

NMP SIMULATOR SCENARIO

NRC Scenario 1

REV. 0

No. of Pages: 23

ERV OPENS, EPR OSCILLATIONS, DEGRADED 345KV GRID, COOLANT LEAK IN DRYWELL, LOSS OF HIGH PRESSURE FEED

| | | | |
|--------------------------------|---------------------------------|------|-----------------------------|
| PREPARER | <u>JRZ</u> | DATE | <u>1/26/09</u> |
| VALIDATED | <u>Gallagher, Blum, Wallace</u> | DATE | <u>1/20/09</u> |
| GEN SUPERVISOR OPS TRAINING | <u>T. Allen</u> | DATE | <u>1/26/2009</u> |
| OPERATIONS MANAGER | <u>N/A - Exam Security</u> | DATE | <u> </u> |
| CONFIGURATION CONTROL | <u>N/A - Exam Security</u> | DATE | <u> </u> |

SCENARIO SUMMARY

Length: 90 minutes

Initial Power Level: Approximately 100% power

Mitigating Strategy Code: RL2, Small break LOCA or loss of high pressure injection, RPV level cannot be maintained above the top of active fuel (TAF), RPV Blowdown, recover level above TAF with low pressure systems

The crew assumes the shift with power at approximately 100%. They are directed to perform N1-ST-M8, Reactor Building Emergency Ventilation System (RBEVS) Operability Test, for RBEVS loop 11. When RBEVS fan 11 is started, flow will be below the acceptance criteria. The fan will be declared inoperable and the SRO will determine the impact in Technical Specifications.

Next, Electromatic Relief Valve (ERV) 111 will inadvertently open. The crew will enter SOP-1.4 for the stuck open ERV. The crew will perform an emergency power reduction to approximately 85% power. The ERV will close when fuses are pulled in the control room.

After ERV 111 is closed, the Electrical Pressure Regulator (EPR) will begin to oscillate. The crew will enter SOP-31.2 and place the Mechanical Pressure Regulator (MPR) in service. Again the SRO will determine the impact in Technical Specifications. The loss of the backup pressure regulator while between 45% and 90% power will require a revised MCPR thermal limit.

Next, grid disturbances will result in lowering frequency and voltage on the 345KV power lines. The crew will enter SOP-33B.1 and monitor grid frequency to determine action times for tripping the turbine. As the grid continues to degrade, the crew will scram the Reactor. Shortly after the scram, grid conditions will return to normal.

A coolant leak in the Drywell will develop following the scram. The crew will enter EOP-4 and re-enter EOP-2. The crew will spray the containment to control pressure and temperature. The remaining high pressure Feedwater pump will trip, causing RPV water level to lower to the top of active fuel (TAF). The crew will perform an RPV Blowdown and restore RPV water level above TAF with low pressure systems.

Major Procedures: N1-SOP-1.4, N1-SOP-1.1, N1-SOP-31.2, N1-SOP-33B.1, N1-SOP-1, N1-EOP-2, N1-EOP-4, and N1-EOP-8

EAL Classification: Alert, EAL 3.1.1

Termination Criteria: RPV Blowdown in progress, RPV water level restored above -84 inches, containment parameters controlled in accordance with N1-EOP-1 attachment 17

I. SIMULATOR SET UP

A. IC Number: IC 171

B. Presets/Function Key Assignments

1. Malfunctions:

- | | |
|---|--------|
| a. FW03A, Feedwater Pump Trip 11 | PRESET |
| b. AD05, ERV 111 Failure – Opens Inadvertently | TRG 1 |
| c. TC06, Electrical Pres. Regulator Fails – Oscillates | TRG 2 |
| d. EG11, 345 KV Power Grid Transient, RT=7:30, IV=345, FV=333 | TRG 3 |
| e. CU01, CU Coolant Leak Inside of Drywell, RT=15:00, FV=50 | TRG 4 |
| f. FW03B, Feedwater Pump Trip 12 | TRG 5 |

2. Remotes:

- | | |
|---|--------|
| a. AD01A, ERV 111 Fuses, FV=pulled | TRG 25 |
| b. AD07, Acoustic Monitor Alarm Reset, FV=reset | TRG 26 |
| c. FW24, Removal of HPCI Fuses FU8/FU9 | TRG 27 |

3. Overrides:

- | | |
|--|--------|
| a. OVR-11M40AO53090 5L11/202-49B, DT=00:02, RT=00:05, IV=0, FV=135 (RBEVS Loop 11 Flow) | TRG 23 |
|--|--------|

4. Annunciators:

- a. None

5. Triggers:

- a. TRG 4 – Triggers the coolant leak and ramps grid conditions back to normal when the mode switch is taken to SHUTDOWN
- Event Action: `zdrpstdn==1`
 - Command: `imf eg11 (0 0) 345 120 333`
- b. TRG 5 – Triggers the trip of Feedwater pump 12 when torus pressure exceeds 6 psig
- Event Action: `trpgas>20.7`
 - Command: None
- c. TRG 23 – Triggers the override of RBEVS Loop 11 Flow when RBEVS fan 11 control switch is taken to start
- Event Action: `zdhvf53s==1`
 - Command: None
- d. TRG 24 – Deletes the override of RBEVS Loop 11 Flow if RBEVS fan 11 control switch is taken to trip
- Event Action: `zdhvf53t==1`

ii. Command: dor 11M40AO53090

C. Equipment Out of Service

1. Feedwater pump 11 control switch is in pull-to-lock with a yellow clearance tag applied
2. Feedwater pump 11 block valve is closed with a yellow clearance tag applied

D. Support Documentation

3. N1-ST-M8 is marked up to step 8.1.1

E. Miscellaneous

1. Ensure RBVS fans are in slow speed to support RBEVS surveillance
2. Place protected signs on RBEVS loop 12, Feedwater Pump 12, Powerboard 12, EDG 103 and Powerboard 103/17B
3. Update divisional status board as follows:
 - a. RBEVS 11 – red
 - b. RBEVS 12 – green
 - c. EDG 103 – green

II.

SHIFT TURNOVER INFORMATION

OFF GOING SHIFT: N D

DATE: Today

PART I: To be performed by the oncoming Operator before assuming the shift.

- Control Panel Walkdown (all panels) (SM, CRS, STA, RO, CRE)

PART II: To be reviewed by the oncoming Operator before assuming the shift.

- Shift Manager Log (SM, CRS, STA)
- RO Log (RO)
- Lit Control Room Annunciators (SM, CRS, STA, RO, CRE)
- Shift Turnover Checklist (ALL)
- LCO Status (SM, CRS, STA)
- Computer Alarm Summary (RO)

Evolutions/General Information/Equipment Status:

- Feedwater Pump 11 is out of service for maintenance
- N1-ST-M8, RBEVS Operability Test, is to be performed for RBEVS loop 11

PART III: Remarks/Planned Evolutions:

- Perform N1-ST-M8, RBEVS Operability Test, for RBEVS loop 11, starting at step 8.1.1

Note: For step 8.1.7, the Shift Manager has directed the Normal Reactor Building Ventilation System to be maintained in the current lineup.

PART IV: To be reviewed/accomplished shortly after assuming the shift:

- Review new Clearances (SM)
- Shift Crew Composition (SM/CRS)
- Test Control Annunciators (CRE)

| TITLE | NAME | TITLE | NAME |
|--------|------|-------|------|
| SRO | | | |
| ATC RO | | | |
| BOP RO | | | |
| | | | |

PERFORMANCE OBJECTIVES

A. Critical Tasks:

- CT-1.0 Given a LOCA in the Drywell, the crew will initiate Containment Sprays prior to exceeding the Pressure Suppression Pressure limit, in accordance with N1-EOP-4.
- CT-2.0 Given a LOCA with degraded high pressure injection capability, the crew will depressurize the RPV and inject with Preferred and Alternate Injection Systems to restore and maintain RPV water level above -84 inches, in accordance with N1-EOP-2, such that Severe Accident Procedure (SAP) entry is not required.

B. Performance Objectives:

- PO-1.0 Given the plant operating at power, the crew will perform the Reactor Building Emergency Ventilation System Operability Test, in accordance with N1-ST-M8.
- PO-2.0 Given Reactor Building Emergency Ventilation Loop 11 flow below the acceptance criteria, the crew will declare the system inoperable, in accordance with Technical Specifications.
- PO-3.0 Given an inadvertently opened ERV, the crew will close the ERV, in accordance with N1-SOP-1.4.
- PO-4.0 Given an oscillating Electrical Pressure Regulator, the crew will place the Mechanical Pressure Regulator in service, in accordance with N1-SOP-31.2.
- PO-5.0 Given degrading voltage and frequency on the 345KV power lines, the crew will scram the Reactor, in accordance with N1-SOP-33B.1.
- PO-6.0 Given a coolant leak in the drywell, the crew will respond to the event, in accordance with N1-EOP-2 and N1-EOP-4.
- PO-7.0 Given the plant in a condition requiring emergency classification, the SRO shall classify the events properly, complete initial notification forms, and discuss the bases for the classification in accordance with the emergency plan procedure.
- PO-8.0 Given the plant or a plant system in a condition requiring Technical Specification action, identify the deviation and any required actions/notifications.

**INSTRUCTOR ACTIONS/
PLANT RESPONSE**

OPERATOR ACTIONS

Take the simulator out of freeze before the crew enters for the pre-shift walkdown and briefing.
Allow no more than 5 minutes for panel walkdown

Event 1

Perform N1-ST-M8, Reactor Building Emergency Ventilation System (RBEVS) Operability Test for RBEVS Loop 11

The initiation point for this event is when the SRO directs the performance of N1-ST-M8, RBEVS Operability Test. There are NO Console Operator activities related to this normal evolution.

CREW

Crew conducts pre-brief, walks down the panels, assumes the shift

PO-1.0

SRO

- Directs the performance of N1-ST-M8, RBEVS Operability Test, starting at step 8.1.1 for RBEVS loop 11

RO

- Monitors plant parameters

BOP

- Acknowledges direction from the SRO to perform N1-ST-M8
- Verifies open 202-36, EM VENTILATION FROM REACTOR BLDG BV
- Verifies closed 202-47, EM VENTILATION TIE BV
- Opens 202-37, EM VENTILATION LOOP 11 INLET BV
- Starts 202-53, EVS FAN 11

Event 1 Continued

Role Play: When contacted as operator to verify 10KW heater energized, immediately report that the 10KW heater indicates energized at Powerboard 167 (red light on, green light off).

Role Play: If contacted as operator to obtain RBEVS Train 11 filter D/Ps, acknowledge request, wait 2 minutes and report the following values:

Filter 111 (DPI-202-44) = 1 inch H₂O

Charcoal Filter 11 (DPI-202-46) = 0.5 inch H₂O

Filter 112 (DPI-202-57) = 1 inch H₂O

BOP Continued

- Verifies open 202-34, EM VENT EXHAUST FAN 11 OUTLET BV
- Confirms proper operation of 202-50, EM VENT EXHAUST FAN 11 INLET FCV, by observing indicating lights and flow indication
- Contacts operator to confirm 202-76, EMERGENCY VENTILATION EXHAUST HEATER (10KW) energized as indicated at Powerboard 167 (RB EL 281) by Red light on, Green light off.
- Records 202-53, EVS FAN 11 start time
- Records the following at Control Room Panel L:
 - 202-49B, EMER VENT FLOW 11
 - 202-17D, REACT BLD/ATM DIFF PR IN H₂O
- Dispatches operator to obtain RBEVS Train 11 filter D/Ps

INSTRUCTOR ACTIONS/
PLANT RESPONSE

OPERATOR ACTIONS

Event 2

RBEVS Loop 11 Flow Below Acceptance Criteria

When the control switch for RBEVS fan 11 is taken to start, verify the following **override** is **inserted**:

OVR-11M40AO53090 5L11/202-49B, DT=00:02, RT=00:05, IV=0, FV=135

TRG 23

RBEVS fan 11 flow rises to 1350 cfm

Role Play: If contacted as Shift Manager, Operations Management OR Work Week Management, acknowledge failure of RBEVS fan 11 flow to reach acceptable flow rate. Direct the crew to continue with the surveillance run while maintenance and engineering investigate.

Role Play: If contacted as operator to investigate RBEVS fan 11, wait 1 minute and report there are no abnormal indications with RBEVS fan 11.

PO-2.0

SRO

- Acknowledges report that RBEVS loop 11 flow is below the minimum acceptance criteria of 1440 cfm
- Declares RBEVS loop 11 inoperable
- Determines Tech Spec 3.4.4.d and 3.4.4.e apply, requiring 7 day LCO
- Notifies Work Week Manager and/or Operations Management of failure of RBEVS loop 11 to achieve acceptable flow
- Directs crew to continue with surveillance run of RBEVS loop 11

RO

- Monitors plant parameters

BOP

- Notifies Crew/SRO that RBEVS loop 11 flow is below the minimum acceptance criteria

Event 3

ERV 111 Opens Inadvertently

When directed by examiner, **insert malfunction:**

AD05, ERV 111 Failure – Opens Inadvertently

TRG 1

ERV 111 Opens

Expected annunciators:

*F1-4-8, STEAM LINE DETECTION SYS FLOW
OFF NORM*

*F2-4-1, MAIN STM LINE ELECTROMATIC RELIEF
VALVE OPEN*

H3-4-5, PRESS SAFETY/RELIEF VALVES FLOW

Note: If the crew is unable to close the ERV in this event, they will be required to insert a manual reactor scram. This is very unlikely, yet possible.

If a manual scram is inserted in this event, the scenario will automatically continue with trigger 4 in event 6. Events 4 and 5 would be skipped.

PO-3.0

CREW

- Recognize/report ERV 111 is open
- Respond to annunciators:
 - F1-4-8, STEAM LINE
DETECTION SYS FLOW OFF
NORM
 - F2-4-1, ERV OPEN
 - H3-4-5, ERV FLOW

SRO

- Acknowledges report
- Directs BOP to respond to open ERV using ARPs and N1-SOP-1.4, STUCK OPEN ERV
- Determines that ERV 111 is inoperable per TS 3.1.5.a, requiring a 10 hour shutdown
- Directs emergency power reduction to approximately 85% power
- Provides oversight for reactivity manipulation
- Acknowledges that ERV 111 has closed
- Enters EOP-4 if Torus temp is above 85°F or Torus level is above 11.25'
 - Directs containment spray to PTL
- Directs BOP to initiate Torus Cooling per N1-EOP-1, Att. 16 or N1-SOP-1.4

Event 3 Continued

Role Play: When directed as operator to go to Auxiliary Control Room and verify ERV 111 is open, wait one minute and report ERV 111 is open; subsequent reports on acoustic monitor status may be given immediately, with close attention paid to the actual status of the ERV

Note: Safety glasses and gloves are required for pulling fuses in F panel

RO

- Performs emergency power reduction per N1-SOP-1.1
- Reduces recirculation master controller to lower power to approximately 85%
- Monitors APRMs
- Monitors core thermal power
- Monitors position on power to flow map

BOP

- Determines ERV 111 is open using:
 - Valve indicating lights on F panel
 - Red ERV flow indicating light on F panel
- Enters N1-SOP-1.4
- Sends an operator to the Aux Control Room to verify ERV open using Acoustic Monitor
- May send an operator to RB 237' to standby for pulling local ERV fuses
- Depresses ADS Timer Reset pushbuttons
- Cycles Control Switch for ERV 111
- Pulls control power fuses F15 and F30 in F panel (ERV 111)
- Checks with operator in Aux Control Room to see if ERV is still open
- Determines/verifies ERV closes
- Notifies crew that ERV 111 has closed

Event 3 Continued

Role Play: If the operator is directed to pull fuses in the RB wait 2 minutes and **insert remote:**

AD01A, ERV 111 Fuses, FV=pulled

TRG 25

Report fuses are pulled

Role Play: As operator, when directed to reset the acoustic monitor, wait one minute and **insert remote:**

AD07, Acoustic Monitor Alarm Reset, FV=reset

TRG 26

Report acoustic monitor is reset

BOP Continued

- Monitors torus temperature
- Reports if/when torus temperature exceeds 85°F or torus level exceeds 11.25'
- Places Containment Spray pumps in pull to lock if directed
- Places torus cooling in service when directed
- Directs reset of acoustic monitor

INSTRUCTOR ACTIONS/
PLANT RESPONSE

OPERATOR ACTIONS

Event 4

EPR Oscillations

When directed by examiner, **insert malfunction:**

**TC06, Electrical Pres. Regulator Fails –
Oscillates**

TRG 2

Reactor power and pressure oscillate

EPR servo indication oscillates

Expected annunciator:

*A2-4-4, TURBINE MECHANICAL PRESS. REG. IN
CONTROL*

Note: Core Operating Limits Report requires a penalty to the MCPR and LHGR thermal limits, per tables 2f and 3, respectively. These limits will vary depending on the exact power level and core flow.

Role Play: If contacted as Reactor Engineering to verify thermal limits, acknowledge request.

PO-4.0

CREW

- Acknowledge / report MPR annunciator A2-4-4
- Observe power oscillations on APRMs
- Observe reactor pressure oscillations
- Observe EPR servo oscillations

SRO

- Acknowledges report from crew
- May direct execution of ARP for A2-4-4
- May direct execution of N1-SOP-1.5, Unplanned Power Changes
- Directs execution of N1-SOP-31.2, Pressure Regulator Malfunctions
- References Tech Spec 3.1.7 and Core Operating Limits Report to determine thermal limit penalty will be required for loss of backup pressure regulator when operating between 45% and 90% power
- Contacts Reactor Engineering to verify thermal limits

Event 4 Continued

Note: If the MPR is currently in control, the RO will not adjust MPR setpoint.

RO

- Executes N1-SOP-31.2, Pressure Regulator Malfunctions
- Lowers MPR setpoint to place the MPR in control
- Raises the EPR setpoint to 1010 psig
- Verifies MPR is in control (A2-4-4 alarming)
- Confirms reactor pressure is steady
- Works with BOP to return pressure to pre-transient value

BOP

- Acknowledges direction from SRO
- May execute N1-SOP-1.5, Unplanned Power Changes
- Monitors reactor pressure and level

**INSTRUCTOR ACTIONS/
PLANT RESPONSE**

OPERATOR ACTIONS

Event 5

Degraded 345KV Grid Conditions

When directed by examiner, **insert malfunction:**

**EG11, 345 KV Power Grid Transient, RT=7:30,
IV=345, FV=333**

TRG 3

345KV frequency and voltage lower

Expected annunciators:

A8-1-3, 115 KV Bus Low Voltage (first)

*A6-3-3, 345 KV Sys Frequency High – Low
(second)*

A6-2-6, 345 KV Bus Voltage High-Low (later)

Verify the following **malfunction changes** when the mode switch is taken to SHUTDOWN:

**EG11, 345 KV Power Grid Transient, RT=2:00,
IV=333, FV=345**

PO-5.0

CREW

- Acknowledge/report annunciators:
- A8-1-3, 115 KV Bus Low Voltage
- A6-3-3, 345 KV Sys Frequency High - Low
- Diagnose/report lowering 345 KV grid frequency

SRO

- Acknowledges report
- Directs execution of ARPs
- Direct entry into N1-SOP-33A.3, Major 115 KV Grid Disturbances
- Directs entry into N1-SOP-33B.1, Major 345 KV Grid Disturbances
- Acknowledges report that turbine operational time limit is exceeded for current frequency variation
- Directs manual scram
- Acknowledges SCRAM report
- Enters N1-EOP-2 on low RPV water level
- Directs N1-SOP-1 actions
- Directs RPV water level controlled 53-95" with Condensate/FW and CRD

Event 5 Continued

Role Play: If contacted as operator to check for abnormal indications (pump operation, Aux Control Room panels, breaker targets, etc.) due to the grid disturbance, wait 2 minutes and report there are no abnormal indications.

Role Play: If contacted as Power Control regarding the low voltage post contingency alarm, inform that the low voltage post contingency alarm is not alarming.

Role Play: If contacted as Power Control regarding grid voltage or frequency, give current values based on the simulator instructor station.

Role Play: If contacted as Power Control regarding status of offsite power, inform that thunderstorms have caused a loss of some generation and you do not currently have an estimated time for restoration.

SRO Continued

- Directs RPV pressure controlled 800-1000 psig with Turbine Bypass Valves or Emergency Condensers

RO

- Monitors plant parameters
- When directed, places Mode Switch in Shutdown
- Provides scram report
- Performs N1-SOP-1, Reactor Scram, scram verification actions
 - Places IRMs on range 9
 - Inserts IRM and SRM detectors
 - Downranges IRMs as necessary to monitor power decrease
- Reduces Recirc Master flow to 25-43 x 10⁶ lb/hr
- Maintains RPV pressure below 1080 psig and in assigned band

BOP

- Executes ARPs
- Executes N1-SOP-33A.3
- Executes N1-SOP-33B.1
- Monitors 345 KV grid frequency and determines magnitude of frequency variation
- Contacts Power Control and obtains 345 KV line frequency
- Updates crew on turbine operational time limit as grid frequency lowers
- Notifies Power Control of turbine operational time limit

Event 5 Continued

Note: If the crew fails to insert a manual reactor scram for a prolonged period of time following grid frequency lowering below 58.1 Hz, the examiner may choose to force the scenario progression by **inserting malfunction:**

TC01, Main Turbine Trip

BOP Continued

- Places Turbine Vibration chart recorder in fast speed
- When grid frequency lowers to 58.1 Hz, notifies crew that turbine must be tripped and Reactor must be scrammed
- Performs N1-SOP-1, Reactor Scram, level control actions:
 - Restores RPV level to 53-95" by controlling injection and rejecting through RWCU, as necessary
 - Determines #13 FWP was running
 - Determines RPV water level is recovering
 - Verifies at least one Electric FW Pump running
 - Terminates 13 FWP injection as follows:
 - Places 13 FWP VALVE CONTROL in MANUAL and closes
 - Disengages 13 FWP
 - Gives 29-10, FEEDWATER PUMP 13 BLOCKING VALVE a CLOSE signal
 - Verifies RPV water level above 53"
 - Verifies 11/12 FWP controllers in MANUAL and set to zero output
 - Resets HPCI signal, if required
 - Places 12 FWP BYPASS Valve in AUTO, sets to 65-70 inches

Event 5 Continued

BOP Continued

- If RPV level reaches 85 inches and rising, then:
 - Verifies off all Feedwater Pumps
 - Secures CRD Pumps not required
 - Maximizes RWCU reject flow
 - Closes FWIVs if required
 - Closes MSIVs if required
- Maintains RPV water level in assigned band

**INSTRUCTOR ACTIONS/
PLANT RESPONSE**

OPERATOR ACTIONS

Events 6 and 7

Coolant Leak in the Drywell

Verify the following **malfunction** is **inserted** when the mode switch is taken to SHUTDOWN:

**CU01, CU Coolant Leak Inside of Drywell,
RT=15:00, FV=50**

TRG 4

Drywell humidity, pressure and temperature rise

Drywell leakage rises

RPV level and pressure lower

Expected annunciators:

H2-4-7, Drywell Water Leak Detection Sys

K2-4-3, Drywell Pressure High-Low

F1-1-5, RPS Ch 11 Drywell Press High

F4-1-4, RPS Ch 12 Drywell Press High

Trip of Feedwater Pump 12

Verify the following **malfunction** is **inserted** when torus pressure exceeds 6 psig:

FW03B, Feedwater Pump Trip 12

TRG 5

Feedwater Pump 12 trips

Expected annunciators:

H3-2-7, Reactor FW Pump 12 Trip Overload

Suction Hi-Level

H3-2-8, Reactor FW Pump 12 Aux System

PO-6.0

CREW

- Recognize/report degrading containment parameters
- Recognize/report loss of high pressure Feedwater (later)

SRO

- Acknowledges report
- Enter N1-EOP-4 due to high drywell pressure and temperature
- Re-enters N1-EOP-2 due to high drywell pressure and low RPV level
- Directs Containment Spray pumps locked out
- Acknowledges trip of Feedwater pump 12
- When torus pressure exceeds 13 psig or drywell temperature approaches 300°F:
 - Answers "Below the Containment Spray Initiation Limit?" – Yes

Events 6 and 7 Continued

SRO Continued

- Verifies all Recirc pumps are tripped
- Directs trip of all Drywell cooling fans
- **Directs operation of Containment Spray per N1-EOP-1 attachment 17 (CT-1.0)**
- Evaluates/monitors position on Pressure Suppression Pressure curve
- Directs RPV injection with CRD and Liquid Poison
- May direct closure of MSIVs and pressure control using Emergency Condensers
- Transitions to alternate level control leg of N1-EOP-2
- Directs ADS bypassed
- Directs verification of EC initiation
- Answers "Are 2 or more Subsystems available?" – Yes (Both loops of Core Spray available)
- Waits until RPV level drops to -84 inches
- Answers "Is any Subsystem lined up with a pump running?" – Yes (Both loops of Core Spray running)
- Answers "Is any injection source lined up with a pump running?" – Yes

Events 6 and 7 Continued

Note: Most likely injection sources are Core Spray, Condensate/Feedwater, CRD and/or Liquid Poison.

SRO Continued

- **Enters N1-EOP-8, RPV Blowdown: (CT-2.0)**
 - Answers "Are all control rods inserted to at least position 04?" – Yes
 - Answers "Drywell pressure?" – At or above 3.5 psig
 - Directs EC initiation
 - Answers "Torus water level?" – Above 8.0 ft
 - Directs open 3 ERVs
- Verifies injection of entire contents of Liquid Poison tank
- **Directs injection with available systems to restore and maintain RPV water level above -84 inches (CT-2.0)**
- Directs installation of Core Spray jumpers (N1-EOP-1 attachment 4) to allow control of Core Spray IVs
- Transitions back to normal level control leg of N1-EOP-2
- Directs restoration of RPV level to 53-95 inches

RO/BOP

- Updates crew on containment parameters
- Locks out Containment Spray pumps
- Recognizes/reports trip of Feedwater pump 12

Events 6 and 7 Continued

Role Play: If requested to pull HPCI fuses, wait 1 minute and **insert remote:**

FW24, Removal of HPCI Fuses FU8/FU9

TRG 27

Report task completion.

RO/BOP Continued

- When torus pressure exceeds 13 psig or drywell temperature approaches 300°F:
 - Verifies all Recirc pump are tripped
 - Trips all Drywell cooling fans
 - **Initiates Containment Spray per N1-EOP-1 attachment 17 (CT-1.0)**
 - Verifies started two Containment Spray pumps (111 or 122 preferred)
 - May start additional Containment Spray and Containment Spray Raw Water pumps as necessary
- Maximizes RPV injection with CRD and Liquid Poison
- Bypasses ADS
- Verifies EC initiation
- When RPV level drops below -84 inches:
 - Initiates ECs
 - **Opens 3 ERVs (CT-2.0)**
- Verifies Liquid Poison injection to inject entire contents of Liquid Poison tank
- **Injects with available systems to restore and maintain RPV water level above -84 inches (CT-2.0)**
- Installs Core Spray jumpers (N1-EOP-1 attachment 4)

Events 6 and 7 Continued

RO/BOP Continued

- Throttles Core Spray IVs as necessary to control RPV level
- Restores RPV level to 53-95 inches

TERMINATING CUE

- RPV Blowdown in progress
- RPV Water Level restored above -84 inches
- Containment parameters controlled in accordance with N1-EOP-1 attachment 17

NMP SIMULATOR SCENARIO

NRC Scenario 2

REV. 0

No. of Pages: 32

RPS MG SET TRIPS, CRD PUMP TRIPS, LOSS OF VACUUM, ATWS, SDV RUPTURE

PREPARER TKB DATE 1/26/09

VALIDATED Gallagher, Blum, Wallace DATE 1/19/09

GEN SUPERVISOR
OPS TRAINING T. Allen DATE 1/26/2009

OPERATIONS
MANAGER N/A - Exam Security DATE _____

CONFIGURATION
CONTROL N/A - Exam Security DATE _____

SCENARIO SUMMARY

Length: 90 minutes

Initial Power Level: Approximately 100% power

Mitigating Strategy Code: SC1, Primary system leak in secondary containment, exceed max safe level and/or temperature in 2 or more areas, blowdown required

The crew assumes the shift at approximately 100% power. They are directed to transfer the Powerboard 101 supply from the normal breaker, R1014, to the alternate breaker, R1011.

Following transfer of this power supply, RPS motor generator set 141 trips. This results in a half scram on RPS channel 12 and a partial loss of Feedwater heating. The crew will enter SOP-16.1 for the partial loss of Feedwater heating, and enter SOP-1.1 to maintain Reactor power below 1850 MWth. The crew will dispatch an operator to power RPS trip bus 141 from the maintenance supply. Once power is restored to the trip bus, the crew will reset the half scram, reset the Feedwater heaters and exit SOP-16.1.

Once the half scram is reset, Control Rod Drive (CRD) pump 12 trips. The crew will enter SOP-5.1 for the loss of CRD and start CRD pump 11. The SRO will review Technical Specifications for the loss of the CRD pump. Once CRD header pressure is restored, Reactor pressure instrument 36-07C fails low. The SRO will review Technical Specifications for the loss of automatic scram instrumentation.

Following the Technical Specification determination, main condenser vacuum begins to degrade. The crew will enter SOP-25.2 for the unplanned loss of vacuum, and SOP-1.1 to

lower Reactor power. Vacuum will continue to degrade, resulting in the crew inserting a manual Reactor scram. Control rods will not fully insert on the scram. Reactor power will lower below 6%. The crew will enter EOP-3, Failure to Scram. Approximately three minutes into the Failure to Scram, main condenser vacuum will degrade to the point at which Turbine Bypass Valves trip closed. The crew will transfer RPV pressure control to the Emergency Condensers as necessary.

Following the scram, a leak will develop from the Scram Discharge Volume. The crew will enter EOP-5 due to high area radiation levels. An operator will be dispatched to the Reactor Building to determine general area temperatures and radiation levels. RPS will fail to reset, resulting in the inability to isolate the leak or insert control rods. The operator will report two general area temperatures above the maximum safe level. The crew will perform an RPV Blowdown. Due to the failure to scram, the crew will be required to terminate and prevent all RPV injection except Boron and CRD, and then reinject with Feedwater once RPV pressure is below 288 psig.

Major Procedures: N1-SOP-16.1, N1-SOP-5.1, N1-SOP-25.1, N1-SOP-1.1, N1-EOP-3, N1-EOP-3.1, N1-EOP-5, N1-EOP-8

EAL Classification: Site Area Emergency, EAL 4.1.1

Termination Criteria: RPV water level controlled in assigned band, RPV Blowdown in progress

I. SIMULATOR SET UP

A. IC Number: IC 172

B. Presets/Function Key Assignments

1. Malfunctions:

- a. CT01C, CT Pump 121 Trip PRESET
- b. RP01B, Reactor Trip Bus Motor Generator Trips 141 TRG 1
- c. RD35B, CRD Hydraulic Pump 12 Trip TRG 2
- d. RP17B, RPV PT 36-07C Failed Low TRG 3
- e. MC01, Main Condenser Air Inleakage, RT=5:00, FV=25 TRG 4
- f. RD33A, Control Rod Bank Blocked Bank 1, Insert Fail Position, FV=12
PRESET
- g. RD33B, Control Rod Bank Blocked Bank 2, Insert Fail Position, FV=8
PRESET
- h. RD33C, Control Rod Bank Blocked Bank 3, Insert Fail Position, FV=6
PRESET
- i. RD33D, Control Rod Bank Blocked Bank 4, Insert Fail Position, FV=8
PRESET
- j. RD33E, Control Rod Bank Blocked Bank 5, Insert Fail Position, FV=12
PRESET
- k. RD41, Scram Discharge Volume Rupture, DT=8:00, RT=1:00, FV=100
TRG 26

2. Remotes:

- a. RP02, Rx Trip Bus 141 Pwr Source, FV=maint TRG 16
- b. MS05, FW Htr String 12 Reset, FV=reset TRG 17
- c. FW24, Removal of HPCI Fuses FU8/FU9, FV=pulled TRG 19

3. Overrides:

- a. OVR-5DS267LO2348 ON G, FV=off
(Mimics racking out CRD pump 12 breaker) TRG 18
- b. OVR-13S22DI45613 Set 1E44 Reac. Trip Reset, FV=reset
(Prevents reset of RPS) TRG 26

4. Annunciators:

- a. None

5. Triggers:

- a. TRG 26 – Changes condenser leak to 100% severity, inserts Scram Discharge Volume leak, and disables RPS reset pushbutton when the mode switch is taken to SHUTDOWN
 - i. Event Action: zdrpstdn==1
 - ii. Command: imf mc01 (0 0) 100

C. Equipment Out of Service

1. Containment Spray pump 121 control switch is in pull-to-lock with a yellow clearance tag applied
2. Containment Spray pump 121 suction valve is closed with a yellow clearance tag applied

D. Support Documentation

1. N1-OP-30 marked up to step H.8.2

E. Miscellaneous

1. Protect the following equipment:
 - a. Containment Spray and Containment Spray Raw Water pumps 111, 112, 122
 - b. EDG 102
 - c. PB 102
2. Update the divisional status board:
 - a. Containment Spray 12 – Red
 - b. Containment Spray 11 – Green
 - c. EDG 102 - Green

II.

SHIFT TURNOVER INFORMATION

OFF GOING SHIFT: N D

DATE: Today

PART I: To be performed by the oncoming Operator before assuming the shift.

- Control Panel Walkdown (all panels) (SM, CRS, STA, RO, CRE)

PART II: To be reviewed by the oncoming Operator before assuming the shift.

- Shift Manager Log (SM, CRS, STA)
- RO Log (RO)
- Lit Control Room Annunciators (SM, CRS, STA, RO, CRE)
- Shift Turnover Checklist (ALL)
- LCO Status (SM, CRS, STA)
- Computer Alarm Summary (RO)

Evolutions/General Information/Equipment Status:

Plant is operating at approximately 100% power

Containment Spray pump 121 is out of service for planned maintenance (Day 1 of planned 3 day LCO)

PART III: Remarks/Planned Evolutions:

Transfer Powerboard 101 supply from R1014 to R1011 in accordance with N1-OP-30 section H.8.0. Previous shift has completed step H.8.1.

PART IV: To be reviewed/accomplished shortly after assuming the shift:

- Review new Clearances (SM)
- Shift Crew Composition (SM/CRS)
- Test Control Annunciators (CRE)

| TITLE | NAME | TITLE | NAME |
|--------|------|-------|------|
| SRO | | | |
| ATC RO | | | |
| BOP RO | | | |
| | | | |

III. PERFORMANCE OBJECTIVES

A. Critical Tasks:

- CT-1.0 Given an un-isolable primary system leak outside primary containment and two general area temperatures above the Maximum Safe Value, the crew will perform an RPV Blowdown, in accordance with N1-EOP-5.
- CT-2.0 Given a failure to scram and the need for an RPV Blowdown, the crew will terminate and prevent all RPV injection except Boron and CRD, and then re-establish injection to the RPV with Condensate/Feedwater, CRD and Boron after RPV pressure lowers below the Minimum Steam Cooling Pressure (Table J) to restore and maintain RPV water level above -109 inches, in accordance with N1-EOP-3 and N1-EOP-8.

B. Performance Objectives:

- PO-1.0 Given the plant operating at power, the crew will transfer the Powerboard 101 supply from R1014 to R1011, in accordance with N1-OP-30.
- PO-2.0 Given a trip of RPS MG Set 141, the crew will restore RPS trip bus 141, in accordance with N1-ARP-F4.
- PO-3.0 Given a trip of the operating CRD pump, the crew will start the standby pump, in accordance with N1-SOP-5.1.
- PO-4.0 Given a failure of RPV pressure instrument 36-07C, the crew will respond to the loss, in accordance with N1-ARP-F1.
- PO-5.0 Given an unplanned loss of main condenser vacuum, the crew will respond to the loss, in accordance with N1-SOP-25.1.
- PO-6.0 Given a failure to scram, the crew will respond to the event, in accordance with N1-EOP-3.
- PO-7.0 Given a rupture in the Scram Discharge Volume, the crew will respond to the event, in accordance with N1-EOP-5.
- PO-8.0 Given the plant in a condition requiring emergency classification, the SRO shall classify the events properly, complete initial notification forms, and discuss the bases for the classification in accordance with the emergency plan procedure.
- PO-9.0 Given the plant or a plant system in a condition requiring Technical Specification action, identify the deviation and any required actions/notifications.

**INSTRUCTOR ACTIONS/
PLANT RESPONSE**

OPERATOR ACTIONS

Take the simulator out of freeze before the crew enters for the pre-shift walkdown and briefing.
Allow no more than 5 minutes for panel walkdown

Event 1

Transfer Powerboard 101 supply from R1014 to R1011

The initiation point for this event is when the SRO directs the performance of Section H.8.0 of N1-OP-30.

Note: Annunciator A5-2-1 expected while PB101 SUPPLY BREAKER INTERLOCK BY-PASS SWITCH is in BYPASS

CREW

Crew conducts pre-brief, walks down the panels, assumes the shift

PO-1.0

SRO

- Directs transferring Powerboard 101 supply from R1014 to R1011 in accordance with N1-OP-30
- Provides oversight for evolution

RO

- Monitors plant parameters

BOP

- Acknowledges direction from the SRO
- Places PB101 SUPPLY BREAKER INTERLOCK BY-PASS SWITCH in BYPASS
- Inserts Sync Key in Breaker R1011
- Turns Sync Key ON
- Confirms incoming AND running voltage NORMAL
- Closes Breaker R1011
- Turns Sync Key OFF
- Removes Sync Key

Event 1 Continued

BOP Continued

- Opens Breaker R1014
- Places PB101 SUPPLY BREAKER INTERLOCK BY-PASS SWITCH in NORMAL

Event 2

RPS MG Set 141 Trips

When directed by the examiner, **insert malfunction:**

RP01B, Reactor Trip Bus Motor Generator Trips 141

TRG 1

*RPS channel 12 scram lights de-energize
Reactor power slowly rises 2-4 MWth due to partial loss of Feedwater heating*

Expected annunciators:

F4-3-2, Rx Trip Bus MG Set 141 Trouble

F4-2-8, RPS Ch 12 Auto Reactor Trip

F4-3-8, RPS Ch 12 Man Reactor Trip

Note: This event leads to a partial loss of Feedwater Heating due to the loss of power to the Feedwater Heater Extraction Steam Non-Return Valve solenoids for String 12. The Extraction Steam Non-Return Valves fail closed on the loss of power to the solenoids, which stops heating steam from entering the Feedwater Heaters.

PO-2.0

CREW

- Recognize/report half scram
- Recognize/report loss of RPS MG Set 141

SRO

- Acknowledges reports
- Directs execution of N1-ARP-F4
- Directs power reduction in accordance with N1-SOP-1.1 as necessary to restore and maintain Reactor power below 1850 MWth
- Provides oversight for reactivity manipulation
- May reference Tech Spec 3.6.12 for MG set protective instrumentation

Event 2 Continued

Role Play: When dispatched as operator to perform dead bus transfer of RPS Trip Bus 141, wait 5 minutes and **insert remote:**

RP02, Rx Trip Bus 141 Pwr Source, FV=maint

TRG 16

Then report that the dead bus transfer is complete and OP-48 step H.5.8 is to the control room.

RO

- Monitors plant parameters
- Performs power reduction in accordance with N1-SOP-1.1 as necessary to restore and maintain Reactor power below 1850 MWth
- Monitors APRMs
- Monitors core thermal power
- Resets half scram

BOP

- Executes N1-ARP-F4-3-2
- Dispatches operator to perform dead bus transfer of RPS Trip Bus 141 per N1-OP-48, section H.5.0
- Enters N1-SOP-16.1, Feedwater System Failures, for partial loss of Feedwater heating
 - Answers "Problem with FWLC, FW Pumps or FW Heating?" FW Heating
 - Determines loss of only 12 FW Heating string due to loss of RPS Trip Bus 141
 - Assesses Feedwater temperatures (Computer points A390, A392, A393, A394, A395) versus Minimum FW Temp Table

Event 2 Continued

Role Play: If dispatched as operator to reset 12 Feedwater Heater string, wait 2 minutes and **insert remote:**

MS05, FW Htr String 12 Reset, FV=reset

TRG 17

Then report 12 Feedwater Heater string is reset.

BOP Continued

- Notifies crew to adjust Reactor power per N1-SOP-1.1 as necessary to maintain Reactor power less than or equal to 1850 MWth and Feedwater temperatures (Computer points A390 and A392) above minimum temperature
- Acknowledges completion of RPS trip bus 141 dead transfer
- Executes N1-ARP-F4-2-8
 - Resets half scram
- May direct operator to reset 12 Feedwater Heater string

Event 3

CRD Pump 12 Trips

When directed by examiner, **insert malfunction:**

RD35B, CRD Hydraulic Pump 12 Trip

TRG 2

CRD pump 12 red light off, green light on

CRD pressures and flows lower

Expected annunciators:

F3-1-3, Control Rod Drive Pump 12 Trip-Vib

F3-1-5, CRD Charging Wtr Pressure Hi/Lo

Role Play: If dispatched as operator to investigate CRD pump 12 trip, wait 2 minutes and report that there is an overcurrent trip on the motor breaker, but no obvious abnormalities at the pump.

Role Play: If dispatched as operator to check on the start of CRD pump 11, wait 2 minutes and report a good pump start.

PO-3.0

CREW

- Recognize/report trip of CRD pump 12

SRO

- Acknowledges report
- May direct response to N1-ARP-F3
- Directs entry into N1-SOP-5.1
- Declares CRD pump 12 inoperable
- Determines Tech Spec 3.1.6.b applies, requiring entry into a 7 day LCO

RO

- Monitors plant parameters

BOP

- May execute N1-ARP-F3
- Enters N1-SOP-5.1
- Answers "Is a CRD pump operating?"
No
- Starts CRD pump 11
- Green flags CRD pump 12 control switch

Event 3 Continued

Note: CRD flow may be higher 32 to 33 x 10³ lbm/hr on FIC RD51 while the CRD flow control valve responds.

Role Play: If dispatched as operator to rack out CRD pump 12 motor breaker, wait ten minutes and insert override:

OVR-5DS267LO2348 ON G, FV=off

TRG 18

Then report CRD pump 12 motor breaker racked out.

Role Play: If dispatched as operator to shift RPV level backfill system per N1-OP-58, section H.2.0, wait 5 minutes and report task completion.

BOP Continued

- Observes proper operation of CRD pump 11:
 - Less than or equal to 220 amps
 - CRD Flow, 32 to 33 x 10³ lbm/hr on FIC RD51
 - F3-3-3 clear
- May place CRD pump 12 control switch in pull-to-lock
- May dispatch operator to rack out CRD pump 12 motor breaker
- May dispatch operator to shift RPV level backfill system per N1-OP-58, section H.2.0

**INSTRUCTOR ACTIONS/
PLANT RESPONSE**

OPERATOR ACTIONS

Event 4

Reactor Pressure Instrument 36-07C Fails Low

Following the start of CRD pump 11 and when directed by the examiner, **insert malfunction:**

RP17B, RPV PT 36-07C Failed Low

TRG 3

ATS red trouble light on

Expected annunciators:

F1-4-2, RPS Ch 11 Main Steam Isolation Auto

Operate

F1-4-7, RPS Ch 11 Reactor Press Low

PO-4.0

CREW

- Recognize/report annunciators

SRO

- Acknowledges reports
- Directs execution of N1-ARP-F1
- Determines pressure instrument 36-07C is inoperable for the high reactor pressure scram function
- Determines Tech Spec table 3.6.2.a note O applies, requiring a half scram to be inserted on RPS channel 11 within 12 hours

RO

- Monitors plant parameters

BOP

- Executes N1-ARP-F1-4-7
- Confirms alternate RPV pressure indications are normal

Event 4 Continued

Role Play: When dispatched as operator to check local pressure instrument indication, wait 2 minutes and report that pressure transmitter 36-07C indicates downscale at the ATS cabinet with the gross failure light on.

BOP Continued

- Verifies computer points W039 and C015 are in alarm
- Notifies SRO to verify Tech Specs
- Dispatches operator to check local pressure instrument indication
- Acknowledges/reports failure of pressure transmitter 36-07C

INSTRUCTOR ACTIONS/
PLANT RESPONSE

OPERATOR ACTIONS

Event 5

Loss of Main Condenser Vacuum

Following Tech Spec determination and when directed by examiner, **insert malfunction:**

**MC01, Main Condenser Air Inleakage, RT=5:00,
FV=25**

TRG 4

Offgas system flow slowly rises

Main Condenser vacuum slowly lowers

Main Generator electrical output slowly lowers

Expected Annunciator:

*A1-3-4, Condenser Vacuum Below 24" HG
(delayed)*

PO-5.0

CREW

- Recognize/report lowering Main Condenser vacuum

SRO

- Acknowledges report
- Directs execution of N1-SOP-25.1
- Directs emergency power reduction per N1-SOP-1.1
- Provides oversight for reactivity manipulation
- Directs manual Reactor scram as vacuum approaches 22.1" Hgv

RO

- Monitors plant parameters
- Lowers Reactor power per N1-SOP-1.1 to attempt to stabilize vacuum
- Monitors APRMs
- Monitors core thermal power
- Monitors vacuum

Event 5 Continued

Note: Verify the following malfunction is automatically inserted when the mode switch is taken to SHUTDOWN:

MC01, Main Condenser Air Inleakage, FV=100

Main Condenser vacuum lowers at a higher rate

Role Play: If dispatched as operator to check for Main Condenser vacuum leaks in field, wait 5 minutes and report that you have been unable to find any obvious vacuum leaks.

Role Play: If dispatched as operator to place standby Steam Jet Air Ejectors in service, wait 10 minutes and report the standby Steam Jet Air Ejectors have been placed in service.

Note: As vacuum lowers, the turbine will trip at 22.1" Hgv, the Turbine Bypass valves will close at 10" Hgv, and the MSIVs will close at 7" Hgv.

Note: With power above ~45%, the crew will insert a manual scram versus a manual turbine trip, prior to 22.1" Hgv. The turbine will trip approximately 5 seconds after an automatic scram signal is generated on low RPV water level due to shrink after the manual scram.

RO Continued

- Monitors position on power-to-flow map
- Inserts manual Reactor scram as vacuum approaches 22.1" Hgv

BOP

- Executes N1-SOP-25.1
- Notifies crew to lower power per N1-SOP-1.1 to attempt to stabilize vacuum
- Verifies proper operation of the following, as time permits:
 - Circ Water System
 - Steam Jet Air Ejectors
 - Off Gas System
 - Condensate System
 - Turbine Gland Seal System
- May dispatch operator to check in field for leaks
- May dispatch operator to place standby Steam Jet Air Ejectors in service
- Answers "F3-4-6 First Stage Bowl Press in alarm?" No
- Notifies crew to scram before vacuum reaches 22.1" Hgv

Events 6 and 7

Failure to Scram and RPS Fails to Reset

The following **malfunctions** are **preset** to cause the failure to scram:

**RD33A, Control Rod Bank Blocked Bank 1,
FV=12**

**RD33B, Control Rod Bank Blocked Bank 2,
FV=8**

**RD33C, Control Rod Bank Blocked Bank 3,
FV=6**

**RD33D, Control Rod Bank Blocked Bank 4,
FV=8**

**RD33E, Control Rod Bank Blocked Bank 5,
FV=12**

Control rods partially insert

Reactor power lowers below 6%

Verify the following **override** is **automatically inserted** when the mode switch is taken to SHUTDOWN to cause RPS to fail to reset:

**OVR-13S22DI45613 SET 1E44 Reac. Trip Reset,
FV=reset**

TRG 26

When RPS reset pushbutton is reset:

RPS lights fail to energize

RPS scram annunciators fail to extinguish

Scram valves fail to reposition (resulting in inability to isolate Scram Discharge Volume from RPV)

PO-6.0

CREW

- Recognize/report failure of control rods to fully insert

Event 6 and 7 Continued

Note: SRO may elect to not install the N1-EOP-1 Att 2 jumpers given need for eventual MSIV closure due to low vacuum.

Note: Expected RPV water level control band is 53 to 95 inches.

SRO

- Acknowledges reports
- Enters N1-EOP-2 due to RPV water level below 53 inches
- Answers "Are all control rods inserted to at least position 04?" No
- Answers "Will the reactor stay shutdown without boron?"
No/Unknown
- Exits N1-EOP-2, enters N1-EOP-3
- Directs ADS bypassed
- Directs prevention of Core Spray injection with N1-EOP-1 attachment 4

N1-EOP-3 Level Leg Actions:

- Answers "Is any main steam line open?" Yes or No, depending on position of MSIVs and degradation of vacuum
- If answers previous question yes, then directs bypass of the low-low RPV water level MSIV isolation with N1-EOP-1 attachment 2
- Determines Reactor power is below 6%
- Answers "Was level previously lowered at circle 8?" No
- Directs RPV water level control -109 to 95 inches using only Condensate/Feedwater and CRD

Events 6 and 7 Continued

Note: Expected initial RPV pressure control band is 800 to 1000 psig.

Note: May decide to leave MSIVs open until 10" Hgv to maximize use of main condenser as a heat sink given the failure to scram.

Note: May determine Reactor is "shutdown" based on IRMs on range 6 or below once fully inserted.

Note: Once "shutdown", a depressurization may be commenced, if no Boron has been injected, to minimize the driving head for the Scram Discharge Volume Leak. The cooldown rate must be maintained below 100°F/hr.

SRO Continued

N1-EOP-3 Pressure Leg Actions:

- Answers "Is any ERV cycling?" No
- Directs RPV pressure stabilized below 1080 psig using Turbine Bypass Valves, ERVs and/or Emergency Condensers
- May direct MSIVs closed as vacuum continues to degrade
- Waits until Reactor is shutdown with no boron injected OR Cold Shutdown Boron is injected (1050 gal)
- If the reactor returns critical, re-enters Power leg and returns to circle 12
- May direct depressurization of the RPV using Turbine Bypass valves, ERVs or Emergency Condensers

N1-EOP-3 Power Leg Actions:

- Directs verification of ARI
- Answers "Is the Turbine Generator online?" No
- Answers "Reactor power?" At or below 6%
- Directs execution of N1-EOP-3.1
- If the Reactor is shutdown AND no boron has been injected, exits Power leg and enters N1-SOP-1
- May direct injection of Liquid Poison

Events 6 and 7 Continued

Note: SRO may elect to not install the N1-EOP-1 Att 2 jumpers given need for eventual MSIV closure due to low vacuum.

RO

- Depresses RPS Trip pushbuttons
- Provides scram report
- Bypasses Core Spray IV interlocks per N1-EOP-1 Att 4 by installing six jumpers inside Panel N
- Bypasses low-low MSIV isolation per N1-EOP-1 Att 2 by installing four jumpers inside Panel N, if directed
- Controls RPV pressure in assigned band
- When directed performs N1-EOP-3.1, Section 3 (driving rods) and/or 4 (manual scrams) (See actions below)

Possible N1-EOP-3.1 Section 3 Actions:

- Verifies a CRD Pump running
- Places Reactor Mode Switch in REFUEL
- Places ARI OVERRIDE switch in OVERRIDE
- Installs RPS jumpers (5, 6, 12, 13)
- Attempts to reset the scram
- Recognizes/reports scram cannot be reset

Possible N1-EOP-3.1 Section 4 Actions:

- Places ARI OVERRIDE switch in OVERRIDE
- Installs RPS jumpers (5, 6, 12, 13)
- Attempts to reset the scram
- Recognizes/reports scram cannot be reset

Events 6 and 7 Continued

BOP

- Bypasses ADS
- Controls RPV water level in assigned band
- Verifies ARI
- Injects Liquid Poison, if directed
 - Reports initial tank level
 - Starts Liquid Poison pump 11 or 12
 - Verifies RWCU isolated
- Closes MSIVs, if directed

Event 8

Scram Discharge Volume Rupture

Verify the following **malfunction** is automatically **inserted** when the mode switch is taken to shutdown:

**RD41, Scram Discharge Volume Rupture,
DT=8:00, RT=1:00, FV=100**

TRG 26

Secondary containment temperatures and radiation levels begin to rise

RPV pressure slowly lowers

Expected annunciators:

H2-2-8, Fire Header Pressure Low

MFP 2-1-1-6, React Bldg 261 Local Panel No 6 Fire

MFP 2-2-1-2, Diesel Fire Pump #1 Running

MFP 2-2-2-2, Electric Fire Pump #1 Running

L1-3-4, React Bldg/Atm Diff Press

K1-1-1, Rx Bldg Area High Temp

H1-4-8, Area Radiation Monitors

L1-4-3, React Bldg Vent Rad Monitor Off Normal

L1-3-6, Emer Vent Sys Channel 11 Relay Operate

L1-4-6, Emer Vent Sys Channel 12 Relay Operate

Note: Reactor Building D/P will go positive for a short period of time while the ventilation dampers respond to the steam leak. Reactor Building D/P will then return to a negative value, which may allow for temporarily exiting N1-EOP-5 if other entry conditions are not yet met. Reactor Building D/P will go positive again when normal Ventilation trips and Emergency Ventilation starts due to high exhaust radiation levels.

PO-7.0

CREW

- Recognize/report annunciators
- Diagnose leak in secondary containment

SRO

- Acknowledges reports
- Directs response to annunciators
- Enters N1-EOP-5 due to positive Reactor Building D/P
- Re-enters N1-EOP-5 due to high area radiation levels and Reactor Building Ventilation exhaust radiation levels

Event 8 Continued

Note: May not proceed to N1-EOP-5 circle 28 until field report confirms the leak is from a primary system (Scram Discharge Volume) AND the crew determines the discharge cannot be isolated (RPS cannot be reset to close scram valves).

SRO Continued

- When Reactor Building Ventilation exhaust radiation exceeds 5 mr/hr, directs verification of Reactor Building Ventilation isolation and Emergency Ventilation initiation
- Determines area radiation levels in Detail R are exceeded, goes to N1-EOP-5 circle 27
- Determines primary system is discharging into the Reactor Building and the discharge cannot be isolated, goes to N1-EOP-5 circle 28
- Before any area temperature or radiation level reaches a Maximum Safe Value:
 - Verifies Reactor Scram
 - Re-enters N1-EOP-2
- Waits until 2 or more General Areas are above Maximum Safe Values of the same parameter (Detail S)
- **When 2 General Areas are reported above the Maximum Safe Value for temperature, enters N1-EOP-8 (CT-1.0)**
- Answers "Are all control rods inserted to at least position 04?" No
- Answers "Will the reactor stay shutdown without boron?"
No/Unknown
- **Directs all RPV injection except boron and CRD to be terminated and prevented per N1-EOP-1 attachment 24 (CT-2.0)**

Event 8 Continued

Note: Expected RPV water level control band is 53 to 95 inches.

SRO Continued

- Directs initiation of Emergency Condensers
- Answers "Torus water level?" Above 8 ft
- Directs open 3 ERVs
- Returns to N1-EOP-3 at circle 10
- Answers "Is any ERV open?" Yes
- Waits until RPV pressure is below the value in Table J (288 psig for 3 ERVs open)
- Answers "Was level intentionally lower before you entered EOP-8?" No
- Returns to N1-EOP-3 circle 7
- **Directs RPV water level controlled between -109 and 95 inches using only Condensate/Feedwater and CRD (CT-2.0)**

RO/BOP

- Responds to annunciators
- Verifies Reactor Building Ventilation isolation and Emergency Ventilation initiation per N1-EOP-HC attachment 6 or N1-OP-10 section H.2.0

Event 8 Continued

RO/BOP Continued

Possible actions per N1-EOP-HC
attachment 6:

- Verify the following fans started:
 - 202-53, EVS FAN 11
 - 202-33, EVS FAN 12
- Verify the following fan control switches in OFF:
 - REACTOR BLDG SUPPLY FAN 11
 - REACTOR BLDG SUPPLY FAN 12
 - REACTOR BLDG EXHAUST FAN 11
 - REACTOR BLDG EXHAUST FAN 12
- Verify open the following valves:
 - EM VENT EXHAUST FAN 11
OUTLET BV
 - 202-37, EM VENTILATION LOOP
11 INLET BV
 - EM VENT EXHAUST FAN 12
OUTLET BV
 - 202-38, EM VENTILATION LOOP
12 INLET BV
- Verify closed the following valves:
 - EM VENTILATION LOOP 11
COOLING BV
 - EM VENTILATION LOOP 12
COOLING BV
 - 202-15, REACTOR BLDG
SUPPLY ISOLATION VALVE 11
 - 202-16, REACTOR BLDG
SUPPLY ISOLATION VALVE 12
 - 202-32, REACTOR BUILDING
EXHAUST ISOLATION VALVE 11
 - 202-31, REACTOR BUILDING
EXHAUST ISOLATION VALVE 12

Event 8 Continued

Role Play: When informed as RP of Reactor Building Ventilation lineup, acknowledge report.

RO/BOP Continued

Possible actions per N1-EOP-HC attachment 6 (continued):

- Notify Rad Protection, the normal Reactor Building Emergency Ventilation system has isolated AND Reactor Building Emergency Ventilation system is in service
- BEFORE 30 minutes has elapsed perform ONE of the following in accordance with N1-EOP-HC, Attachment 7:
 - Secure the train of RBEVS associated with an inoperable EDG
 - OR
 - Secure a train of RBEVS as directed by the CRS or SM
- WHEN RBEVS operation is NO longer required, secure RBEVS AND establish normal Reactor Building Ventilation per N1-OP-10

Possible actions per N1-EOP-HC attachment 7:

- Place EVS FAN 11(12) control switch in Normal-After-START (red flagged)
- Place EM VENTILATION LOOP 11(12) INLET BV, control switch in OPEN
- Place EVS FAN 12(11) control switch in PULL-TO-LOCK

Event 8 Continued

RO/BOP Continued

Possible actions per N1-EOP-HC

attachment 7 (continued):

- Notify SM to enter LCO 3.4.4.e (7 day plant shutdown LCO when one train of
- RBEVS in inoperable)
- Verify closed EM VENTILATION LOOP 12(11) INLET BV

Possible actions per N1-OP-10 section

H.2.0:

- Confirm the following fans started:
 - 202-53, EVS FAN 11
 - 202-33, EVS FAN 12
- Confirm the following fans stopped:
 - 202-01, REACTOR BLDG SUPPLY FAN 11
 - 202-02, REACTOR BLDG SUPPLY FAN 12
 - 202-05, REACTOR BLDG EXHAUST FAN 11
 - 202-06, REACTOR BLDG EXHAUST FAN 12
- Confirm open the following valves:
 - 202-34, EM VENT EXHAUST FAN 11 OUTLET BV
 - 202-37, EM VENTILATION LOOP 11 INLET BV
 - 202-35, EM VENT EXHAUST FAN 12 OUTLET BV
 - 202-38, EM VENTILATION LOOP 12 INLET BV

Event 8 Continued

RO/BOP Continued

Possible actions per N1-OP-10 section

H.2.0 (continued):

- Confirm closed the following valves:
 - 202-74, EM VENTILATION LOOP
11 COOLING BV
 - 202-75, EM VENTILATION LOOP
12 COOLING BV
 - 202-03, REACTOR BLDG
SUPPLY FAN 11 INLET DAMPER
 - 202-04, REACTOR BLDG
SUPPLY FAN 12 INLET DAMPER
 - 202-80, REACTOR BLDG
EXHAUST FAN 11 OUTLET
DAMPER
 - 202-81, REACTOR BLDG
EXHAUST FAN 12 OUTLET
DAMPER
 - 202-15, REACTOR BLDG
SUPPLY ISOLATION VALVE 11
 - 202-16, REACTOR BLDG
SUPPLY ISOLATION VALVE 12
 - 202-32, REACTOR BUILDING
EXHAUST ISOLATION VALVE 11
 - 202-31, REACTOR BUILDING
EXHAUST ISOLATION VALVE 12
- Notify Rad Protection, the normal
Reactor Building Emergency
Ventilation system has isolated AND
Reactor Building Emergency
Ventilation system is in service

Role Play: When informed as RP of Reactor
Building Ventilation lineup, acknowledge report.

Event 8 Continued

RO/BOP Continued

Possible actions per N1-OP-10 section

H.2.0 (continued):

- BEFORE 30 minutes has elapsed, secure one train of RBEVS:
 - Place EVS FAN 11(12) control switch to RED FLAG
 - Place EM VENTILATION LOOP 11(12) INLET BV control switch to OPEN
 - Verify flow approximately 1600 CFM
 - Place EVS FAN 12(11) control switch to PULL TO LOCK

- Enter LCO 3.4.4.e (7 day plant shutdown LCO when one train of EVS is inoperable)
- Verify closed EM VENTILATION LOOP 12(11) INLET BV
- Verify in OFF position the following control switches:
 - REACTOR BLDG SUPPLY FAN 11
 - REACTOR BLDG SUPPLY FAN 12
 - REACTOR BLDG EXHAUST FAN 11
 - REACTOR BLDG EXHAUST FAN 12

Event 8 Continued

Role Play: When dispatched as operator and/or RP technician to determine Reactor Building General Area temperatures and radiation levels, acknowledge order. Wait 3 minutes, and then report steam leaking from the vicinity of the Scram Discharge Volume on Reactor Building 237. Report temperature and radiation levels based on the following simulator values:

- Reactor Building 237' West temp: RBTG237A
- Reactor Building 237' East temp: average of RBTG237A and RBTG237D
- Reactor Building 237' West rad: RMQAGC3
- Reactor Building 237' East rad: 75% of RMQAGC3

Then provide updated reports every 2-4 minutes, or as requested by the crew, for these four values.

Role Play: When dispatched as operator to pull HPCI fuses, wait 1 minute, then **insert remote:**

FW24, Removal of HPCI Fuses FU8/FU9, FV=pulled

TRG 19

Then report task completion.

RO/BOP Continued

- Dispatches operator and RP technician to determine Reactor Building General Area temperatures and radiation levels
- Acknowledges reports of Scram Discharge Volume leakage and corresponding temperatures and radiation levels
- Determines Scram Discharge Volume cannot be isolated from RPV due to failure of RPS to reset
- Reports 2 General Area temperatures above Maximum Safe Value (135°F)
- **Terminates and prevents all RPV injection except boron and CRD per N1-EOP-1 attachment 24 (CT-2.0)**
 - Performs one of the following:
 - Closes both FEEDWATER ISOLATION Valves 11 and 12
 - Places FEEDWATER Pumps 11 and 12 in Pull-to-Lock
 - Selects Manual on 11, 12 and 13 FWP Valve Control selector switches
 - Closes 11, 12 and 13 Feedwater FCV (Knurled Knob) full counterclockwise
 - Places FW LVL SETPOINT SETDOWN switch to OVERRIDE
 - Dispatches operator to pull HPCI fuses (FU8 and FU9)
 - Verifies Closed, FEEDWATER PUMP 13 BLOCKING VALVE

Event 8 Continued

RO/BOP Continued

- Terminates and prevents all RPV injection except boron and CRD per N1-EOP-1 attachment 24 (continued)
 - Verifies in MAN, FWP 11 BYPASS VALVE, AND set to zero output
 - Verifies in MAN, FWP 12 BYPASS VALVE, AND set to zero output
 - Performs one of the following:
 - Reopens at least one FEEDWATER ISOLATION Valves 11 and / or 12, if closed
 - Restarts FEEDWATER Pumps 11 and/or 12, if shutdown
 - IF RPV level restoration is required using the FEEDWATER System, positions FEEDWATER FCV 11 and/or 12 to maintain required RPV level
- Initiates Emergency Condensers
- **Opens 3 ERVs (CT-1.0)**
- **Injects with Condensate/Feedwater and/or CRD to restore and maintain RPV water level above -109 inches (CT-2.0)**
- Controls injection to maintain RPV water level in assigned band

TERMINATING CUE

- RPV Blowdown in progress
- RPV pressure below the value in Table J (288 psig for 3 ERVs open)
- RPV injection re-established
- RPV water level above -109 inches

NMP SIMULATOR SCENARIO

NRC Scenario 3

REV. 0

No. of Pages: 25

PLANT SHUTDOWN, CONTROL ROD DRIFTS, SEISMIC EVENT, TORUS WATER LEAK

| | | | |
|--------------------------------|---------------------------------|------|------------------|
| PREPARER | <u><i>T K Z 2</i></u> | DATE | <u>1/26/09</u> |
| VALIDATED | <u>Gallagher, Blum, Wallace</u> | DATE | <u>1/19/09</u> |
| GEN SUPERVISOR OPS TRAINING | <u><i>T. Allen</i></u> | DATE | <u>1/26/2009</u> |
| OPERATIONS MANAGER | <u>N/A – Exam Security</u> | DATE | <u></u> |
| CONFIGURATION CONTROL | <u>N/A – Exam Security</u> | DATE | <u></u> |

SCENARIO SUMMARY

Length: 90 minutes

Initial Power Level: 4% with plant shutdown in progress

Mitigating Strategy Code: PC2, loss of inventory in Torus, RPV blowdown or anticipate blowdown and depressurize to the main condenser

The crew assumes the shift at approximately 4% power during a shutdown. The crew will begin by de-inerting the primary containment. Containment isolation valve 201-31 will fail to fully close when securing the lineup. The SRO will evaluate the impact of this failure on Technical Specifications. The crew will close another isolation valve in the line, 201-32, to satisfy Technical Specifications.

Once 201-32 is closed, the crew will continue the Reactor shutdown by inserting control rods. During this evolution, IRM 16 will fail downscale. The crew will diagnose the failure and bypass the faulty IRM. The SRO will review Technical Specifications for the failed IRM.

Next, the running Condensate Transfer pump will trip. The crew will execute the annunciator response procedure and start the alternate pump. As the crew prepares to resume the plant shutdown, a control rod will begin to drift out. The crew will select the drifting control rod and drive it full in. The crew will dispatch an operator to valve out the affected Hydraulic Control Unit to prevent the control rod from continuing to drift.

A seismic event will result in a Torus water leak in the primary containment. The crew will scram the Reactor prior to Torus water level dropping to 8 feet. The crew will enter N1-EOP-4, Primary Containment Control, and attempt to add water to the Torus. Containment Spray Raw

Water pump 112 will trip when started. Containment Spray Raw Water pump 121 is out of service for maintenance. This will prevent the crew from being able to makeup to the Torus with the Containment Spray Raw Water method. The crew will be able to add water to the Torus with the lower capacity Core Spray Keep-Fill method. The crew will determine that the Torus water leak is in excess of makeup capacity and that Torus water level cannot be maintained above 8 feet. Before Torus water level reaches 8 feet, the crew will enter N1-EOP-8, RPV Blowdown. While executing the Blowdown, ERVs 112 and 122 will fail to open. The crew will take action to open alternate ERVs until three are open.

Major Procedures: N1-SOP-5.2, N1-SOP-28, N1-SOP-1, N1-EOP-2, N1-EOP-4, and N1-EOP-8

EAL Classification: Alert, EAL 8.4.4, and 8.4.6 (3.1.1 possible if ERV tailpipes become uncovered during Blowdown)

Termination Criteria: RPV Blowdown in progress, RPV water level controlled in assigned band

I. SIMULATOR SET UP

A. IC Number: IC 173

B. Presets/Function Key Assignments

1. Malfunctions:

- | | |
|---|--------|
| a. CT02C, CT Raw Water Pump 121 Trip | PRESET |
| b. NM11F, IRM Channel 16 Failure - Downscale | TRG 1 |
| c. RD02R2635, 26-35 Control Rod Failure – Drift Out | TRG 3 |
| d. RD03R2635, 26-35 Control Rod Failure – Accumulator Trouble | TRG 26 |
| e. PC05, Seismic Event Triggered | TRG 4 |
| f. PC04, Torus Water Leak, FV=15 | TRG 4 |
| g. CT02B, CT Raw Water Pump 112 Trip | PRESET |
| h. AD07B, ERV 112 Fails Closed (Burned Out Solenoid) | PRESET |
| i. AD07E, ERV 122 Fails Closed (Burned Out Solenoid) | PRESET |

2. Remotes:

- | | |
|---|--------|
| a. RD07, Reset of Rod Drift Alarm, FV=reset | TRG 26 |
| b. CS02A, CS Discharge Isolation Valve 40-12 (11), FV=close | TRG 27 |
| c. CS01A, CS Test Valve 40-06 (11) to Torus, FV=close | TRG 28 |
| d. CS02B, CS Discharge Isolation Valve 40-02 (12), FV=close | TRG 29 |
| e. CS01B, CS Test Valve 40-05 (12) to Torus, FV=close | TRG 30 |

3. Overrides:

- | | |
|--|--------|
| a. OVR-11DS74LO5529 ON "2060 VLV201-7,9,17,31 RED LAMPS ", DT=0:02, FV=ON (201-31 RED LAMP) | TRG 16 |
| b. OVR-7S25DI464 POS_2 4H12/57-11A POS B, FV=ON | TRG 2 |
| c. OVR-7S25DI467 POS_5 4H12/57-11A POS D, FV=OFF | TRG 2 |

4. Annunciators:

- | | |
|---|--------|
| a. H2-2-7, Condenser Hotwell Lvl High-Low, FV=fail off | PRESET |
| b. H2-3-7, Hotwell Level High-Low Cond Spry Pump Sump Lvl, FV=fail off | PRESET |

5. Triggers:

- | | |
|--|--|
| a. TRG 16 – Causes 201-31 red light to be overridden on when the control switch is taken to close, simulating the valve sticking in mid position | |
| i. Event Action: zdpvc31o==1 | |
| ii. Command: None | |
| b. TRG 17 – Re-inserts Torus water leak malfunction to a higher value when Torus water level lowers below 10.3 feet | |

- i. Event Action: trlevel<10.3
- ii. Command: imf pc04 (0 0) 40 15:00 15
- c. TRG 25 – Deletes the control rod drift malfunction at the same time the HCU is valved out
 - i. Event Action: None
 - ii. Command: dmf rd02r2635

C. Equipment Out of Service

- 1. Rod Worth Minimizer is inoperable.
- 2. Containment Spray Raw Water pump 121 is out of service for maintenance.

D. Support Documentation

- 1. N1-OP-9, N2 INERTING AND H2-O2 MONITORING SYSTEMS, Section G.1.0 De-Inerting/Venting for Personnel Access-Rx Coolant Temp >212 °F marked up through step 1.11.
- 3. N1-OP-43C marked up to appropriate step.
- 4. Reactivity Maneuver Instruction for shutdown control rod insertion.
- 5. Shutdown Control Rod Sequence sheets updated to current control rod.

E. Miscellaneous

- 1. Setup IRM/APRM recorders to display both IRMs and APRMs.
- 2. Place yellow clearance tag on RWM bypass keylock switch.
- 3. Place Containment Spray Raw Water pump 121 control switch in pull to lock with a yellow clearance tag.
- 4. Protect the other three Containment Spray Raw Water pumps, EDG 102 and Powerboard 102. Update Divisional Status Board appropriately.
- 5. Ensure torus is de-inerted (0 psig).
- 6. Verify bearing lift pumps are on and the turbine is on the turning gear.

II.

SHIFT TURNOVER INFORMATION

OFF GOING SHIFT: N D

DATE: Today

PART I: To be performed by the oncoming Operator before assuming the shift.

- Control Panel Walkdown (all panels) (SM, CRS, STA, RO, CRE)

PART II: To be reviewed by the oncoming Operator before assuming the shift.

- Shift Manager Log (SM, CRS, STA)
- RO Log (RO)
- Lit Control Room Annunciators (SM, CRS, STA, RO, CRE)
- Shift Turnover Checklist (ALL)
- LCO Status (SM, CRS, STA)
- Computer Alarm Summary (RO)

Evolutions/General Information/Equipment Status:

Drywell entry is required for maintenance during forced outage

Perform Containment De-Inerting per N1-OP-9

Plant shutdown to continue by inserting control rods

Containment Spray Raw Water pump 121 is out of service for maintenance (Day 1 of planned 2 day LCO)

Rod Worth Minimizer is inoperable with yellow clearance tag applied to bypass keylock switch

PART III: Remarks/Planned Evolutions:

1. Perform N1-OP-9, N₂ Inerting and H₂-O₂ Monitoring Systems starting at step G.1.6 to de-inert the Primary Containment with Rx Coolant Temp >212°F, raising oxygen concentration to >19.5%

2. Continue shutdown in accordance with N1-OP-43C

PART IV: To be reviewed/accomplished shortly after assuming the shift:

- Review new Clearances (SM)
- Shift Crew Composition (SM/CRS)
- Test Control Annunciators (CRE)

| TITLE | NAME | TITLE | NAME |
|--------|------|-------|------|
| SRO | | | |
| ATC RO | | | |
| BOP RO | | | |
| | | | |

PERFORMANCE OBJECTIVES

A. Critical Tasks:

- CT-1.0 Given a lowering Torus water level, the crew will scram the Reactor before Torus water level drops to 8 feet, in accordance with N1-EOP-4.
- CT-2.0 Given a lowering Torus water level, the crew will execute N1-EOP-8, RPV Blowdown, when it is determined Torus water level cannot be maintained above 8 feet, in accordance with N1-EOP-4.

B. Performance Objectives:

- PO-1.0 Given the plant in a shutdown, the crew will perform Primary Containment de-inerting, in accordance with N1-OP-9, N₂ Inerting and H₂-O₂ Monitoring Systems.
- PO-2.0 Given a failure of a Primary Containment Isolation Valve to close, the crew will recognize the loss and take proper actions, in accordance with Technical Specifications.
- PO-3.0 Given the plant in a shutdown, the crew will insert control rods, in accordance with N1-OP-5.
- PO-4.0 Given a failed IRM, the crew will bypass the IRM, in accordance with N1-OP-38B.
- PO-5.0 Given a trip of the running Condensate Transfer pump, the crew will start the standby Condensate Transfer pump, in accordance with N1-ARP-H3.
- PO-6.0 Given a control rod drifting out, the crew will insert the control rod and valve out the corresponding Hydraulic Control Unit, in accordance with N1-SOP-5.2.
- PO-7.0 Given a seismic event, the crew will respond to the event, in accordance with N1-SOP-28.
- PO-8.0 Given a torus water leak, the crew will attempt to establish makeup injection, in accordance with N1-EOP-4.
- PO-9.0 Given the plant in a condition requiring emergency classification, the SRO shall classify the events properly, complete initial notification forms, and discuss the bases for the classification in accordance with the emergency plan procedure.
- PO-10.0 Given the plant or a plant system in a condition requiring Technical Specification action, identify the deviation and any required actions/notifications.

Take the simulator out of freeze before the crew enters for the pre-shift walkdown and briefing. Allow no more than 5 minutes for panel walkdown

Event 1

Perform Containment De-Inerting

The initiation point for this event is when the SRO directs the performance of Section G.1.0 of N1-OP-9, N₂ Inerting and H₂-O₂ Monitoring Systems. There are NO Console Operator activities related to this normal evolution.

CREW

Crew conducts pre-brief, walks down the panels, assumes the shift

PO-1.0

SRO

- Directs de-inerting the Primary Containment IAW Section G.1.0 of N1-OP-9, N₂ Inerting and H₂-O₂ Monitoring Systems

RO

- Monitors plant parameters

BOP

- Acknowledges direction from the SRO to de-inert the containment
- Opens 201-32, DW N2 VENT & PURGE ISOLATION VALVE 11
- Starts 201-35, DRYWELL & TORUS VENT & PURGE
- Verifies open the following valves:
 - 201-21, DRYWELL & TOR VENT & PURGE FAN INLET BV
 - 201-22, DRYWELL & TOR VENT & PURGE FAN OUTLET BV

Event 1 Continued

Note: The containment vacuum breakers may cycle during this event to equalize pressures.

Note: Annunciator K2-4-3, Drywell Pressure High-Low, expected.

Note: 201-31 will fail to fully close, as indicated by both red and green lights on, leading to the next event

BOP Continued

- Throttles open 201-31, DW N2 VENT & PURGE ISOLATION VALVE 12
- WHEN Drywell pressure drops BELOW 0 psig, performs the following:
 - Stops 201-35, DRYWELL & TORUS VENT & PURGE FAN
 - Verifies closed the following valves:
 - 201-21, DRYWELL & TOR VENT & PURGE FAN INLET BV
 - 201-22, DRYWELL & TOR VENT & PURGE FAN OUTLET BV
 - Verifies closed the following valves:
 - 201-32, DW N2 VENT & PURGE ISOLATION VALVE 11
 - 201-31, DW N2 VENT & PURGE ISOLATION VALVE 12

Event 2

Failure of 201-31, DW N2 VENT & PURGE ISOLATION VALVE 12 to fully close following N₂ Primary Containment De-Inerting

When the control switch for 201-31 is taken to close, verify **TRG 16** automatically **inserts** the following **override**:

OVR-11DS74LO5529 ON "2060 VLV201-7,9,17,31 RED LAMPS ", DELAY TIME=0:02, FINAL VALUE=ON (201-31 RED LAMP)

TRG 16

201-31 red light remains on

Role Play: As Shift Manager, Operations Management, Work Week Manager OR OCC, acknowledge failure of 201-31 and direct the SRO to secure from de-inerting, until the next shift. Direct the SRO to continue on with control rod insertion.

Role Play: If contacted as operator for local position indication for 201-31, wait 1 minute and report 201-31 indicates partially open.

PO-2.0

SRO

- Acknowledges report that 201-31, DW N2 VENT & PURGE ISOLATION VALVE 12 did NOT fully close
- Directs BOP to manually close 201-31
- Acknowledges report that 201-31 DW did NOT fully close
- Directs BOP to verify 201-32, DW N2 VENT & PURGE ISOLATION VALVE 11 is fully closed
- Enters T.S. 3.3.4.b
- Contacts Operations Management to notify about the failure of 201-31 to close
- Directs the crew to stop de-inerting and exit N1-OP-9

RO

- Monitors plant parameters

BOP

- Notifies Crew/SRO that 201-31 did NOT fully close
- Attempts to manually close 201-31
- Verifies 201-32 closed

Event 3

Plant Shutdown using Control Rods

There are NO Console Operator activities related to this normal evolution.

Note: Recommend allowing insertion of two control rods to allow the crew to stop at a stable point

PO-3.0

SRO

- Directs insertion of control rods for reactor shutdown in accordance with Shutdown Control Rod Sequence
- Provides oversight of reactivity maneuver

RO

- Inserts control rods to continue reactor shutdown in accordance with Shutdown Control Rod Sequence
- Observes IRM response AND ranges IRM switches as required, maintaining recorder pen as follows:
 - 0-125 scale between 25 and 75 nominal
 - 0-40 scale between 8 and 24 nominal
- Monitors and maintains reactor cooldown rate less than 100°F/hr

BOP

- Monitors Feedwater Level Control
- Monitors plant parameters
- Provides peer checks as required

Event 4

IRM 16 Fails Downscale

When a sufficient number of control rods have been inserted and directed by the examiner, **insert malfunction:**

NM11F, IRM Channel 16 Failure - Downscale

TRG 1

IRM 16 Downscale/INOP light lit

IRM 16 indicates downscale

Expected annunciators:

F3-3-1, IRM 15-18

F3-4-4, Rod Block

PO-4.0

CREW

- Respond to annunciators and diagnose IRM 16 failed downscale

SRO

- Acknowledges reports
- Reviews Tech Specs
- Determines Tech Spec 3.6.2 tables (a) and (g) are satisfied with only one failed IRM
- Directs bypassing IRM 16

RO

- Monitors plant parameters

BOP

- Executes N1-ARP-F3-3-1
- Confirms alarm on the computer printout
- Observes E panel to determine IRM 16 DOWNSCALE OR INOP light lit
- Verifies range switch proper setting

Event 4 Continued

BOP Continued

- Monitors IRM recorder for flux levels
- Monitors IRM for malfunction on G Panel
- Verifies correct position of detector in core
- Enters N1-OP-38B to bypass IRM 16
- Places IRM BYPASS switch in BYPASS position
- Confirms IRM BYPASS light is lit on panel E
- Confirms IRM BYPASS light is lit on the IRM auxiliaries drawer
- Confirms computer printout "IRM BYPASS YES"

Event 5

Condensate Transfer Pump 11 Trip

When directed by examiner, **insert overrides:**

**OVR-7S25DI464 POS_2 4H12/57-11A POS B,
FV=ON**

TRG 2

**OVR-7S25DI467 POS_5 4H12/57-11A POS D,
FV=OFF**

TRG 2

Condensate Transfer pump 11 amps lower

*Condensate Transfer pump 11 red light off, green
light on*

Condensate Transfer pressure lowers

Expected annunciators:

H3-3-2, Condensate Trans Pump Header Pres Low

H3-3-1, R Building Sealing Wtr System Hi-Lo Press

H3-1-1, Turb Bldg Seal Water System Hi-Lo Press

PO-5.0

CREW

- Acknowledges/reports annunciators
- Diagnoses trip of Condensate Transfer pump 11

SRO

- Acknowledges report from crew
- Directs execution of ARP

RO

- Monitors plant parameters

BOP

- Reviews/executes ARP H3-3-2
- Confirms alarm on computer printout
- Monitors system parameters for abnormalities
- Determines system pressure low due to trip of pump 11

Event 5 Continued

Note: The pump trip is modeled after a control switch fault that spuriously opens the breaker. There will be no indications of pump damage or electrical fault.

Role Play: When dispatched as operator to investigate trip of Condensate Transfer pump 11, wait 2 minutes and report that the pump is off, but there are no abnormal indications at the pump or the breaker.

Role Play: When dispatch as operator to verify proper start of Condensate Transfer pump 12, wait 1 minute and report proper start.

BOP Continued

- Starts Condensate Transfer pump 12
- Monitors level in Condensate Surge and Storage Tanks
- Dispatches operator to investigate trip of Condensate Transfer pump 11
- Dispatches operator to verify proper start of Condensate Transfer pump 12

Event 6

Control Rod Drift Out

When directed by examiner, **insert malfunction:**

RD02R2635, 26-35 Control Rod Failure – Drift Out

TRG 3

Reactor power rises

Expected Annunciators:

F3-2-6, CONTROL ROD DRIFT

Note: The first four steps listed for SOP-5.2 are Immediate Actions (IA). These will likely be performed prior to the RO referencing the procedure. The procedure should then be referenced to verify correct execution and complete remaining steps.

PO-6.0

CREW

- Acknowledges/reports annunciator F3-2-6
- Observes control rod 26-36 drifting outward

SRO

- Acknowledges report from crew
- Directs execution of N1-SOP-5.2
- Reviews Tech Spec 3.1.1

RO

- Executes N1-SOP-5.2
- Identifies drifting rod (IA)
- Turns on control rod power (IA)
- Selects rod 26-35 (IA)
- Inserts rod 26-35 using emergency rod in (IA)
- Determines rod can be fully inserted
- Releases emergency rod in switch
- Determines rod is drifting out again
- Inserts control rod with emergency rod in and holds switch
- Acknowledges that HCU is valved out
- Releases emergency rod in switch
- Determines control rod does not drift

Event 6 Continued

Role Play: When directed as operator to valve out HCU, acknowledge order and wait 2 minutes, then **insert malfunction:**

RD03R2635, 26-35 Control Rod Failure – Accumulator Trouble

TRG 25

Verify the following **malfunction** is **deleted:**

RD02R2635, 26-35 Control Rod Failure – Drift Out

Report HCU for control rod 26-35 is valved out.

Role Play: When directed as operator to reset the control rod drift alarm, wait 1 minute, then **insert remote:**

RD07, Reset of Rod Drift Alarm, FV=reset

TRG 26

Then report task completion.

Role Play: If dispatched as operator to disarm the HCU, acknowledge the report and wait two minutes, then report the control rod has been disarmed.

BOP

- Monitors reactor pressure and level
- Peer checks RO
- Dispatches operator to valve out HCU
- Dispatches operator to reset control rod drift alarm
- If required, dispatches operator to disarm the control rod

**INSTRUCTOR ACTIONS/
PLANT RESPONSE**

OPERATOR ACTIONS

Events 7, 8 and 9

Seismic Event, Torus Water Leak, Trip of
Containment Spray Raw Water Pump 112, ERVs
112 and 122 Fail to Open

When directed by examiner, **insert** the following
malfunctions:

PC05, Seismic Event Triggered

TRG 4

PC04, Torus Water Leak, FV=15

TRG 4

Torus water level slowly lowers

Expected annunciators:

H2-1-6, Seismic Detection Equipment Event (first)

*H2-2-1, R Bldg FI Dr Sumps 11-16 Area Wtr Lvl Hi
(second)*

K3-3-1, Torus Water Level High-Low (later)

Verify the following **malfunctions** are **preset**:

CT02B, CT Raw Water Pump 112 Trip

*Containment Spray Raw Water Pump 112 trips
immediately after starting*

**AD07B, ERV 112 Fails Closed (Burned Out
Solenoid)**

**AD07E, ERV 122 Fails Closed (Burned Out
Solenoid)**

ERVs 112 and 122 will not open

PO-7.0, PO-8.0

CREW

- Recognize and report annunciator
H2-1-6
- Recognize and report lowering Torus
water level

Events 7, 8 and 9 Continued

Note: Based on the rate of the Torus leak, the crew may make the determination that they will not be able maintain Torus water level with any of the available makeup sources. Therefore the crew may elect to scram and blowdown before injecting to the Torus.

Note: N1-EOP-1 attachment 18 provides Torus makeup using Containment Spray Raw Water. This makeup source has a much higher capacity than the alternate attachment 6, which uses a Condensate Transfer pump through Core Spray Keep-Fill. Attachment 18 will be unsuccessful due to Containment Spray Raw Water pump 121 out of service for maintenance, combined with the eventual trip of Containment Spray Raw Water pump 112.

Note: Verify the following **malfunction** is automatically **inserted** when Torus water level lowers below 10.3 feet:

PC04, Torus Water Leak, RT=15:00, IV=15, FV=40

Torus water level lowers at a faster rate

SRO

- Acknowledges reports
- Directs entry into N1-SOP-28 for the seismic event
- Enters N1-EOP-5 for high Reactor Building water level
- Enters N1-EOP-4 when Torus water level drops below 10.5 feet
- Directs lockout of Containment Spray pumps
- Directs raising Torus water level with N1-EOP-1 attachments 18 or 6
- Acknowledges report that Containment Spray Raw Water pump 112 tripped and 121 is unavailable
- Acknowledges report that Torus water leak is beyond the makeup capability
- **Before Torus water level drops to 8 feet:**
 - **Directs manual scram (CT-1.0)**
 - Enters N1-EOP-2, RPV Control
- Acknowledges scram report
- Directs entry into N1-SOP-1, Reactor Scram
- Directs RPV level control 53-95 inches using Condensate/Feedwater and CRD
- Directs initial RPV pressure control using Turbine Bypass Valves

Events 7, 8 and 9 Continued

SRO Continued

- May anticipate RPV Blowdown per N1-EOP-2 and direct rapid depressurization using Emergency Condensers and Turbine Bypass Valves
- Determines Torus water level cannot be maintained above 8 feet
- **Enters N1-EOP-8, RPV Blowdown (CT-2.0)**

N1-EOP-8, RPV Blowdown actions:

- Answers "Are all control rods inserted to at least position 04" Yes
- Answers "Drywell pressure?" Below 3.5 psig
- Directs Emergency Condenser initiation
- If answers "Torus water level?" > 8.0 ft, then:
 - Directs open 3 ERVs
 - Acknowledges ERVs 112 and/or 122 will not open
 - Acknowledges 3 ERVs open
- If answers "Torus water level?" < 8.0 ft, then:
 - Directs use of alternate blowdown systems
- Stops at WAIT block for 120 psig

RO

- Monitors plant parameters
- **Places the mode switch in SHUTDOWN (CT-1.0)**

Events 7, 8 and 9 Continued

Role Play: When contacted as Unit 2, report that Unit 2 also detected a seismic event and the seismic instrumentation indicates a magnitude of 0.09g.

Role Play: When contacted as JAF, report that JAF also detected a seismic event.

Role Play: When contacted as I&C to dispatch a Tech, acknowledge request.

Role Play: When dispatched as operators to walkdown systems, acknowledge request. Wait 5 minutes and report sound of running water coming from behind the Torus room doors.

RO Continued

- Provides scram report
- Performs N1-SOP-1, Reactor Scram, scram verification actions
 - Places IRMs on range 9
 - Inserts IRM and SRM detectors
 - Downranges IRMs as necessary to monitor power decrease
 - Reduces Recirc Master flow to 25-43 x 10⁶ lb/hr
 - Maintains RPV pressure below 1080 psig and in assigned band

BOP

- Executes N1-SOP-28 for seismic event
- Confirms ALARM and/or EVENT lights lit on Seismic Detectors
- Contacts Unit 2 and JAF to confirm seismic event
- Notifies I&C to dispatch Tech to interpret data from J Panel
- Notifies SRO to suspend all activities and transients not essential for safe operation
- Dispatches operators to walk down equipment
- Monitors Drywell instrumentation
- Reports lowering Torus water level

Events 7, 8 and 9 Continued

BOP Continued

- Performs N1-SOP-1, Reactor Scram, level control actions:
- Restores RPV level to 53-95 inches by controlling injection and rejecting through RWCU, as necessary
- Determines #13 FWP was not running
- Verifies RPV water level above 53"
- Verifies 11/12 FWP controllers in MANUAL and set to zero output
- Resets HPCI signal, if required
- Places 11/12 FWP BYPASS Valve in AUTO, sets to 65-70 inches
- Secures 2nd FWP, if running
- If RPV level reaches 85 inches and rising, then:
 - Verifies off all Feedwater Pumps
 - Secures CRD Pumps not required
 - Maximizes RWCU reject flow
 - Closes FWIVs if required
 - Closes MSIVs if required
- Maintain RPV water level in assigned band

Events 7, 8 and 9 Continued

Note: As Torus water level lowers, torus pressure will be drawn negative until the Reactor Building to Torus Vacuum Breakers cycle. When the Reactor Building to Torus Vacuum Breakers cycle, Reactor Building D/P will momentarily drop, leading to annunciator L1-3-4 coming in and clearing.

RO/BOP

- Locks out Containment Spray pumps
- Attempts to raise Torus water level with N1-EOP-1 attachments 18 or 6

Possible N1-EOP-1 Att. 18 Actions:

- Closes 80-35, CONT SPRAY DISCH IV 122
- Closes 80-40, CONT SPRAY BYPASS BV 111
- Verifies closed the following valves:
 - 80-41, CONT SPRAY BYPASS BV 121
 - 80-44, CONT SPRAY BYPASS BV 112
 - 80-118, CONT SPRAY TEST TO TORUS FCV
 - 80-114, CONT SPRAY TO RAD WASTE IV 11
 - 80-115, CONT SPRAY TO RAD WASTE IV 12
- Places CONT SPRAY RAW WTR 112 INTERTIE control switch to CNT SPR 122 position
- Confirms open 93-72, CNT SPR 122
- Confirms closed 93-28, DIS VLV 112
- Confirms open 80-45, CONT SPRAY BYPASS BV 122
- Starts makeup to Torus as follows:
- Starts CONTAINMENT SPRAY RAW WATER PUMP 112
- Recognizes/reports trip of Containment Spray Raw Water Pump 112

Events 7, 8 and 9 Continued

Role Play: When dispatched as operator to unlock and close motor breakers, wait 1 minute. Then **insert** the appropriate following **remotes**, as directed, with a 1 minute wait time between subsequent remotes:

CS02A, CS Discharge Isolation Valve 40-12 (11)
FV=close
TRG 27

CS01A, CS Test Valve 40-06 (11) to Torus,
FV=close
TRG 28

CS02B, CS Discharge Isolation Valve 40-02 (12)
FV=close
TRG 29

CS01B, CS Test Valve 40-05 (12) to Torus,
FV=close
TRG 30

RO/BOP Continued

Possible N1-EOP-1 Att. 6 Actions:

- Confirms the following conditions are satisfied:
 - Both subsystems of the other Core Spray System are operable
 - Core Spray system is NOT running
- Aligns Condensate Transfer to fill the Torus through a Core Spray System as follows:
- For Core Spray System 11 performs section 3.3:
 - Dispatches operator to unlock and close the following motor breakers:
 - 40-12, CORE SPRAY DISCHARGE IV 11 (OUTSIDE)
 - 40-06, CORE SPR TEST VALVE 11 (CRS TEST V11 DISCONNECT CAB TB 261)
 - Closes 40-12, CORE SPRAY DISCHARGE IV 11 (OUTSIDE)
 - Opens 40-06, CORE SPR TEST VALVE 11 AND monitors Torus level

Events 7, 8 and 9 Continued

RO/BOP Continued

Possible N1-EOP-1 Att. 6 Actions

(continued):

- For Core Spray System 12 performs section 3.4:
 - Dispatches operator to unlock and close the following motor breakers:
 - 40-02, CORE SPRAY DISCHARGE IV 12 (OUTSIDE) PB 167, RB 281 (North Wall)
 - 40-05, CORE SPR TEST VALVE 12 (CRS TEST V12 DISCONNECT CAB TB 261)
 - Closes 40-02, CORE SPRAY DISCHARGE IV 12
 - Opens 40-05 CORE SPR TEST VALVE 12 AND monitors Torus level

RO/BOP Continued

- Recognizes/reports that Torus water leak is beyond the makeup capability
- Rapidly depressurizes the RPV using Emergency Condensers and Turbine Bypass Valves, if directed by SRO
- Initiates Emergency Condensers
- **If Torus water level > 8.0 ft, then opens 3 ERVs (CT-2.0)**
 - Recognizes/reports failure of ERV 112 and/or 122 to open
 - Opens alternate ERVs to obtain 3 open

Events 7, 8 and 9 Continued

RO/BOP Continued

- If Torus water level < 8.0 ft, then initiates alternate blowdown systems as directed by SRO (CT-2.0)
- Restores and maintains RPV water level in assigned band with Condensate/Feedwater and CRD

TERMINATING CUES:

- RPV Blowdown in progress
- RPV water level controlled in assigned band