002).



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### CRITICAL TASKS

- ★ Insert Control Rods IAW EO-100-113, Sheet 2, CONTROL ROD INSERTION.
- ★ Initiate the Standby Liquid Control (SLC) system IAW EO-100-113, Step LQ/Q-3, LEVEL/POWER CONTROL.
- ★ Throttle and prevent injection to maintain RPV water level between -60 to -161 inches.

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<b>SCENARIO REFERENCES</b>
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1. Remove Startup Transformer T-10 from Service
  - 1.1 OP-003-001 13.8KV Common Electrical Equipment
2. Supply Breaker trip to Bus 1D
  - 2.1 ON-104-204 Loss of 4KV ESS Bus 1D (1A204)
  - 2.2 ON-155-007 Loss of CRD Flow
3. Inadvertent HPCI Initiation
  - 3.1 OP-152-001 HPCI System operation
  - 3.2 T.S. 3.5.1 Emergency Core Cooling Systems
4. Power Reduction:
  - 4.1 GO-100-012 Power Maneuvers
5. Recirc Flow Unit Failure
  - 5.1 ON-164-001 Recirc Drive Flow Instrument Failure
  - 5.2 TS 3.3.1.1 RPS Instrumentation
  - 5.3 TR 3.1.3 Control Rod Block Instrumentation
6. Loss of Instrument Air
  - 6.1 ON-118-001 Loss of Instrument air
  - 6.2 ON-100-101 Reactor Scram
  - 6.3 EO-100-102 RPV Control
7. Failure to Scram - ATWS
  - 7.1 EO-100-113 Level Power Control
  - 7.2 EO-100-103 Primary Containment Control
  - 7.3 OP-150-001 RCIC System Operation
  - 7.4 OP-155-001 CRD System Operation
  - 7.5 OP-149-001 RHR System Operation
  - 7.6 OP-151-001 Core Spray System Operation
  - 7.7 OP-145-001 Feedwater System Operation
  - 7.8 OP-116-001 RHRSW System Operation
  - 7.9 OP-149-005 RHR SPC Operation

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<b>SCENARIO SPECIAL INSTRUCTIONS</b>
--------------------------------------

1. Initialize the Simulator to IC-182. Both Units at 100 percent power.

Ensure the "B" CRD Pump is operating

2. Load the following malfunctions and overrides:

IMF RD155017 bat RPB.HYDATWS_1 bat RPB.STKRDS IMF CN02:FCE411R600 89 0 100 IOR ZDIFCE411R600A OPEN	HYD ATS BROWN FERRY 58 RODS STUCK IN CORE 16 RODS STUCK IN CORE HPCI FLOW CONTROLLER FAILED AS IS HPCI FLOW CONTROLLER FAILED OPEN
--	--

PB 1	IMF BR03:1a20409	4KV ESS Bus 1D (1A204) Normal Supply Breaker Trips
PB 2	IMF HP152004	Inadvertent HPCI Initiation
PB 3	IMF NM178012	"A" Flow Unit Failure Downscale
PB 4	MRF NM178006 ZERO	Place 'A' Flow Unit mode switch to ZERO
PB 5	IMF IA118002 2% to 20%	Instrument Air Break on the Common Header (over 20 minutes)
PB 6	bat RPB.ES158002	Bypasses RPS Scrams
PB 7	bat RPB.DISABLARI	Disables ARI
PB 8	DMF RD155017	DELETES BROWN FERRY ATWS
PB 9	bat RPB.HYATWSCLR	DELETES 58 RODS STUCK
PB 10	bat EOP.ACT17	DELETES 16 RODS STUCK

3. Place the Simulator in RUN.

4. Prepare a turnover package with turnover sheets

- Both Units at 100 percent power.
- Perform OP-003-001 to remove Startup Transformer T-10 from service for a maintenance inspection that's expected to last less than 8 hours.
- All systems OPERABLE.

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## SCENARIO EVENT DESCRIPTION FORM

**Initial Conditions:** Unit 1 is at 100% Power. No LCOs are in Effect.

[illegible]



## SCENARIO EVENT FORM

**Event No: 1**

**Brief Description:** Remove Startup Transformer T-10 from service.

[illegible]

NOTES:	

<b>INSTRUCTOR ACTIVITIES, ROLE PLAY, AND INSTRUCTOR'S PERSONAL NOTES</b>
--

Event No: 1

Brief Description: Remove Startup Transformer T-10 from service.

**INSTRUCTOR ACTIVITY:**

None Required

**ROLE PLAY:**

1. As Power Control Center Operator acknowledge the removal of the T-10 Transformer for maintenance expected to last less than 8 hours.

## SCENARIO EVENT FORM

**Event No:** 2

**Brief Description:** Breaker supplying 4KV ESS Bus Trips OPEN

[illegible]

<b>NOTES:</b>	1. Corrective maintenance may lead to LCO not being met, therefore, Required Action A.1 would be entered.

<b>INSTRUCTOR ACTIVITIES, ROLE PLAY, AND INSTRUCTOR'S PERSONAL NOTES</b>
--

Event No: 2

Brief Description: Breaker supplying 4KV ESS Bus Trips OPEN

**INSTRUCTOR ACTIVITY:**

When directed by the chief examiner initiate the malfunction by depressing:

**PB1**

**IMF BR03:1A20409**

**4KV ESS Bus 1D (1A204) Normal Supply Breaker Trips**

**ROLE PLAY:**

1. If dispatched as NPO to locally check position of the breaker, wait  $\approx$ 2 minutes and report the breaker is open and there are no tripped flags or indications of a problem.
2. If dispatched as maintenance to investigate the breaker, wait  $\approx$  5 minutes and report that the breaker must eventually be removed from the Bus. State you need to get a work plan approved to perform the necessary repairs. No time estimate is available at this time.
3. If/When dispatched to the Instrument Air Compressor panel 1C140, reset AR-B02, "Dryer Control Power Failure" was in, but is all clear at this time.
4. If/When dispatched to the D D/G, report everything looks normal, and the air receivers have just shut down.

## 5. SCENARIO EVENT FORM

Event No: 3  
Brief Description: Inadvertent HPCI Initiation and Injection

POSITION	TIME	STUDENT ACTIVITIES
BOP/RO	25 min	Recognizes and reports HPCI has initiated
SRO		Determines HPCI mis-operation in Auto
		Directs BOP to override HPCI injection
		Directs RO to monitor reactor power
		Directs isolation of HPCI when HPCI cannot be overridden
		Directs RO to monitor MSL and Off-gas rad levels
		Call I&C/EWAC to investigate HPCI problem
		Refers to T.S. 3.5.1 and Declares HPCI inoperable
		Enter Required Action D.1, verify RCIC is operable immediately and D.2, restore HPCI Operable in 14 days
BOP		Determines HPCI initiation invalid by observing RPV Level and Drywell pressure indication
		Refers to OP-152-001 Section 3.9 to override HPCI
		Notifies SRO HPCI is not responding
		Takes action to override HPCI injection
		Depresses isolation pushbutton or closes Isolation valves and verifies HPCI F003 shuts, turbine trips and injection stops
RO		Monitors APRM and thermal power change
		Monitors MSL and Off-gas Rad Monitors
		Directs NPO to reset 1C605 Rad Monitors

<b>NOTES:</b>	

**INSTRUCTOR ACTIVITIES, ROLE PLAY,  
AND INSTRUCTOR'S PERSONAL NOTES**

**Event No:** 3  
**Brief Description:** Inadvertent HPCI Initiation and Injection

**INSTRUCTOR ACTIVITY:**

1. When actions are complete for ESS Bus 1D, insert the following to cause HPCI initiation:

**PB2**

IMF HP152004

Inadvertent HPCI Initiation

2. If requested to reset ARMs at panel 1C605, insert the following:

**MRF RM179004 RESET**

RESET ARMs AT 1C605

**ROLE PLAY:**

As I & C dispatched to investigate HPCI system, wait  $\approx$  5 minutes and report an intermittent ground exists in the logic. Additional investigation is required, and no time estimate for restoration is possible at this time. The failure of the controller is a separate issue and is not related to the initiation logic as far as we can tell at this point.

### SCENARIO EVENT FORM

Event No: 4  
Brief Description: Power Reduction

POSITION	TIME	STUDENT ACTIVITIES
RO	35 min	Immediately reduces reactor power to within the licensed limit IAW ON-100-104, or GO-100-012 and CRC Instructions if power reduction > 5%.
		Plot POWER/FLOW change on power-to-flow map in accordance with NDAP-QA-0338-10.
		Monitors main steam and Offgas activity levels.
		Monitors reactor power and Feedwater temperatures.
		Notifies GCC of plant status and load capability.
SRO		Directs performance of ON-100-004 REACTOR POWER GREATER THAN 100%
		Monitors COLR limits and looks for indication of core instability.
		Notifies Reactor Engineering, Operations Management of events
BOP		Maintains Load Set within 100Mwe of actual generator load
		Maintains Auto and Manual Voltage regulators balanced
		Dispatch NPO to Feedwater Heater Panel for alarms resulting from the power change
		<i>RE calls to request power reduction of 5%.</i>

NOTES:	

**INSTRUCTOR ACTIVITIES, ROLE PLAY,  
AND INSTRUCTOR'S PERSONAL NOTES**

Event No: 4  
Brief Description: Power Reduction

**INSTRUCTOR ACTIVITY:**

None

**ROLE PLAY:**

As necessary



### SCENARIO EVENT FORM

Event No: 5  
Brief Description: Recirc Flow Unit Failure.

POSITION	TIME	STUDENT ACTIVITIES
RO	55 min	Respond to AR-103-C04, C05, and AR-104-H05
		Recognize/report Rod Block and half scram.
		Recognize/report indication of a failed Recirc Flow Unit.
		Determines Flow Unit 'C' has failed.
SRO		Dispatches NPO to Relay Room.
		Implements ON-164-001 for loss of Recirc Drive Flow instrument failure.
		Directs bypass of failed flow unit and resetting half scram
		Reviews Technical Specifications 3.3.1.1, determines LCO is not met. Enters Action A.1, place channel in trip or place the trip system in trip within 12 hours
		Declares 1 of 2 required Flow Biased Simulated Thermal Power - High trip functions inoperable.
		Refers to Technical Requirement 3.1.3, determines TRO is met.
		Contact I & C to investigate Recirc Flow Unit 'C' Failure.
RO		Places joystick for "A" Flow Unit to BYPASS.
		Directs NPO to place mode switch for "C" Flow Unit to ZERO position.
		Resets half scram

<b>NOTES:</b>	

**INSTRUCTOR ACTIVITIES, ROLE PLAY,  
AND INSTRUCTOR'S PERSONAL NOTES**

**Event No:** 5  
**Brief Description:** Recirc Flow Unit Failure.

**INSTRUCTOR ACTIVITY:**

1. When the Chief/Lead Examiner indicates the exam team has seen sufficient power change, insert a Recirc Flow Unit failure by depressing:

**PB3**  
**IMF NM178012A                      "A" Flow Unit Failure Downscale**

2. When directed to place 'C' Flow Unit mode switch to ZERO insert:

**PB4**  
**MRF NM178006 ZERO              "A" Flow Unit mode switch to ZERO**

**ROLE PLAY:**

1. As NPO dispatched to the relay room: if asked for Flow Unit meter indications, report C indicates downscale.
2. As NPO dispatched to the Relay Room to place Mode Switch to ZERO: wait ~2 minutes and report the 'C' Flow Unit Mode Switch is in ZERO position.
3. As I&C dispatched to investigate flow unit failure: wait ~5 minutes and report a suspected circuit card failure, but no additional information is available; trouble shooting is continuing.

### SCENARIO EVENT FORM

Event No: 6  
Brief Description: Loss of Instrument Air

POSITION	TIME	STUDENT ACTIVITIES
BOP/RO	75 min	Recognize/report Instrument air Pressure lowering.
		Dispatches NPO to Instrument Air compressors and receiver area.
BOP		Performs scram eminent actions: <ul style="list-style-type: none"> <li>• Shift Unit Auxiliary Busses to the Startup Transformer</li> <li>• Start:               <ul style="list-style-type: none"> <li>▪ Main Lube Oil Suction Pump</li> <li>▪ Turning Gear Oil Pump</li> </ul> </li> </ul>
RO		Lowers Reactor power with Recirc flow IAW CRC Instructions 65 Mlbm/hr
		Initiates a Manual Scram before/when Instrument Air pressure reaches 65 psig
SRO		Implements ON-118-001 LOSS OF INSTRUMENT AIR.
		Recognizes inability to recover and directs scram imminent actions

<b>NOTES:</b>	

**INSTRUCTOR ACTIVITIES, ROLE PLAY,  
AND INSTRUCTOR'S PERSONAL NOTES**

Event No: 6  
Brief Description: Loss of Instrument Air

**INSTRUCTOR ACTIVITY:**

1. When "A" Flow Unit has been bypassed and half scram reset, insert Instrument air break on the Common Header by depressing:

**PB5**

**IMF IA118002 20 20:00**

**20% Instrument Air Break on the Common Header  
(over 20 minutes)**

Note: Leak is slow enough to ensure a power reduction and Scram Imminent Actions are completed prior to reaching 65# on the header.

**ROLE PLAY:**

1. As NPO dispatched to the Instrument Air area report hearing an air leak but not being able to specifically see the exact location, report system responding normally but pressure slowly lowering.

### SCENARIO EVENT FORM

Event No: 7

Brief Description: Hydraulic ATWS:

POSITION	TIME	STUDENT ACTIVITIES
RO	80 min	Place Reactor MODE SWITCH to S/D, arms and depresses the manual scram pushbuttons; reports partial rod motion.
		Lowers RPV level <-60" controls RPV level in target band -60" to 110".
		Inserts control rods with RMCS
CREW		Recognizes that the RFPT will trip, and MSIVs will close and that with no Instrument air the scrams CANNOT be reset (ES-158-002 should NOT be entered).
SRO		Enters EO-100-102; then exits EO-100-102 and enters EO-100-113.
		Directs inhibiting ADS.
		Directs lowering RPV level <-60" using Feedwater, HPCI and RCIC; directs RPV level to be controlled in target band -60" to -110".
		Directs manually initiating ARI
		Directs Injection of SLC
		Directs Maximizing CRD
BOP		Manually initiates ARI. Maximize CRD. Initiate SLC. Inhibit ADS.
		Stabilizes RPV pressure <1,087 psig using SRVs.
		When directed, maximizes Suppression Pool Cooling.
		When directed sends operator to vent Scram Air Header

<b>NOTES:</b>	

**INSTRUCTOR ACTIVITIES, ROLE PLAY,  
AND INSTRUCTOR'S PERSONAL NOTES**

Event No: 7  
Brief Description: Hydraulic ATWS:

IF directed by ES-158-002, reset RPS and scram rods by depressing

**PB 6**  
**Bat RPB.ES158002                  BYPASS RPS SCRAMS**

**ROLE PLAY:**

If directed report you are ready to disable ARI:

**PB 7**  
**Bat RPB.DISABLARI                  Disables ARI**

When scram has been reset and prior to manual Scram, allow rods to insert by depressing:

**PB 8**  
**DMF RD155017                          DELETES BROWN FERRY ATWS**

**PB 9**  
**bat RPB.HYATWSCLR                  DELETES 58 RODS STUCK**

**PB 10**  
**bat EOP.ACT17                          DELETES 16 RODS STUCK**

**ROLE PLAY:**

If directed, report you are ready to BYPASS RPS.

After the Crew has demonstrated inserting control rods, has lowered power and is controlling RPV water level, **AND WHEN DIRECTED BY THE CHIEF EXAMINER** place the Simulator to FREEZE.

# UNIT SUPERVISOR TURNOVER SHEET

UNIT: 1

Date: August 15, 2001

SHIFT 1900 to 0700  
Start End

SHIFT 0700 to 1900  
Start End

MODE 1

MODE \_\_\_\_\_

POWER LEVEL 100 %

POWER LEVEL \_\_\_\_\_ %

GENERATOR OUTPUT 1125 MWe

GENERATOR OUTPUT \_\_\_\_\_ MWe

CASK STORAGE GATE INSTALLED: YES/NO

CASK STORAGE GATE INSTALLED: YES/NO

## REMARKS: UNIT 1

- 1) Both Units at 100% power
- 2) Remove Startup Transformer T-10 from service for Maintenance IAW OP-003-001.
- 3) All systems are operable.
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)
- 10)
- 11)
- 12)
- 13)
- 14)
- 15)
- 16)
- 17)

## COMMON

- 1) Common Recombiner in S/B

# UNIT SUPERVISOR TURNOVER SHEET

UNIT: 1

Date: August 15, 2001

SHIFT 1900 to 0700  
Start End

SHIFT 0700 to 1900  
Start End

MODE 1

MODE \_\_\_\_\_

POWER LEVEL 100 %

POWER LEVEL \_\_\_\_\_ %

GENERATOR OUTPUT 1125 MWe

GENERATOR OUTPUT \_\_\_\_\_ MWe

CASK STORAGE GATE INSTALLED: YES/NO

CASK STORAGE GATE INSTALLED: YES/NO

## REMARKS: UNIT 1

- 1) Both Units at 100% power
- 2) Remove Startup Transformer T-10 from service for Maintenance IAW OP-003-001.
- 3) All systems are operable.
- 4)
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- 17)

## COMMON

- 1) Common Recombiner in S/B