NMP SIMULATOR SCENARIO

NRC Scenario 1 **REV. 0** **No. of Pages: 31**

PLANT SHUTDOWN, RECIRC PUMP SEAL FAILURE, FUEL FAILURE, UNISOLABLE EMERGENCY CONDENSER LEAK TO THE ENVIRONMENT

PREPARER		DATE
VALIDATED	Frank Payne, Kyle James, Bruce Williams	DATE 5/18/08
GEN SUPERVISOR OPS TRAINING		DATE
OPERATIONS MANAGER	N/A – Exam Security	DATE
CONFIGURATION CONTROL	N/A – Exam Security	DATE

SCENARIO SUMMARY

Length: 90 minutes

Initial Power Level: 4% with plant shutdown in progress

Mitigating Strategy Code: RR4, fuel leak with a failure of EC tubes and EC fails to isolate, requires RPV Blowdown to stop release

The crew assumes the shift with the plant being shutdown. The crew is directed to de-inert the containment in accordance with N1-OP-9, N_2 Inerting and H_2-O_2 Monitoring Systems. When drywell pressure is lowered to 0 psig, the operator will secure the lineup, but one of the containment isolation valves will fail to fully close. This will require entry into Technical Specifications and ensuring a second valve in the line is isolated. Then the crew will continue the shutdown by inserting control rods.

Next Reactor Building Radiation Monitor 12 will fail upscale causing a trip of RBVS and a start of RBEVS. Additionally there will be a failure of the Reactor Building to isolate. The crew must isolate the Reactor Building to restore Secondary Containment and the SRO must address Technical Specifications. When these actions are complete, both seals on the 11 Recirculation Pump will fail requiring the crew to shutdown and isolate the pump. Following the loss of the Recirculation Pump, a fuel failure will cause offgas and main steam line radiation levels to rise, requiring a reactor scram. Multiple control rods will fail to fully insert during the scram requiring the crew to enter N1-SOP-1 and take alternate actions to insert the control rods. The rods are inserted using RMCS.

Following the scram, the crew will diagnose an Emergency Condenser tube leak. They will try to isolate the affected EC but the isolation valves will fail to fully close. Rising off site radiation levels will require an RPV blowdown before General Emergency levels are reached.

Major Procedures:	N1-SOP-1.2, N1-SOP-25.2, N1-SOP-1.1, N1-SOP-1, N1-EOP-2, N1-EOP-6, and N1-EOP-8
EAL Classification:	Site Area Emergency, EALs 3.4.1, 5.1.3 and 5.2.4
Termination Criteria:	RPV Blowdown in progress, RPV water level controlled in assigned band

I. SIMULATOR SET UP

A. IC Number: IC 171

B. Presets/Function Key Assignments

1. Malfunctions:

a. RM6V, RX BLDG VENT RAD MON 12, FINAL VALUE=100% TRG 1

b. HV04, RB VENTILATION FAILS TO ISOLATE PRESET

c. RR06A, RR PUMP 11 LOWER(INNER) SEAL FAILS, RAMP=2:00
FINAL VALUE=100% TRG 2

d. RR07A, RR PUMP 11 UPPER(OUTER) SEAL FAILS, DELAY=1:30
RAMP=2:00, FINAL VALUE=100% TRG 2

e. RX01, FUEL CLADDING FAILURE, FINAL VALUE=7% TRG 3

f. RD33C, CONTROL ROD BANK BLOCKED BANK 3,
FINAL VALUE=04 PRESET

g. EC06A, EMERGENCY CONDENSER TUBE LEAK 111,
RAMP=1:00, FINAL VALUE=4% TRG 4

h. EC07A, EMERGENCY CONDENSER FAILS TO ISOLATE 11 PRESET

i. EC08A, EC LOOP 11 STM IV FAIL TO CLOSE 111,
FINAL VALUE=100% PRESET

j. EC08B, EC LOOP 11 STM IV FAIL TO CLOSE 112,
FINAL VALUE=100% PRESET

2. Remotes:

a. None

3. Overrides:

a. OVR-11DS74LO5529 ON “2060 VLV201-7,9,17,31 RED LAMPS “,
DELAY TIME=0:02, FINAL VALUE=ON (201-31 RED LAMP) TRG 16

4. Annunciators:

a. None

5. Triggers:

a. TRG 4 – Initiates EC 11 tube failure when the mode switch is taken to shutdown

i. Event Action: zdrpstdn==1

ii. Command: None

b. 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: zdpcv31o==1

ii. Command: None

C. Equipment Out of Service

1. None

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 1.5
2. N1-OP-43C marked up to step G.3.13.6
3. Shutdown Control Rod Sequence sheets updated to current control rod.

E. Miscellaneous

1. Setup trend recorder XP-1E1B on E console to trend recirc pump suction temperature.
2. Setup IRM/APRM recorders to display both IRMs and APRMs.
3. Place yellow clearance tag on RWM bypass keylock switch.

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

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

PART III: Remarks/Planned Evolutions:

1. Perform N1-OP-9, N_2 Inerting and H_2-O_2 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 from step G.3.13.6 of 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			

Scenario ID

INSTRUCTOR COMMENTS (Strengths, Areas for Improvement, Open Items etc.)

What Happened?	What we did?	Why? (Goals)	Other Options?

III. PERFORMANCE OBJECTIVES

A. Critical Tasks:

CT-1.0 Given a fuel failure, the crew will insert a manual reactor scram as Main Steam Line radiation levels rise, in accordance with N1-SOP-25.2.

CT-2.0 Given an unisolable primary system leak, indications of fuel failure and rising off-site release rates approaching the General Emergency level, the crew will perform an RPV Blowdown, in accordance with N1-EOP-6 and N1-EOP-8.

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, N_2 Inerting and H_2-O_2 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 Reactor Building Radiation Monitor and a failure of the Reactor Building to isolate, the crew will respond to the condition and manually close the Reactor Building isolation valves, in accordance with N1-OP-10.

PO-5.0 Given a total recirculation pump seal failure, the crew will secure and isolate the pump, in accordance with N1-SOP-1.2.

PO-6.0 Given a fuel leak, the crew will respond to rising radiation levels, in accordance with N1-SOP-25.2.

PO-7.0 Given a failure of control rods to insert during a scram, the crew will enter and execute N1-SOP-1.

PO-8.0 Given an Emergency Condenser tube leak, the crew will enter and execute N1-EOP-6.

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

CREW

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

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, N_2 Inerting and H_2-O_2 Monitoring Systems. There are NO Console Operator activities related to this normal evolution.

PO-1.0

SRO

- Directs de-inerting the Primary Containment IAW Section G.1.0 of N1-OP-9, N_2 Inerting and H_2-O_2 Monitoring Systems

RO

- Monitors plant parameters

BOP

- Acknowledge direction from the SRO to de-inert the containment
- Verify closed the following valves in the Control Room:
  - 201-11, TORUS/DRYWELL VENT TO CONDENSER
  - 201-10, DW AIR VENT & PURGE ISOLATION VALVE 11
  - 201-08, TOR AIR VENT & PURGE ISOLATION VALVE 11

EVENT 1 Continued

BOP Continued

- 201-32, DW N2 VENT & PURGE ISOLATION VALVE 11

- Open 201-16, TORUS N2 VENT & PURGE ISOLATION VALVE 11
- Start 201-35, DRYWELL & TORUS VENT & PURGE FAN
- Verify open the following valves:
  - 201-21, DRYWELL & TOR VENT & PURGE FAN INLET BV
  - 201-22, DRYWELL & TOR VENT & PURGE FAN OUTLET BV
- Throttle open 201-17, TORUS N2 VENT & PURGE ISOLATION VALVE 12
- WHEN Torus pressure drops BELOW 0 psig, perform the following:
  - Stop 201-35, DRYWELL & TORUS VENT & PURGE FAN
  - Verify closed the following valves:
    - 201-21, DRYWELL & TOR VENT & PURGE FAN INLET BV
    - 201-22, DRYWELL & TOR VENT & PURGE FAN OUTLET BV
  - Verify closed the following valves:
    - 201-16, TORUS N2 VENT & PURGE ISOLATION VALVE 11
    - 201-17, TORUS N2 VENT & PURGE ISOLATION VALVE 12

EVENT 1 Continued

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

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

BOP Continued

- Open 201-32, DW N2 VENT & PURGE ISOLATION VALVE 11
- Start 201-35, DRYWELL & TORUS VENT & PURGE
- Verify open the following valves:
  - 201-21, DRYWELL & TOR VENT & PURGE FAN INLET BV
  - 201-22, DRYWELL & TOR VENT & PURGE FAN OUTLET BV
- Throttle open 201-31, DW N2 VENT & PURGE ISOLATION VALVE 12
- WHEN Drywell pressure drops BELOW 0 psig, perform the following:
  - Stop 201-35, DRYWELL & TORUS VENT & PURGE FAN
  - Verify closed the following valves:
    - 201-21, DRYWELL & TOR VENT & PURGE FAN INLET BV
    - 201-22, DRYWELL & TOR VENT & PURGE FAN OUTLET BV
  - Verify 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 N_2 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 Operations Management, 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.

PO-2.0

SRO

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

RO

- Monitors plant parameters

BOP

- Notify Crew/SRO that 201-31 did NOT fully close
- Attempt to manually close 201-31
- Verify 201-32 closed

EVENT 3

Plant Shutdown using Control Rods

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

Note: Provide GAI-OPS-05 Attachment 1, SRO REACTIVITY BRIEF CHECKLIST (may be done in pre-scenario brief) and plant shutdown RMI

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

PO-3.0

SRO

- Conduct crew brief of shutdown activities and responsibilities
- Conduct GAI-OPS-05 Reactivity Brief
- Direct Insertion of control rods for reactor shutdown in accordance with Shutdown Control Rod Sequence
- Provides oversight of reactivity maneuver

RO

- Insert control rods to continue reactor shutdown in accordance with Shutdown Control Rod Sequence
- Observe IRM response AND range 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
- Monitor and maintain reactor cooldown rate less than 100°F/hr

BOP

- Monitor Feedwater Level Control
- Monitor plant parameters
- Provide peer checks as required

EVENT 4

Reactor Building Ventilation Radiation Monitor 12 fails UPSCALE and RB Ventilation fails to Isolate

When control rod 30-47 has been inserted and directed by the examiner, **insert malfunction**:

RM6V, RX BLDG VENT RAD MON 12 (0-100%), FINAL VALUE=100%

TRG 1

Verify the following **malfunction** is active:

HV04, RB VENTILATION FAILS TO ISOLATE

PRESET

Expected Annunciators:

L1-4-3, RB VENT RAD MONITOR OFF NORMAL
L1-1-5, RB VENT EXH FAN 11- 12 TRIP
L1-3-6, EMER VENT CH 11 RELAY OPERATE
L1-4-6, EMER VENT CH 12 RELAY OPERATE

RBVS fans trip

RBEVS initiates

RB isolation valves remain open

EVENT 4 Continued

PO-4.0

CREW

- Respond to annunciators and diagnose Radiation Monitor trip with failure of RB to isolate

SRO

- Acknowledges reports
- Enter N1-EOP-5, Secondary Containment Control, AND execute concurrently with ARPs

SRO Continued

- Direct manual isolation of the Reactor Building
- Determine that the reactor building failed to isolate and one channel of RB Rad Monitoring is inop and entry into Tech Spec 3.4.2 is required
- Enter LCO 3.4.4.e (7 day plant shutdown LCO when one train of EVS is inoperable)

RO

- Monitor plant parameters

BOP

- Verifies Reactor Building Radiation Monitor 12 failed UPSCALE
- Confirm alarm on computer printout
- Verify shutdown of RB Vent Sys and startup of RBEVS per N1-OP-10 section H.2.0 or N1-EOP-HC attachment 6
- 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

BOP Continued

Role Play: If contacted as RP, acknowledge request but delay any reports on Reactor Building radiation levels

EVENT 4 Continued

EVENT 4 Continued

- 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
- 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

BOP Continued

Note: Examiner may decide to proceed with next event before one train of RBEVS is secured

- 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, 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 5

Recirculation Pump Seal Failure

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

RR06A, RR PUMP 11 LOWER(INNER) SEAL FAILS, RAMP=2:00, FINAL VALUE=100%

TRG 2

RR07A, RR PUMP 11 UPPER(OUTER) SEAL FAILS, DELAY=1:30, RAMP=2:00, FINAL VALUE=100%

TRG 2

RRP 11 seal pressures lower

Drywell leakage, pressure and humidity rise

Expected Annunciator:

F2-1-1 REACT RECIRC PUMP-MOTOR 11

ARP F2-1-1 directs entry into SOP-1.2 if seal pressure <425 psig or high seal flow/leakage exists. Drywell conditions will begin to deteriorate and increased drywell humidity and in-leakage to the DWEDT will be indicated. When Drywell parameters are impacted, the failure is considered "catastrophic" and the pump must be tripped and isolated.

PO-5.0

CREW

- Acknowledge/report annunciator F2-1-1
- Diagnose RRP 11 seal failure

SRO

- Acknowledges report from crew
- Directs execution of ARP
- Directs entry into N1-SOP-1.2, RRP SEAL FAILURE
- Determine the failure is "catastrophic" and pump should be tripped and isolated
- Provide reactivity management oversight for removing the pump from service
- When RRP 11 has been shutdown and isolated exit N1-SOP-1.2 and enter N1-OP-1, Section H, for 4 Loop Operation
- Review TS for impact of seal leakage and removal of pump from service

EVENT 5 Continued

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

SRO Continued

- Tech Spec 3.2.5 identifies RCS leakage be limited to <2 GPM/day increase for identified leakage. This will apply until the RRP is isolated
- TS 3.1.7.e applies for partial loop operation, limits power to 90.5% until clearance applied to valve breakers
- Contacts Reactor Engineering to verify thermal limits

RO

- Monitor plant parameters
- Monitor reactor power and recirculation flow during closure of RRP suction and discharge valves
- Verify operating position on the Power to Flow Map

BOP

- Reviews/executes ARP F2-1-1
- Confirms alarm computer point A072 RRP 11 SEAL LEAK DET FL
- Enters N1-SOP-1.2 for seal failure
- Monitors containment parameters
- Monitors RRP seal indications
- Determines that both seals are failed
- Determines seal failure is catastrophic
- Place REACTOR RP MOTOR MG SET 11 control switch to STOP
- Close REACTOR R PUMP 11 BYPASS VALVE

EVENT 5 Continued

BOP Continued

- Simultaneously close Suction AND Discharge Valves for RRP 11 holding switches in CLOSE position
- Exit N1-SOP-1.2 AND enter N1-OP-1, Section H, for 4 Loop Operation

EVENT 6

Fuel Failure

When actions to isolate 11 RRP have been completed and directed by examiner **insert malfunction**:

RX01, FUEL CLADDING FAILURE (0-100%), FINAL VALUE=7%

TRG 3

Expected Annunciators:
H1-1-7, OFF GAS HIGH RADIATION (initial)
F1-2-7, MAIN STEAM RAD MONITOR CH 11 HI/LO (later)
F4-2-2, MAIN STEAM RAD MONITOR CH 12 HI/LO (later)
Rising off-gas radiation levels
Rising main steam line radiation levels

PO-6.0

CREW

- Acknowledge/report annunciator H1-1-7, OFF GAS HIGH RADIATION
- Recognize rising offgas and main steam line radiation levels
- Determine fuel failure has occurred

SRO

- Acknowledge report of off-gas high radiation annunciator
- Enter N1-SOP-25.2 Fuel Failure/High Activity
- Notify Chemistry to sample reactor coolant for gross activity
- Classify event as an UNUSUAL EVENT per EAL 1.2.1
- Brief crew on event impact
- Direct reactor power reduction per N1-SOP-1.1 as necessary to control radiation levels

EVENT 6 Continued

SRO Continued

- Acknowledge report that MSL Rad Monitors are approaching/exceeding 3.75 X normal
- **Direct a manual scram**

CT-1.0

- Directs manual vessel isolation and entry into N1-SOP-40.2, if Main Steam Line rad levels reach 3.75 x NFPB

RO

- Perform emergency power reduction per N1-SOP-1.1 as directed
- **When directed place Mode Switch in Shutdown**

CT-1.0

- Recognize/diagnose failure of all control rods to insert
- Perform a manual vessel isolation by placing both Vessel Isolation Ch 11 and Ch 12 Control Switches on the E Panel to ISOLATION IN, if necessary

BOP

- Execute N1-SOP-25.2
- Notify Chemistry to sample offgas and reactor coolant for gross activity
- Direct NAO to close Turbine Building Roof Vents, Sidewall Vents and Roll Doors
- Monitor ARM's and rad monitors to determine plant radiation levels
- Notify SRO/Crew of rising Main Steam Line Radiation Monitor levels

Role Play: When dispatched as Chemistry to take samples, acknowledge request.

Role Play: When directed to close Turbine Building Roof Vents, Sidewall Vents and Roll Doors, wait 2 minutes then report the Turbine Building Roof Vents, Sidewall Vents and Roll Doors are **CLOSED.** Also report that RP is with you, and they have detected higher than normal rad levels near the offgas piping.

EVENT 6 Continued

BOP Continued

- Notify SRO when MSL Rad Monitors approach/exceed 3.75 X normal

EVENT 7

Reactor Scram with failure of one bank of control rods to fully insert

The following malfunctions are preset:

RD33C, CONTROL ROD BANK BLOCKED BANK 3, FINAL VALUE=04

PO-7.0

CREW

- Recognize and report failure of rods to fully insert

SRO

- Acknowledge SCRAM report
- Acknowledge report that control rods failed to insert
- Directs N1-SOP-1 actions
- Directs RPV water level controlled 53-95" with Condensate/FW
- Directs RPV pressure controlled 800-1000 psig with Emergency Condensers

RO

- Provide scram report
- Recognize/ report all control rods not inserted
- Perform N1-SOP-1, Reactor Scram, scram verification actions
  - Place IRMs on range 9
  - Insert IRM and SRM detectors
  - Downrange IRMs as necessary to monitor power decrease
  - Reduce Recirc Master flow to 25-43 x 10^6 lb/hr

RO Continued

EVENT 7 Continued

Note: The RO will not be able to reset the scram until RPV pressure is less than 600 psig once the MSIVs are closed. This will likely delay control rod insertion.

- Attempts to insert control rods using N1-OP-5, section H.23.0

BOP

- 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
- Maintain RPV pressure below 1080 psig and in assigned band
- Performs N1-SOP-40.2 for Vessel Isolation verification

EVENT 8

Failure of Emergency Condenser Tubes

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

EC06A, EMERGENCY CONDENSER TUBE LEAK 111, RAMP=1:00, FINAL VALUE=4%

TRG 4

Expected Annunciator:
K-1-1-2, EC Rad Vent 11 Monitors
Rising rad levels on EC Vent Rad Monitor (J panel)

Role Play: If requested as RP to check dose rates at EC piping, wait 3 minutes and report dose rates are 50 mR/hr and rising. Wait another 3 minutes and report dose rates are 200 mR/hr and rising, you are leaving the refuel floor to perform downwind site boundary surveys.

EVENT 8 Continued

PO-8.0

CREW

- Recognize/report annunciator K1-1-2
- Recognize/report rising EC Vent Rad Monitor readings

SRO

- Acknowledges report of annunciator, K-1-1-2, EC Rad Monitors
- Directs crew to obtain a radiation value from EC VENT RAD Monitors
- Enters N1-EOP-6 due to EC Vent Rad Monitor above 30 mR/hr (ALERT EAL level)
- Directs/grants permission for the isolation of 11 Emergency Condenser

RO/BOP

- Reports/responds to annunciator K-1-1-2, EC Rad Monitors
- Confirms alarm on computer printout
- Confirms radiation levels on J Panel
- Contacts RP to check dose rates at EC piping above elevation 340'

RO/BOP Continued

Role Play: If requested as Chemistry to assess for possible unmonitored radiological release, acknowledge request

Role Play: If directed as RP/Chemistry to perform a downwind site boundary radiological survey, report that you are assembling and dispatching the team. Wait 4 minutes after the above RP role plays are complete, and then report that the dose rate at the north site boundary is 750 mRem TEDE and rising. Wait another 4 minutes, and if the crew has not entered RPV Blowdown yet, report that the dose rate at the north site boundary is 950 mRem TEDE and rising.

- Contacts Chemistry to assess for possible unmonitored radiological release
- Contacts RP to perform downwind site boundary radiological survey
- Notifies crew of radiation levels

EVENT 9

Emergency Condenser Failure to Isolate

When an operator attempts to isolate EC 11, the following **preset malfunctions** act to prevent steam isolation valve closure:

EC07, EMERGENCY CONDENSER FAILS TO ISOLATE 11
EC08A, EC LOOP 11 STM IV FAIL TO CLOSE 111 (0-100%), FINAL VALUE=100%
EC08B, EC LOOP 11 STM IV FAIL TO CLOSE 112 (0-100%), FINAL VALUE=100%

PO-9.0

CREW

- Diagnose/report failure of EC 11 to isolate

SRO

- Acknowledges Emergency Condenser cannot be isolated
- Evaluates EAL matrix and determines the rising off site dose rates are approaching General Emergency levels per section 5.2.6 of EPIP-EPP-01, Emergency Action Level Matrix
- IF a primary system is discharing outside primary and secondary containments AND the discharge cannot be isolated, THEN before the offsite release rate reches the Emergency Plan “General Emergency” level:
  - Scram
  - Enter N1-EOP-2, RPV Control
  - Enter N1-EOP-8, RPV Blowdown

EVENT 9 Continued

SRO Continued

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 12 initiation
- Answers "Torus water level?" > 8.0 ft
- **Directs open 3 ERVs**

CT-2.0

- Stops at WAIT block for 120 psig

RO/BOP

- When granted permission or directed, attempts to isolate EC 11 by closing the following valves:
  - Places control switch for 39-07R, EC STM ISOLATION VALVE 112 in CLOSE
  - Diagnoses failure of 39-07R to fully close
  - Places control switch for 39-09R, EC STM ISOLATION VALVE 111 in CLOSE
  - Diagnoses failure of 39-09R to fully close
  - Report failure of steam IVs to isolate
- Initiates Emergency Condenser 12
- **Places control switches for 3 ERVs to open**

CT-2.0

EVENT 9 Continued

TERMINATING CUE

- All control rods inserted
- RPV Blowdown in progress
- RPV Water Level controlled in assigned band

RO/BOP Continued

- Reports 3 ERVs open
- Restores and maintains RPV water level 53-95 inches using Condensate/FW and CRD

V. POST SCENARIO CRITIQUE

A. N/A, NRC Exam

VI. REFERENCE EVENTS AND COMMITMENTS

A. Reference Events

1. None

B. Commitments

1. None

VII. LESSONS LEARNED

A. None

NMP SIMULATOR SCENARIO

NRC Scenario 2 **REV. 0** **No. of Pages: 29**

LOSS OF POWERBOARD 11, UNISOLABLE RWCU LEAK IN THE SECONDARY CONTAINMENT

PREPARER		DATE
VALIDATED	Frank Payne, Kyle James, Bruce Williams	DATE 5/17/08
GEN SUPERVISOR OPS TRAINING		DATE
OPERATIONS MANAGER	N/A – Exam Security	DATE
CONFIGURATION CONTROL	N/A – Exam Security	DATE

SCENARIO SUMMARY

Length: 90 minutes

Initial Power Level: 90%, 4 Loop Operation

Mitigating Strategy Code: SC1, unisolable primary system leak in the Secondary Containment, RPV Blowdown required

The crew assumes the shift with the plant operating at 90% power and four recirculation loops in service. Immediately after assuming the shift the crew will be directed to restore Recirculation Pump 15 to service and return to full power. The crew will assess plant conditions and lower power with Recirculation Flow until flow is less than 50 Mlbm/hr. They will then return Recirculation Pump 15 to service. After the crew has placed the pump in service, the Main Generator Auto Voltage Regulator will fail. The crew will diagnose the failure and take manual control of generator voltage and restore the correct generator output. When a normal generator output is established, the Control Rod Drive Flow Control Valve fails closed, requiring shifting to the alternate FCV. After CRD flow is returned to normal, a loss of power to Power Board 11 occurs. The SRO will address Technical Specifications.

A Reactor Water Cleanup system line break will occur in the Secondary Containment downstream of the Supply Isolation Valves. Reactor Water Cleanup will fail to isolate on high area temperature. The crew will attempt to isolate the system, but the valves will fail to fully close. This break will require a scram and RPV blowdown due to exceeding the Maximum Safe Value for general area temperatures. When the Mode Switch is placed in SHUTDOWN and/or the Reactor Trip pushbuttons on the E Panel are pushed, the reactor will NOT scram. ARI must be manually initiated to scram the control rods.

Major Procedures: N1-SOP-1, N1-SOP-1.1, N1-SOP-1.3, N1-SOP-5.1, N1-SOP-30.1, N1-EOP-2, N1-EOP-3, N1-EOP-5, and N1-EOP-8

EAL Classification: Site Area Emergency, EALs 3.4.1, 4.1.1

Termination Criteria: All control rods are in, RPV Blowdown in progress, RPV water level controlled in assigned band

I. SIMULATOR SET UP

F. IC Number: IC 172

G. Presets/Function Key Assignments

1. Malfunctions:

a. EG02, GENERATOR AUTO VOLTAGE REGULATOR FAILS – INCREASE TRG 1

b. RD36A, CRD FCV 44-151 FAILURE - CLOSED TRG 2

c. ED04, AC POWER BOARD ELECTRICAL FAULT(PB11) TRG 3

d. CU14, CLEANUP ISOLATION VALVES STUCK OPEN PRESET

e. CU11, COOLANT LEAK OUTSIDE OF DRYWELL, RAMP TIME=10:00, FINAL VALUE=20% TRG 4

f. RP05B, REACTOR PROTECTION SYSTEM FAILURE TO SCRAM CH 12 PRESET

2. Remotes:

a. RD05, CRD FLOW CONTROL VALVE ISOL, FINAL VALUE=nc30b TRG 16

3. Overrrides:

a. OVR-9DS51LO51912 ON 1150 STATUS MOVS ARRAY 33-01 GR CLO, FINAL VALUE=ON TRG 17

b. OVR-9DS53LO51914 ON 1150 STATUS MOVS ARRAY 33-02 GR CLO, FINAL VALUE=ON TRG 18

c. OVR-9DS55LO5200 ON 1150 STATUS MOVS ARRAY 33-04 GR CLO, FINAL VALUE=ON TRG 19

4. Annunciators:

a. None

5. Triggers:

a. TRG 16 – Activates when the CRD FCV transfer switch is moved to “Valve 12” to automate the corresponding field action

i. Event Action: zdrdfcvb==1

ii. Command: None

b. TRG 17 – Activates when RWCU IV 33-01 control switch is taken to close to override on the green light, simulating some valve movement

i. Event Action: zdcu301c==1

ii. Command: None

c. TRG 18 – Activates when RWCU IV 33-02 control switch is taken to close to override on the green light, simulating some valve movement

i. Event Action: zdcu302c==1

ii. Command: None

d. TRG 19 – Activates when RWCU IV 33-04 control switch is taken to close to override on the green light, simulating some valve movement

i. Event Action: zdcu304c==1

ii. Command: None

H. Equipment Out of Service

a. RRP 15 removed from service, control switch green flagged, discharge valve closed

I. Support Documentation

1. N1-OP-1 marked up through step H.4.5
2. N1-OP-43B marked up through step 2.7
3. RMR for lowering recirc flow to 50 Mlbm/hr
4. RMR for power ascension to rated

J. Miscellaneous

1. Steam Packing Exhauster 12 should be in operation at the beginning of the scenario to prevent the crew from having to swap to this division following a loss of PB 11.
2. Ensure LPRM downscale pushbuttons are depressed on rod block monitor.

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:

- Load Dispatcher was notified of power reduction and RRP 15 start two (2) hours ago

PART III: Remarks/Planned Evolutions:

- RRP 15 removed from service. TS 3.1.7.e. Four loop operation.
- Start RRP 15 per N1-OP-1, H.4.0, and return to five-loop operation. N1-OP-1, H.4.0, signed off up to step 4.6. N1-OP-43B signed off up to step 2.8.
- Reactor power is at 90% and must be lowered until recirc flow <50 Mlbm/hr to support starting RRP 15.
- After starting Recirc Pump 15 MG set, operate it for one hour while maintenance takes readings before returning to 100% power.

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			

Scenario ID

INSTRUCTOR COMMENTS (Strengths, Areas for Improvement, Open Items etc.)

What Happened?	What we did?	Why? (Goals)	Other Options?

IV. PERFORMANCE OBJECTIVES

C. Critical Tasks:

CT-1.0 Given an un-isolable RWCU leak outside primary containment and one general area temperature approaching or exceeding the maximum safe limit, the crew will insert a manual reactor scram, in accordance with N1-EOP-5.

CT-2.0 Given a failure of RPS to de-energize when a scram is required, the crew will insert control rods by initiating manual Alternate Rod Insertion (ARI), in accordance with N1-EOP-3.

CT-3.0 Given an un-isolable RWCU leak outside primary containment and two general area temperatures above the maximum safe limit, the crew will perform an RPV Blowdown, in accordance with N1-EOP-5 and N1-EOP-8.

D. Performance Objectives:

PO-3.0 Given the plant at power, the crew will reduce reactor power with recirculation flow, in accordance with N1-OP-43B.

PO-4.0 Given the plant at power, the crew will return a Recirculation Pump to service, in accordance with N1-OP-1, section H.4.0.

PO-3.0 Given a voltage regulator failure on the main generator, the crew will take manual control of generator voltage, in accordance with N1-ARP-A7.

PO-4.0 Given the plant at power, the crew will respond to a failure of the operating CRD Flow Control Valve, in accordance with N1-SOP-5.1.

PO-5.0 Given the plant at power, the crew will respond to a loss of Powerboard 11, in accordance with N1-SOP-30.1.

PO-6.0 Given the plant at power, the crew will respond to a Reactor Water Cleanup leak outside of the primary containment, in accordance with N1-EOP-5.

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.

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.

CREW

- Walkdown panels
- Conduct shift turnover brief
- Assume the shift

EVENT 1

Power Reduction with Recirculation Flow

PO-1.0

Note: Provide GAI-OPS-05 Attachment 1, SRO REACTIVITY BRIEF CHECKLIST (may be done in pre-scenario brief) and RMR

SRO

- Conduct GAI-OPS-05 Reactivity Brief
- Reviews Reactivity Maneuver Request Form
- Provides direction to RO/BOP regarding assignments
  - RO adjusts recirculation flow
  - BOP monitors RRPs and feed system response
- Directs RO to lower core flow to <50 Mlbm/hr IAW RMR
- Supervises reactivity maneuver

RO

- Reduces recirc flow IAW RMR
- Continuously observes the following:
  - APRMs lowering
  - Recirc flow lowering
  - Steam and feedwater flow lowering
  - Vessel level normal
- Lower recirc flow until <50 Mlbm/hr
- Notify Crew of the new power level and that recirc flow is <50 Mlbm/hr

EVENT 1 Continued

BOP

- Monitors individual RRP for response
  - Individual M/A-Speed Control stations trending uniformly
  - Individual RRP indications trending normally for lowering speed
- Monitors feed water controls for proper response
  - FWP 13 FCV responding to power change
- RPV Water Level remains within program band (65” - 83”)

EVENT 2

Restore Reactor Recirculation Pump 15 to Service

Note: Crew directed to start RRP 15 in pre-brief, starting at N1-OP-1, step H.4.6. Provide the SRO with the RMR for RRP #15 recovery.

PO-2.0

SRO

- Direct start up of RRP 15, using N1-OP-1, starting at step H.4.6
- Supervise reactivity manipulation
- Acknowledge report that RRP 15 is in service
- Determine TS 3.1.7.e no longer applies and the LCO Actions can be exited

RO

- Continuously observe the following:
  - APRMs
  - Recirc flow
- Monitor P/F map and transfer from 4 loop to 5 loop map when the startup is performed

BOP

- Acknowledge direction to start RRP 15
- Verify recirculation flow < 50 x 10^6 lb/hr
- Verify RRP 15 GEMAC in MAN and matched with other four GEMACs but no greater than 50%
- Verify RRP 15 discharge valve closed

EVENT 2 Continued

CAUTIONS from N1-OP-1

- Failure to raise Recirc Pump speed during opening of discharge valve may result in stalled rotor and pump trip due to reverse flow.
- To Prevent backflow thru the RRP, discharge valve should be opened before MG frequency lowers to 20 Hz. Frequency will raise, then drop quickly, then raise again before SLOWLY lowering. Discharge BV should be opened when frequency is slowly lowering.

Role Play: As NAO sent to Aux Control Room, wait one minute then report you have reset 50SR Pump Motor Stalled Rotor Target

Role Play: As NAO, when requested report MG set oil temperature is 120°F and stable.

BOP Continued

- Verify RRP 15 suction and discharge bypass valves are open
- Make a plant announcement for start of RRP 15
- Place RRP 15 control switch to START and observe indications
  - MG MOTOR starts, Amp Meter Amps increase then decrease
  - MG Generator accelerates to proper speed (approx 50 - 60 Hz)
  - Generator Field Bkr closes
  - Generator slows toward 20% speed (Approximately 11.5 Hz)
- WHEN speed (Frequency Meter) is between 30 and 25 Hz, open REACTOR R PUMP DISCH VALVE
- Verify RRP 15 maintained less than or equal to OP limits
- Adjust pump speed to match other pumps
- Null RRP 15 controller and shift to BAL or AUTO
- Verify power/flow map updated to five loop requirements
- Dispatch NAO to reset 50SR Pump Motor Stalled Rotor Target (Aux Control Room)
- Dispatch NAO to check MG set oil temperature locally
- May perform N1-ARP-F2-1-5 action to depress PUMP MOTOR VIBRATION RESET pushbutton on F Panel, clearing annunciator F2-1-5

EVENT 3

Main Generator Auto Voltage Regulator Failure

After RRP 15 has been placed in service and when directed by the examiner, **insert malfunction**:

EG02, GENERATOR AUTO VOLTAGE REGULATOR FAILS – INCREASE

TRG 1

Amplidyne output meter will peg HI

Exciter output voltage will peg HI

Generator field current will peg HI

Expected Annunciators:

A3-1-1, TURB GEN EXC. TRANS. 1 TEMP RECORDER (first)

A7-2-6, GEN VOLT REGULATOR TRIP (later)

Role Play: When contacted as Power Control (National Grid), acknowledge the voltage regulator in OFF and request NMP1 supply 60 MVARS to the bus while in manual voltage control

PO-3.0

CREW

- Recognize/diagnose Auto Voltage Regulator Failure from:
- Amplidyne output meter will peg HI
- Exciter output voltage will peg HI
- Generator field current will peg HI
- Generator mVars and terminal voltage will respond accordingly
- Annunciator A7-2-6, GEN VOLT REGULATOR TRIP

SRO

- Acknowledge report from the crew
- Direct/supervise ARP response
- Acknowledge voltage regulator transferred to OFF
- Notify Power Control (National Grid) that the voltage regulator is in manual control (required within 30 minutes)
- Direct CSO to adjust reactive load to 60 MVARS to bus

RO

- Execute N1-ARP-A7-2-6 for voltage regulator trip
- Confirm computer point F099

EVENT 3 Continued

RO Continued

- Monitor generator output voltage
- Place VOLTAGE REG TRANSFER switch to OFF
- Notify Crew/SRO
- Coordinate with SRO to contact Power Control
- Acknowledge direction to adjust VARS from the SRO
- Adjust generator reactive load using exciter field rheostat to 60 MVARS to the bus (N1-OP-32)

BOP

- Monitor plant parameters
- Monitor Turbine and Generator parameters on the A Panel

EVENT 4

CRD Flow Control Valve Failure

When actions for the voltage regulator failure are complete and when directed by the examiner, **insert malfunction:**

RD36A, CRD FCV 44-151 FAILURE – CLOSED

TRG 2

CRD charging water pressure rises

CRD drive water pressure lowers

CRD cooling water pressure and flow lower

Expected Annunciator:

F3-1-5, CRD CHARGING WTR PRESSURE HI/LO

PO-4.0

CREW

- Acknowledge/report annunciator F3-1-5, CRD CHARGING WTR PRESS HI/LO
- Diagnose CRD FCV 11 is closed

SRO

- Acknowledge report from the crew
- Direct entry into N1-SOP-5.1, LOSS OF CRD
- Acknowledge report that CRD FCV has failed
- Acknowledge report that CRD FCV has been shifted and is in AUTO
- Enter Technical Specifications 3.1.6.b, 7 day LCO for loss of CRD FCV 44-151

RO

- Monitor plant parameters

EVENT 4 Continued

Role Play: As NAO, when directed to transfer CRD FCV, wait 1 minute and inform the control room that you are standing by

Role Play: As NAO, when directed to open 44-148 and 44-152, wait 1 minute and report task completion

Role Play: As NAO, when directed to countdown and swap transfer switch, give simulated countdown and report task completion (see note below), as required

Note: When the control room operator takes the CRD Flow Control Transfer Switch to "VALVE 12" TRG 16 will automatically **insert remote:**

RD05, CRD FLOW CONTROL VALVE ISOL, FINAL VALUE=nc30b

TRG 16

This precludes the console operator from having to time the insertion of this remote.

Role Play: As NAO, when directed to close 44-150 and 44-153, wait 1 minute and report task completion.

EVENT 5

Loss of Powerboard 11

BOP

- Acknowledge direction from SRO
- Execute N1-SOP-5.1
- Answers "Is a CRD pump operating" YES
- Determines need to switch CRD Flow Control Valves per N1-OP-5 Section F.5.0:
- Dispatch NAO to report to RB 237' and establish communications
- Place CRD Flow Control in MAN
- Direct NAO open 44-148 and 44-152
- Direct NAO to count-down to place RB air transfer switches in UP position while you place CRD FCV transfer switch in VALVE 12 position at F panel
- Places CRD FCV transfer switch in VALVE 12 position
- Direct NAO close 44-150 and 44-153
- Monitor flow
- Place CRD Flow Control in AUTO

PO-5.0

CREW

When directed by examiner, insert malfunction:

ED04, AC POWER BOARD ELECTRICAL FAULT(PB11)

TRG 3

Expected Annunciators:
A4-1-1, PB 11 R113 TRIP
L1-3-4, REACT BLDG/ATM DIFF PRESS
Also the following equipment trips:
Reactor Recirculation Pumps 11 & 12
Drywell fans 14, 15, 16
Condensate Pump 11
Feedwater Booster Pump 11
Feedwater Pump 11
Circulating Water Pump 11
Service Water Pump 11
RBCLC Pump 11
TBCLC Pump 11
Reactor Building Exhaust Fan 11

EVENT 5 Continued

- Respond to annunciators and equipment trips
- Diagnose/report loss of PB 11
- Recognize/report loss of the following:
  - Reactor Recirculation Pumps 11 & 12
  - Drywell fans 14, 15, 16
  - Condensate Pump 11
  - Feedwater Booster Pump 11
  - Feedwater Pump 11
  - Circulating Water Pump 11
  - Service Water Pump 11
  - RBCLC Pump 11
  - TBCLC Pump 11
  - Reactor Building Exhaust Fan 11
- Recognize/report drop in reactor power
- Recognize/report lowering condenser vacuum
- Recognize/report loss of Reactor Building D/P

SRO

- Acknowledge report from crew
- Direct entry into N1-SOP-30.1
- Direct and supervise power reduction per N1-SOP-1.1 Emergency Power Reduction to stabilize condenser vacuum, as necessary
- Direct entry into N1-SOP-1.3 Recirculation Pump Trip, as required

SRO Continued

- Direct closure of Recirc Pump 11 & 12

Discharge Valves
- Direct RO to re-energize PB16A and 13A-15A
- Enter N1-EOP-5 on loss of Reactor Building Ventilation (positive pressure in RB)
- Direct entry into N1-SOP-6.1 for loss of spent fuel pool cooling pump, as time permits
- Review Technical Specifications
- Acknowledge that the APRMs are inoperable while the RRP discharge valves are still open
- Determine that TS 3.1.7e Partial Loop Operations, 3 loop limitations need to be checked by Reactor Engineering
  - Limited to 90% power in 3 loop operations
  - 2% MCPR penalty must be applied per COLR
- Determine that TS 3.1.8 for HPCI operability is a 15 day LCO
- Review N1-OP-19 Section H.7.0 for operation exceeding SPDES permit, as time permits
- Direct further power reduction as necessary for compliance with SPDES permit

Note: The examiner may move to the next event prior to the SRO addressing Technical Specifications. The Technical Specifications may be covered using a follow-up question.

Note: On the loss of Powerboard 11, Recirc pumps 11 and 12 trip. The APRMs are inoperable due to reverse flow through the tripped Recirc loops. The APRMs will be declared operable once the discharge valves are closed on both tripped Recirc loops.

EVENT 5 Continued

RO
- Acknowledge direction from SRO

- Confirm plant is stable by verifying:
  - No thermal hydraulic Instability
  - 3 Recirc pumps running
  - Not operating in the Restricted Zone
- Execute N1-SOP-1.1, Emergency Power Reduction, to lower recirc flow to stabilize condenser vacuum, as required
- Determine plant operating point on the 3-loop power to flow curves

BOP

- Execute N1-SOP-30.1, Loss of Power Board 11
- Start Service Water Pump 12
- Verify TBCLC pump 12 running
- Verify IAC 12 and/or 13 running
- Verify RBCLC pump(s) running
- Verify Steam Packing Exhauster 12 running
- Answers “Are A4-4-6, A4-4-7, A4-1-3 OR A5-2-8 in alarm” YES
- Determines Power Board 11 is faulted and cannot be reenergized
- Restores power to Power Board 16A as follows:
  - Opens R1041
  - Closes R1042
  - Verifies Power Board 16B amps <962

EVENT 5 Continued

BOP Continued

Role Play: As NAO when directed to energize

- Dispatch NAO to reenergize Power

PB13A-15A, acknowledge order, but delay any action

Role Play: As NAO when directed to restore offgas vacuum pump, acknowledge order, but delay any action

Role Play: As NAO when directed to investigate spent fuel pool cooling, acknowledge order, but delay any action

Note: The operator may choose to either restore normal Reactor Building Ventilation or initiate Reactor Building Emergency Ventilation to restore Reactor Building differential pressure.

EVENT 5 Continued

Boards 13A, 14A, and 15A
- Notify SRO that APRMs are inoperable
- Close Recirc Pump 11 & 12 Discharge Valves
- Hold open for 2-3 seconds Recirc Pump 11 & 12 Discharge Valves
- Execute N1-SOP-1.3, Recirc Pump Trip, as required
- Dispatch NAO to restore Offgas Vacuum Pump
- Enter N1-SOP-6.1 for loss of spent fuel pool cooling, as time permits
- Dispatch NAO to investigate loss of spent fuel pool cooling, as time permits
- May take action to restore Turbine Building Ventilation in accordance with either N1-ARP-L1-2-3 or N1-OP-26
- Respond to either annunciator:
  - L1-1-5, RB VENT EXH FAN 11-12 TRIP – VIB (Normal Ventilation)
    - Verify closed Reactor Building Exhaust Fan 11 outlet damper
    - Start Reactor Building Exhaust Fan 12
  - L1-3-4, REACT BLDG/ATM DIFF PRESS (Emergency Ventilation)
    - Start RBEVS per N1-OP-10

BOP Continued

Role Play: As RP, acknowledge report that RBEVS is in service and RBVS is secured

Possible actions in N1-OP-10 Section H.1.0 to start RBEVS

- Verify open 202-36, EM VENTILATION FROM REACTOR BLDG BV
- Verify closed the following valves:
  - 202-47, EM VENTILATION TIE BV
  - 202-74, EM VENTILATION LOOP 11 COOLING BV
  - 202-75, EM VENTILATION LOOP 12 COOLING BV
- Notify Rad Protection, the Reactor Building Emergency Ventilation system will be placed in service
- Place 202-37(38), EM VENTILATION LOOP 11(12) INLET BV control switch to OPEN
- Verify open 202-37(38), EM VENTILATION LOOP 11(12) INLET BV
- Start 202-53(33), EVS FAN 11(12)
- Verify open 202-34(35), EM VENT EXHAUST FAN 11(12) OUTLET BV
- Confirm proper operation of 202-50(51), EM VENT EXHAUST FAN 11(12) INLET FCV, by observing indicating lights and flow indication

EVENTS 6, 7 and 8

RWCU Leak in the Secondary Containment and failure of the Mode Switch and RPS Pushbuttons to cause a scram

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

CU11, COOLANT LEAK OUTSIDE OF DRYWELL, RAMP TIME=10:00, FINAL VALUE=20%

TRG 4

Expected Annunciators:
L1-3-3, CONTINUOUS AIR RAD MONITOR
H1-4-8, AREA RADIATION MONITORS
K3-3-4, CLEAN-UP SYS LEAK AREA T HI

The following **malfunction** is **preset**:

RP05B, REACTOR PROTECTION SYSTEM FAILURE TO SCRAM CH12

PRESET

RPS Ch 12 lights do not extinguish
Control rods do not insert based on automatic or manual scram signals
Control rods insert once ARI is manually initiated

PO-6.0, 7.0

CREW

- Acknowledge/report:
  - L1-3-3, CONTINUOUS AIR RAD MONITOR
  - H1-4-8, AREA RADIATION MONITORS
  - K3-3-4, CLEAN-UP SYS LEAK AREA T HI
- Diagnose leak from RWCU into secondary containment
- Diagnose RWCU failed to isolate

EVENTS 6, 7 and 8 Continued

SRO

- Acknowledges report from the crew
- Enters N1-EOP-5
- Directs RWCU system isolation
- Acknowledges report that RWCU failed to isolate both automatically and manually
- Directs dispatching of an NAO and RP Tech to obtain general area temperatures and radiation levels in the Reactor Building
- When Reactor Building Ventilation exhaust radiation exceeds 5 mR/hr, then directs verification of RB Vent isolation and RBEVS initiation
- Requests report on ARMs
- Determines area temperatures and radiation levels are above setpoints in Tables T and R, and transitions to circle 27
- Determines a primary system is discharging into the reactor building and the discharge cannot be isolated, and transitions to circle 28
- Before any area temperature or radiation level reaches 135^{o}F or 8 R/hr, respectively:
- **Directs manual scram and N1-SOP-1 execution**

CT-1.0

- Acknowledges scram report
- Acknowledges electrical failure to scram

EVENTS 6, 7 and 8 Continued

SRO Continued

Note: Execution of the N1-EOP-3 steps listed here may be bypassed if the crew manually initiates ARI immediately upon the electrical failure to scram

EVENTS 6, 7 and 8 Continued

- Enters N1-EOP-2 due to power above 6% when a scram is required
- Answers "All rods in to at least 04?" NO
- Answers "Will the reactor stay shutdown without boron?" NO
- Exits N1-EOP-2, enters N1-EOP-3
- Directs ADS bypassed
- Directs Core Spray jumpers installed per N1-EOP-1 Attachment 4
- **Directs manual ARI**

CT-2.0

- Acknowledges new scram report
- Acknowledges all rod in
- Exits N1-EOP-3, enters N1-EOP-2
- Assigns RPV level band 53 to 95 inches using Condensate/Feedwater
- Directs RPV pressure maintained <1080 psig using Turbine Bypass Valves
- May direct anticipatory blowdown with Turbine Bypass Valves and Emergency Condensers with cooldown in excess of 100°F/hr
- Acknowledges reports of Reactor Building temperatures and radiation levels
- When report is received that 2 General Areas temperatures are above 135°F, enters N1-EOP-8, RPV Blowdown
- Answers "Are all control rods inserted to at least position 04" YES

SRO Continued

- Answers “Drywell pressure?” <3.5 psig
- Directs initiation of Emergency Condensers
- Answers “Torus water level?” >8 ft
- **Directs open 3 ERVs**

CT-3.0

RO

- Acknowledge direction from the SRO
- **Rotate reactor mode switch to shutdown**

CT-1.0

- Recognizes/reports RPS CH 12 does not deenergize and control rods do not insert
- Depresses RPS CH 12 scram pushbutton
- Recognizes/reports RPS CH 12 does not deenergize and control rods do not insert
- Provide scram report
  - Mode Switch in SHUTDOWN
  - Control rods NOT all in
- When ARI is initiated, notify Control Room all rods are IN
- Provides scram report
- Perform 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

EVENTS 6, 7 and 8 Continued

RO Continued

- Reduces Recirc Master flow to 25-43 x 10^6 lb/hr
- Control RPV pressure <1080 psig using Turbine Bypass Valves
- If directed to perform anticipatory depressurization
  - Open all bypass valves using BOJM
  - Report all bypass valves open
  - Initiate Emergency Condensers

Note: No General Area temperature information is available until an operator has been dispatched to the Reactor Building to monitor area temperatures. The following timeline of field reports may be adjusted by examiner as necessary for evaluation purposes.

Role Play: When directed as NAO and RP Tech to obtain general area temperatures and radiation levels in the Reactor Building:

Wait 4 minutes and report RB 261' east side temperature is 125°F and rising, radiation level is 25 mr/hr and rising.

> **Note:** When one general area temperature is reported above 135°F and a second general area temperature is reported as approaching 135°F, the crew is likely to perform an anticipatory blowdown per N1-EOP-2

BOP

- Attempts to isolate RWCU
- Closes 33-02R, CU SUPPLY ISOLATION VALVE 11 (INSIDE)
- Informs SRO that 33-02R, CU Supply Isolation Valve 11 has failed to fully close
- Closes 33-04R, CU SUPPLY ISO VLV 12 (OUTSIDE)
- Informs SRO that 33-04R, CU Supply Isolation Valve has failed to fully close
- Closes 33-01R, CU RETURN ISO VLV
- Informs SRO that 33-01R, CU RETURN Isolation Valve has failed to fully close
- Dispatches NAO and RP Tech to obtain Reactor Building general area temperatures and radiation levels

EVENTS 6, 7 and 8 Continued

BOP Continued

Role Play Continued:

Wait an additional 3 minutes and report RB 261' east side temperature is 140°F and rising, radiation level is 30 mr/hr and rising; RB 281' east side temperature is 120°F and rising, radiation level is 20 mr/hr and rising.

Note: When 2 general area temperatures are reported above 135°F, the crew will perform an RPV Blowdown

Wait an additional 3 minutes and report RB 281' east side temperature is 140°F and rising, radiation level is 30 mr/hr and rising

EVENTS 6, 7 and 8 Continued

- If directed during N1-EOP-3 execution
  - Bypasses ADS
  - Prevents Core Spray Injection
  - **Initiates Manual ARI**

CT-2.0

- Performs N1-SOP-1, Reactor Scram, level control actions:
- Restores RPV level to 53-95 inches by controlling injection and rejecting through RWCU
- Determines #13 FWP running and RPV water level recovering
- Verifies at least one Electric FW Pump running
- Terminates 13 FWP injection as follows:
  - Places FWP 13 VALVE CONTROL in MANUAL AND closes
  - Disengages 13 FWP
  - Gives 29-10, FEEDWATER PUMP 13 BLOCKING VALVE, a CLOSE signal
- Verifies RPV water level +53 inches and rising
- Verifies 11/12 FWP controllers in MANUAL and set to zero output
- Resets HPCI signal
- Places 11/12 FWP BYPASS Valve in AUTO, sets to 65-70 inches
- Verifies level stable AND secures 2nd FWP, if running

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
- Maintain RPV water level in assigned band
- Notifies crew of reports on general area temperatures and radiation levels
- When N1-EOP-8, RPV Blowdown, is entered:
  - Initiates Emergency Condensers
  - **Opens 3 ERVs**

CT-3.0

TERMINATING CUE:

- RPV Blowdown in progress
- All control rods are in
- RPV water level controlled in assigned band

VIII. POST SCENARIO CRITIQUE

B. N/A, NRC Exam

IX. REFERENCE EVENTS AND COMMITMENTS

C. Reference Events

1. None

D. Commitments

2. None

X. LESSONS LEARNED

A. None

NMP SIMULATOR SCENARIO

NRC Scenario 3 **REV. 0** **No. of Pages: 35**

LOSS OF POWERBOARD 103, FEEDWATER PROBLEMS, LOCA WITH LOSS OF HIGH PRESSURE INJECTION, RPV BLOWDOWN REQUIRED TO RESTORE RPV WATER LEVEL

PREPARER		DATE	
VALIDATED	Frank Payne, Kyle James, Bruce Williams	DATE	5/17/08
GEN SUPERVISOR OPS TRAINING		DATE	
OPERATIONS MANAGER	N/A – Exam Security	DATE	
CONFIGURATION CONTROL	N/A – Exam Security	DATE	

SCENARIO SUMMARY

Length: 90 minutes

Initial Power Level: Approximately 100%, above 100% rodline

Mitigating Strategy Code: RL2, Small LOCA, RPV Blowdown required to permit injection with low pressure systems to recover RPV water level above TAF

SUMMARY

The crew assumes the shift with the plant at 100% power with Feedwater Pump 12 under clearance for maintenance. The crew will perform N1-PM-Q7, Turbine Thrust Bearing Test from the Control Room. Next, APRM 13 fails. The crew will bypass the APRM and reset the half scram. Next, Powerboard 103 trips on fault. The crew will take action to secure EDG 103 and attempt to restore Powerboard 17B. Powerboard 103 and Powerboard 17B are both faulted and are not restored. The trip of CRD Pump 12 (PB 17B) will require starting CRD Pump 11 and the SRO must address Technical Specifications.

When the necessary steps for the loss of Powerboard 103 are completed, Feedwater Booster Pump 11 will trip with a failure of the standby pump to start. The standby pump can be manually started. The SRO must again address Technical Specifications. When the standby Feedwater Booster Pump is manually started, the Master Feedwater Controller will fail as-is. RPV water level will slowly deviate from the set level. The crew must diagnose the failure and the BOP operator will be required to take manual control of RPV water level. With RPV water level in manual control, Feedwater Pump 11 will trip because of delayed effects from the earlier Feedwater Booster Pump trip. This will require an entry into N1-SOP-1.1, Emergency Power Reduction to lower power to within the capacity of Feedwater Pump 13.

While troubleshooting the electrical faults and troubles with the Feedwater system, the crew recognizes a coolant leak in the containment. Drywell pressure and temperature rise, requiring the crew to insert a manual SCRAM on rising drywell pressure. When the turbine trips, Powerboards 11 and 12 fail to automatically transfer. This results in a loss of feedwater, condensate, circulating water and other loads. Operators are able to restore these power boards. RPV water level continues to drop with only one liquid poison pump and CRD pump 11 available for injection. The crew will determine they cannot restore and maintain RPV water level above -109" and enter N1-EOP-8, RPV Blowdown. While blowing down the crew must diagnose that the inboard IV for Core Spray 111 fails to open and Core Spray pump 121 fails to start. With Core Spray unavailable for injection, the crew will inject with the feedwater booster pumps using N1-EOP-1, Att 25 or 26.

Major Procedures: N1-SOP-1, N1-SOP-1.1, N1-SOP-5.1, N1-SOP-16.1, N1-SOP-30.1, N1-SOP-30.2, N1-EOP-1, N1-EOP-2, N1-EOP-4, N1-EOP-8

Termination Criteria: RPV Blowdown in progress, RPV water level above TAF and controlled in assigned band, containment pressure controlled in accordance with N1-EOP-1 Att 17

EAL Classification: Alert, EAL 3.1.1

II. SIMULATOR SET UP

K. IC Number: IC 173

L. Presets/Function Key Assignments

2. Malfunctions:

a. FW03B, FEEDWATER PUMP TRIP 12	PRESET
b. NM21C, APRM 13 FAILURE – INOP	TRG 1
c. ED08, AC POWER BOARD ELECTRICAL FAULT(PB103)	TRG 2
d. ED21, AC POWERBOARD ELECTRICAL FAULT(PB17 SECTION B)	TRG 2
e. FW02A, FEEDWATER BOOSTER PUMP TRIP 11	TRG 3
f. FW14C, FEEDWATER MASTER CONTROLLER FAILS - AS IS	TRG 4
g. FW03A, FEEDWATER PUMP 11 TRIP	TRG 5
h. CU01, COOLANT LEAK INSIDE OF DRYWELL, RAMP TIME=10:00, FINAL VALUE=40%	TRG 6
i. ED26, FAILURE OF PB11 TO AUTO TRANSFER	PRESET
j. ED27, FAILURE OF PB12 TO AUTO TRANSFER	PRESET
k. CS01C, CORE SPRAY PUMP TRIP 121	PRESET
l. CS03C, CORE SPRAY INBD INJECT VLV FAIL TO OPEN 40-11	PRESET

3. Remotes:

a. ED12, IC BUS 130 NORM PWR BKR FROM PB13, FINAL VALUE=OPEN	TRG 25
b. ED13, IC BUS 130 ALT PWR BKR FROM PNLBRD 167A, FINAL VALUE=CLOSE, DELAY TIME=5 SEC	TRG 25
c. FW24, REMOVAL OF HPCI FUSES FU8/FU9, FINAL VALUE=PULL	TRG 26

4. Overrides:

a. OVR-7S43DI4116 POS_3 4H17/51-02A C FRM B, FINAL VALUE=OFF PRESET

5. Triggers:

a. TRG 4 – Fails Feedwater Pump 13 FCV as-is when Feedwater Booster Pump 12 control switch is taken to start

i. Event Action: zdfwbncb==1

ii. Command: None

6. Equipment Out of Service:

a. Feedwater pump 12 control switch in PTL and yellow tagged

C. Support Documentation

5. N1-PM-Q7, QUARTERLY MAIN TURBINE THRUST BEARING AND GENERATOR CORE MONITOR TESTING, signed off through step 6.1, up to step 6.2 (Note 6.1 is N/A if you perform 6.2)

D. Miscellaneous

1. Verify CRD pump 12 is in service
2. Place protected equipment signs

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:

Power is approximately 100%.

Turbine Surveillance Testing, N1-PM-Q7, to be performed.

Feed Pump 12 is out of service because of a burned out motor. (TS 3.1.8, day 2 of 15)

PART III: Remarks/Planned Evolutions:

Perform N1-PM-Q7, QUARTERLY MAIN TURBINE THRUST BEARING AND GENERATOR CORE MONITOR TESTING, section 6.2.

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			

Scenario ID

INSTRUCTOR COMMENTS (Strengths, Areas for Improvement, Open Items etc.)

What Happened?	What we did?	Why? (Goals)	Other Options?

V. PERFORMANCE OBJECTIVES

E. Critical Tasks:

CT-1.0 Given a LOCA with a loss of high pressure injection, the crew will perform an RPV Blowdown when RPV water level drops below -84 inches, in accordance with N1-EOP-8.

CT-2.0 Given a LOCA with a loss of high pressure injection and Core Spray, the crew will inject to the RPV with Condensate and Feedwater Booster pumps, in accordance with N1-EOP-2.

CT-3.0 Given a LOCA in the Drywell, the crew will initiate Containment Sprays to prevent exceeding PSP, in accordance with N1-EOP-4.

F. Performance Objectives:

PO-1.0 Given the plant operating at power, the crew will perform Main Turbine Thrust Bearing wear testing, in accordance with N1-PM-Q7.

PO-2.0 Given a failed APRM, the crew will bypass the APRM and reset the half scram, in accordance with N1-ARP-F1.

PO-3.0 Given the plant operating at power, the crew will respond to a loss of a Powerboards 103 and 17B, in accordance with N1-ARP-A5.

PO-4.0 Given the plant operating at power, the crew will respond to a loss of the operating CRD pump, in accordance with N1-ARP-A5 or N1-SOP-5.1.

PO-5.0 Given a trip of Feedwater Booster Pump 11 and a failure of the standby pump to automatically start, the crew will start the standby pump, in accordance with N1-ARP-H3.

PO-6.0 Given a failed Feedwater flow control valve, the crew will take manual control to stabilize RPV water level, in accordance with N1-SOP-16.1.

PO-7.0 Given a loss of the operating motor driven feedwater pump, the crew will lower power to within the capacity of the turbine driven feedwater pump, in accordance with N1-SOP-16.1 and N1-SOP-1.1.

PO-8.0 Given a LOCA within the Drywell, the crew will scram the reactor, in accordance with N1-SOP-1.

PO-9.0 Given a failure of Powerboards 11 and 12 to automatically transfer following a Main Turbine trip, the crew will manually transfer the Powerboards, in accordance with N1-SOP-30.1 and N1-SOP-30.2.

PO-10.0 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-11.0 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.

CREW

- Walkdown panels
- Conduct shift turnover brief
- Assume the shift

EVENT 1

Perform N1-PM-Q7, Turbine Thrust Bearing Test

There are no simulator actions required for this test and no malfunctions are intended to occur

PO-1.0

SRO

- Directs the BOP to perform N1-PM-Q7, Quarterly Main Turbine Thrust Bearing and Generator Core Monitoring Testing, Sect 6.2, Thrust Bearing Wear Test from the Control Room
- Perform a pre-job brief

Note: Pre-job brief may be conducted prior to the crew entering the simulator to facilitate scenario run-time.

RO

- Monitors plant parameters

BOP

- Acknowledges direction to perform turbine surveillance testing from the SRO
- Notifies RO of intention to perform the test
- Places THRUST BRG WEAR TEST SOLENOID switch in TEST

BOP Continued

EVENT 1 Continued

- Confirms the following:
  - Yellow TEST MODE 43X/TBWT light illuminates
  - Annunciator A2-3-3 actuates
- Rotates and holds TBWT Motor switch to + READING position, until Annunciator A2-3-4 actuates
- Continues holding TBWT Motor switch to + READING position until POS light is lit then records reading at which trip occurred
- Rotates and holds TBWT Motor switch to – READING position until meter is zeroed, then releases switch
- Confirms Annunciator A2-3-4 clears
- Rotates and holds TBWT Motor switch to – READING position, until Annunciator A2-3-4 actuates
- Continues holding TBWT Motor switch to – READING position until NEG light is lit then records reading at which trip occurred
- Rotates and holds TBWT Motor switch to + READING position until meter is zeroed, then releases switch
- Confirms Annunciator A2-3-4 clears
- Direct the NAO at the middle standard to verify:
  - Trip lights (front and rear) NOT illuminated
  - Test handle in normal (ZERO) position

Role Play: As NAO, when directed, report that the trip lights are NOT illuminated and the test handle is in the normal (ZERO) position at the middle standard

EVENT 1 Continued

BOP Continued

Role Play: As NAO, when directed, report that the test light is NOT illuminated at the middle standard

Cue: If required inform the BOP that the flags on 30/1 and 30/2 are reset

- Place THRUST BRG WEAR TEST SOLENOID Switch to OFF
- Confirm YELLOW TEST MODE 43X/TBWT light is OFF
- Direct the NAO at the middle standard of to verify TEST light NOT illuminated
- Confirm Annunciator A2-3-3 clears
- Verify reset, Flag Target 30/1 and 30/2 on Panel B-3
- Notifies SRO/RO that the Turbine Thrust Bearing test has been successfully completed

EVENT 2

APRM 13 Inoperative Failure

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

NM21C, APRM 13 FAILURE – INOP

TRG 1

Expected Annunciators:

F2-1-6, APRM 11-14

F3-4-4, ROD BLOCK

F1-1-1, RPS CH 11 REACT NEUTRON MONITOR

F1-2-1, RPS CH 11 AUTO REACTOR TRIP

Role Play: If requested to investigate the failure of APRM 13, reply that you will investigate.

PO-2.0

CREW

- Acknowledge/Report Annunciators:
- F2-1-6, APRM 11-14
- F3-4-4, ROD BLOCK
- F1-1-1, RPS CH 11 NEUTRON MONITOR
- F1-2-1, RPS CH 11 AUTO REACTOR TRIP
- Diagnose failure of APRM 13

SRO

- Determines APRM 13 is INOP
- Contacts WWM to request troubleshooting for APRM 13
- References TS 3.6.2.a, determines the Minimum Number of Operable Channels per Trip System is met

RO

- Monitors plant parameters
- When directed bypasses APRM 13
  - Places APRM BYPASS switch in BYPASS position
  - Confirms APRM BYPASS light is ON on Panel E
- Resets the half scram

BOP

- Investigates APRM 13 failure

EVENT 3

PB 103 and PB 17B trip on fault, loss of CRD Pump 12

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

ED08, AC POWER BOARD ELECTRICAL FAULT(PB103)

TRG 2

ED21, AC POWERBOARD ELECTRICAL FAULT(PB17 SECTION B)

TRG 2

Major Expected Annunciators

A5-3-7, POWER BD. 17 R1053 TRIP

A5-4-7, POWER BD 17 LOW BUS VOLTAGE

A5-4-3, POWER BD 103 BUS VOLTAGE LOW

A5-3-5, DSL GEN 103 START-RUN OFFNORMAL (possible if EDG not secured rapidly with loss of cooling water)

The following major loads will be lost as a result of the loss of PB 103 and PB 17B:

- *Core Spray Pumps/Topping Pumps 112/122*
- *Containment Spray Pumps 121/122*
- *Static Batt Charger 171A/B*
- *RPS UPS 172A/B*
- *ESW Pump 12*
- *CRD Pump 12*
- *RBCLC Pump 12*
- *Liquid Poison Pump 12*
- *CREVS 12*
- *RBEVS 12*
- *EDG 103 Auxiliaries*
- *Condensate Transfer Pump 12*
- *Emerg. Cond. 12 Inside Steam IV (39-09R)*

EVENT 3 Continued

PO-3.0, 4.0

CREW

- Acknowledge/report annunciators
- Recognize/report the following:
- Loss of PB 103 and PB 17B
- EDG 103 started but not supplying PB 103
- R1013 tripped (PB 103 normal supply)
- R1053 tripped (PB 17B normal supply)
- Recognize/diagnose loss of CRD

SRO

Role Play: If dispatched as NAO to investigate PB loss, wait 3 minutes then report that R1013, PB 103 Normal Supply Breaker, tripped on over-current

- Acknowledge report from crew
- Direct BOP/RO to execute applicable ARPs
- Recognize that EDG 103 auxiliaries are not powered (Raw Water Pump)
- Direct shutdown of EDG 103 using N1-ARP-A5-4-3
- Acknowledge report from BOP/RO that no CRD Pumps operating and CRD Pump 11 is available
- Direct RO/BOP to start CRD Pump 11 IAW N1-SOP-5.1 or N1-ARP-A5-4-3
- Review loads lost as result of PB 103/17B loss
- Review Tech Specs for impact of loss of PB103
  - TS 3.1.2, Liquid Poison System
  - TS 3.1.4, Core Spray System
  - TS 3.1.5, ADS (Requires to be less than 110 psig in 10 hours)
  - TS 3.1.6, CRD System
  - TS 3.2.7.c, Reactor Coolant System Isolation Valves (Limiting LCO - requires initiating a normal orderly shutdown within one hour and having reactor in the cold shutdown condition within ten hours.)
  - TS 3.3.7, Containment Spray
  - TS 3.6.3, Emergency Power Sources
- Recognize that TS 3.2.7.c is most limiting

EVENT 3 Continued

SRO Continued

Role Play: When contacted as WEC/Mgmt, acknowledge report of impending shutdown

- Notify WEC/Mgmt of impending shutdown
- Brief crew on impending shutdown

RO

- Monitor plant parameters
- May perform N1-SOP-5.1 for loss of 12 CRD pump prior to BOP starting 11 CRD pump per ARPs
  - Places 11 CRD pump control switch to START
  - Places 12 CRD pump control switch to STOP
  - Observes proper operation of 11 CRD pump (amps, flow, alarms)

Role Play: If directed as NAO to shift RPV level CRD backfill per N1-OP-58, H.2.0 reply that you will get the procedure and shift RPV level CRD backfill. Wait 5 minutes and report backfill has been shifted.

BOP

- Executes N1-ARP-A5-4-3
  - Confirm alarm on computer
  - If PB 103 voltage is low:
    - Verifies EDG 103 running
    - Confirm A5-4-1 AND A5-4-2 clear
    - Attempts to close R1032, EDG 103 Output Breaker
    - Recognizes/reports R1032 will not close and PB 103 cannot be re-energized
  - If PB 103 cannot be re-energized:
    - Places R1013 in PTL
    - Places EDG 103 control switch in emergency stop
    - May start CRD Pump 11

EVENT 3 Continued

BOP Continued

- Verifies RBCLC header pressure >40 psig
- Resets Lockout 86-17
- Opens R1053, PB 17B Normal Feeder Breaker
- Closes R1052, PB 17 A-B Tie Breaker
- Recognizes/reports R1052 will not close and PB 17B cannot be re-energized
- Requests clearance to prevent auto-start of EDG 103

Role Play: If requested to develop a clearance to prevent autostart of EDG 103, acknowledge request and estimate one hour for completion.

EVENT 4

PO-5.0

Feedwater Booster Pump 11 Trip with Failure of the Standby Pump to Auto Start

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

FW02A, FEEDWATER BOOSTER PUMP TRIP 11
TRG 3

The following **override** prevents Feedwater Booster Pump 12 from Auto Starting on low header discharge pressure:

OVR-7S43DI4116 POS_3 4H17/51-02A C FRM B
PRESET

RPV water level slowly lowers
Feedwater Booster Pump header pressure lowers
Expected Annunciators:
H3-1-6 REACTOR FW BOOSTER P11 TRIP
H3-1-7, H3-2-7, H3-3-7, REACTOR FW PUMP 11/12/13 SUCTION

EVENT 4 Continued

CREW

- Acknowledge/report annunciator H3-1-6 REACTOR FW BOOSTER P11 TRIP
- Diagnose trip of Feedwater Booster Pump 11

SRO

- Acknowledges report
- If BOP does not manually start FWBP 12, directs starting FWBP 12
- Enters Tech Spec 3.1.8.c
- Determines redundant component inoperable in both HPCI train 11 and 12, thus normal orderly shutdown shall be initiated within one hour and the plant brought to less than 110 psig in 24 hours

SRO Continued

- Initiates surveillance requirement 4.1.8.c for redundant component operability verification
- Notifies WEC
- Notifies Ops Management
- Performs crew brief/update

RO

- Monitors plant parameters
- May perform Emergency Power Reduction per N1-SOP-1.1 as required to maintain RPV water level

BOP

- Report alarm and respond per H3-1-6
- Confirms alarm on computer (E049 RX FW BOOST PMP 11 TRIP)
- Recognizes/diagnoses failure of the standby pump to automatically start
- Manually starts FWBP 12
- Notifies crew of failure of FWBP 12 to auto start
- Dispatches operators to shift Hydrogen Water Chemistry injection from FWBP 11 to FWBP 12

Role Play: When dispatched as NAO to swap HWC, wait 5 minutes and report that HWC injection has been transferred from FWBP 11 to FWBP 12

EVENT 5

Failure of the Feedwater Master Controller AS-IS

The following **malfunction** will be automatically **inserted** when the control switch for Feedwater Booster Pump 12 is placed in START:

FW14C, FEEDWATER MASTER CONTROLLER FAILS - AS IS

TRG 4

RPV water level slowly deviates from setpoint

Feedwater flow remains constant

Expected Annunciator:

F2-3-3 REACT VESSEL LEVEL HIGH-LOW

PO-6.0

CREW

- Recognize/report RPV water level is deviating from setpoint
- Diagnose/report failure of Feedwater Master Controller

SRO

- When notified of feedwater controller failure, directs:
  - Entry into N1-SOP-16.1
  - Manual control of feedwater

RO

- Monitors plant parameters
- May perform Emergency Power Reduction per N1-SOP-1.1 as required to maintain RPV water level

BOP

- Enters N1-SOP-16.1
  - Determines problem with Feedwater Level Control
  - Determines NOT a Flow Control Valve lockup

EVENT 5 Continued

BOP Continued

- Using available FCVs, takes manual control of FWLC at MA stations
- Operates Feedwater FCV 11 or 13 in manual to control feedflow to restore RPV water level
- Controls RPV water level in MANUAL

EVENT 6

Feedwater Pump 11 Trip

When the crew has restored RPV water level to normal band and directed by examiner, **insert malfunction**:

FW03A, FEEDWATER PUMP 11 TRIP

TRG 5

RPV water level lowers

Expected Annunciator:

H3-1-7, REACTOR FW PUMP 11 TRIP OVERLOAD SUCTION HI-LEVEL

PO-7.0

CREW

- Acknowledge/report annunciator
- Diagnose a trip of the operating electric feedwater pump

SRO

- Acknowledges report
- Directs entry into ARP
- Directs re-entry into N1-SOP-16.1
- Directs BOP to maintain RPV water level with FWP 13 using FWLC in manual
- Directs RO to lower power IAW N1-SOP-1.1 as necessary to recover RPV water level (80-85% power)
- Supervises power reduction
- Notifies WEC
- Notifies Ops Management
- Performs crew brief/update
- Recognizes Tech Spec 3.1.8 applies for loss of HPCI component

EVENT 6 Continued

Role Play: If dispatched as NAO to check FWP 11, wait 2 minutes and report that FWP 11 Aux Oil Pump is running and the FWP shaft is not rotating backwards.

Role Play: If dispatched as NAO to investigate trip of FWP 11, wait 2 minutes and report that FWP 11 breaker tripped on overload, but there are no abnormal indications at the pump.

RO

- Monitors plant parameters
- Lowers reactor power IAW N1-SOP-1.1 using recirculation flow as directed/required for RPV water level control
- Monitors position on P/F map

BOP

- Re-enters N1-SOP-16.1
  - Coordinates RPV water level control with RO during power reduction
  - Determines problem with FW pumps
  - Determines level can be maintained >53”
  - Restores level 65-83” by controlling injection from Feedwater FCV 13
- Enters ARP H3-1-7
  - Places 11 FW Pump Control Switch to Stop spring return to Neutral
  - Confirms Aux Oil Pump running AND FW Pump not rotating backwards
  - Verifies closed, 11 FW FCV (29-141) AND 11 FW Low Flow FCV (29-49)
- Dispatch NAO to investigate FWP 11 trip

EVENTS 7, 8 and 9

RPV coolant leak in the Primary Containment

When the crew has restored RPV water level to normal band and directed by examiner, **insert malfunction**:

CU01, COOLANT LEAK INSIDE OF DRYWELL, RAMP TIME=10:00, FINAL VALUE=40%

TRG 6

Drywell humidity, leakage rate, pressure and temperature rise

Expected Annunciators:

H2-4-7, DRYWELL WATER LEAK DETECTION SYS

K2-4-3, DRYWELL PRESSURE HIGH – LOW

The inboard IV for Core Spray 111 fails to open and Core Spray pump 121 fails to start

The following **malfunctions** are preset:

CS01C, CORE SPRAY PUMP TRIP 121

PRESET

CS03C, CORE SPRAY INBD INJECT VLV FAIL TO OPEN 40-11

PRESET

PO-8.0, 9.0

CREW

- Recognize/report containment parameters degrading
  - DW humidity rising
  - DW leakage rising
  - DW pressure rising
  - DW temperature rising
- Diagnose RPV coolant leak

EVENTS 7, 8 and 9 Continued

SRO

Note: A reactor scram will be required because of rising Drywell pressure

EVENTS 7, 8 and 9 Continued

Initial Actions for RPV Coolant Leak

- May direct an emergency power reduction IAW N1-SOP-1.1, if time permits
- Brief crew on plans to insert manual scram
- Direct the RO to place Mode Switch to SHUTDOWN
- Enters N1-EOP-2 when RPV water level reaches 53 inches
- Directs N1-SOP-1, Reactor Scram
- Enters N1-EOP-2 and N1-EOP-4 when DW pressure reaches 3.5 psig

Actions for failure of PB to transfer

- Direct entry into N1-SOP-30.1
- Direct entry into N1-SOP-30.2
- Authorizes PB 11 and PB 12 re-energized
- Acknowledges PB 11 and PB 12 can be re-energized

Subsequent SRO EOP Actions:

- Enters N1-EOP-2 when water level reaches 53 inches:
  - Determines all control rods are in
  - Directs RPV water level controlled between 53-95 inches with CRD
  - Directs RPV pressure controlled less than 1080 psig
  - Adjusts level and pressure bands as coolant leak degrades RPV parameters

SRO Continued

- When RPV level can NOT be maintained >53 inches, directs use of Alternate Injection Systems, Detail E (Liquid Poison) to stay above -84 inches (TAF)
- Direct MSIVs closed to minimize inventory loss and pressure control with ECs
- Determines cannot stay above -84 inches (TAF) with current injection sources, and transitions to Alternate Level Control leg of N1-EOP-2
- Directs ADS bypassed
- Directs EC initiation
- Determines Core Spray pump 121 has failed to start
- Determines 2 Detail F Subsystems are available (Core Spray Loop 11 and Condensate/Feedwater Booster Pumps 12)
- Waits until level drops to -84 inches (TAF)
- Determines a Detail F Subsystem is lined up with a pump running
- Before level drops to -109 inches, determines an injection source is lined up with a pump running
- Enters N1-EOP-8, RPV Blowdown:
  - Determines all control rods are in

EVENTS 7, 8 and 9 Continued

SRO Continued

EVENTS 7, 8 and 9 Continued

- Directs Emergency Condensers initiated
- Determines torus water level is above 8.0 feet
- **Directs open 3 ERVs**

CT-1.0

- Directs RPV water level restored 53-95 inches using Core Spray (N1-EOP-1 Att 4) or Condensate/Feedwater Booster pumps (N1-EOP-1 Att 25/26)
- When RPV pressure is less than 365 psig, determines Core Spray IV 40-11 failed to open
- **Directs RPV water level restored 53-95 inches using Condensate/Feedwater Booster pumps (N1-EOP-1 Att 25/26)**

CT-2.0

- Determines RPV water level is rising
- Transitions back to Normal Level Control leg of N1-EOP-2

- Enters N1-EOP-4 when drywell pressure reaches 3.5 psig and/or drywell temperature reaches 150^{o}F:
  - Directs lockout of Containment Spray Pumps
  - When torus pressure exceeds 13 psig or before drywell temperature exceeds 300^{o}F:

SRO Continued

- Determines plant is inside Containment Spray Initiation Limit Curve (Fig. K)
- Directs verification that the recirculation pumps are tripped
- Directs drywell cooling fans tripped
- **Directs initiation of containment spray IAW N1-EOP-1 Att 17**

CT-3.0

- Monitors torus pressure and water level for PSP

RO

- Places REACTOR 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 10^6 lb/hr
- Controls RPV pressure <1080 psig using Turbine Bypass Valves, as required

BOP

- Continues to control RPV Level in MANUAL

BOP Continued

Note: Further level control actions may not be performed due to powerboard losses and coolant leak

EVENTS 7, 8 and 9 Continued

- Performs N1-SOP-1, Reactor Scram, level control actions:
- Restores RPV level to 53-95 inches by controlling injection and rejecting through RWCU
- Determines #13 FWP running and RPV water level recovering
- Determines no Electric FW Pump running/available
- Terminates 13 FWP injection (as required with no Electric FW Pump and LOCA in progress):
  - Places FWP 13 VALVE CONTROL in MANUAL AND closes
  - Disengages 13 FWP
  - Gives 29-10, FEEDWATER PUMP 13 BLOCKING VALVE, a CLOSE signal
- Verifies RPV water level +53 inches and rising
- Verifies 11/12 FWP controllers in MANUAL and set to zero output
- Resets HPCI signal
- 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
- Attempts to maintain RPV water level in assigned band

RO/BOP

When the turbine trips, Power Boards 11 and 12 fail to transfer

The following **malfunctions** cause the failure to transfer:

ED26, FAILURE OF PB11 TO AUTO TRANSFER PRESET

ED27, FAILURE OF PB12 TO AUTO TRANSFER PRESET

Expected Annunciators:

A4-1-1, POWER BD. 11 R113 TRIP

A5-1-6, POWER BD. 12 R122 TRIP

Major Loads Lost:

Powerboard 11:

RWCU Pump 11

Service Water Pump 11

Circ Pump 11

RR Pump 11

RR Pump 12

TBCLC Pump 11

Condensate Pump 11

Feedwater Booster Pump 11

Powerboard 12:

RWCU Pump 12

Service Water Pump 12

Circ Pump 12

RR Pump 14

RR Pump 15

TBCLC Pump 12

Condensate Pump 13

Feedwater Booster Pump 13

EVENTS 7, 8 and 9 Continued

Actions for Failure of PBs to Transfer:

- Enters N1-SOP-30.1 for PB 11 loss
- Enters N1-SOP-30.2 for PB 12 loss

Actions from N1-SOP-30.1(30.2)

- Verifies fault annunciators clear
- Obtains permission from SRO to re-energize PB 11(12)
- Verifies PB 11(12) components green flagged
  - Cleanup Pump 11(12)
  - Service Water Pump 11(12)
  - Circ Water Pump 11(12)
  - RRMG Set 11 and 12 (14 and 15)
  - TBCLC Pump 11(12)
  - FW Booster Pump 11(13)
  - Condensate Pump 11(13)
- Inserts Sync Key and rotates clockwise for R112(R123)
- Closes R112(R123)
- Confirms voltage normal on PB 11(12)
- Rotates Sync Key counterclockwise and removes for R112(R123)
- Determines PB 11(12) energized
- Closes R111(124)
- Dispatches NAO to recover Powerboards 13, 14, 15
- Reports PB 11(12) re-energized
- Moves to other SOP to re-energize PB 12(11)
- Starts Service Water Pump 11(12)
- Starts IAC 11(12)
- Starts TBCLC Pump 11(12)

RO/BOP Continued

- Starts an RBCLC Pump

Role Play: When contacted as NAO, acknowledge order to recover PBs 13, 14, 15, but delay any report on task completion

- Verifies fault annunciators clear
- Obtains permission from SRO to re-energize PB 12(11)
- Verifies PB 12(11) components green flagged
  - Cleanup Pump 12(11)
  - Service Water Pump 12(11)
  - Circ Water Pump 12(11)
  - RRMG Set 14 and 15 (11 and 12)
  - TBCLC Pump 12(11)
  - FW Booster Pump 13(11)
  - Condensate Pump 13(11)
- Inserts Sync Key and rotates clockwise for R123(R112)
- Closes R123(R112)
- Confirms voltage normal on PB 12(11)
- Rotates Sync Key counterclockwise and removes for R123(R112)
- Determines PB 12(11) energized
- Closes R124(111)
- Reports PB 12(11) re-energized

Subsequent EOP Actions:

- Maximizes injection with CRD and Liquid Poison to attempt to maintain level within the band assigned
- Updates crew on failure to maintain level and pressure bands

EVENTS 7, 8 and 9 Continued

RO/BOP Continued

- Operates Emergency Condensers to

EVENTS 7, 8 and 9 Continued

maintain pressure with the band assigned and NOT exceed 100°F/hr cool-down rate

- Reports failure of Core Spray pump 121 to start
- Closes MSIVs when directed
- Locks out Containment Spray by placing 4 pump control switches in PTL
- Observes and reports containment parameters (torus pressure above 13 psig)
- Verifies/reports that all recirculation pumps have been tripped
- Verifies/reports that all drywell cooling fans have been tripped
- Initiates containment spray (N1-EOP-1 Att 17)
  - **Starts Containment Spray Pumps 111 and 112**

    CT-3.0
  - Verifies Containment Spray flow
  - Monitors containment pressure and temperature to ensure lowering trend
  - Terminates Containment Sprays when drywell pressure is below 3.5 psig
  - Reports containment spray terminated

RO/BOP Continued

- Monitors DWP and reports if DWP

reaches 3.5 psig, after spray is terminated
- IF directed, initiates Containment Spray again

- Initiates Emergency Condensers when directed
- Bypasses ADS
- Reports RPV water level below -84 inches (TAF)
- **Opens 3 ERVs**

CT-1.0

- When RPV pressure lowers below 365 psig, recognizes/reports Core Spray IV 40-11 failed to open
- Attempts to manually open 40-11
- Report inability to inject with Core Spray
- **Injects to the RPV with Condensate/Feedwater Booster pumps (N1-EOP-1 Att 25/26)**

CT-2.0

- Reports RPV water level above -84 inches (TAF)
- Restores and maintains RPV water level 53-95 inches

Possible N1-EOP-1 Att 25 actions:

- WHEN Feedwater Booster HDR PR (PI-51-61A) is greater than RPV pressure, THEN:
- Place LVL SETPOINT SETDOWN to OVERRIDE

EVENTS 7, 8 and 9 Continued

RO/BOP Continued

- Verify Open, at least one of the

FEEDWATER ISOLATION VALVES 11 and 12

- Verify Open, FEEDWATER PUMP 13 BLOCKING VALVE
- Select Manual on 13 FWP Valve Control Selector Switch
- Turn 13 Feedwater FCV (Knurled Knob) clockwise to open Feedwater FCV
- Position 13 Feedwater FCV as necessary to maintain required level

Possible N1-EOP-1 Att 26 actions:

- WHEN Feedwater Booster HDR PR (PI-51-61A) is greater than RPV pressure, THEN:
- Verify Open at least one of the FEEDWATER ISOLATION VALVES 11 and 12
- Verify Open, both FEEDWATER PUMP 11 and 12 BLOCKING VALVES
- Select Manual on 11 and 12 FWP Valve Control Selector Switch
- Turn 11 and 12 Feedwater FCV (Knurled Knob) fully counterclockwise
- Remove the following fuses from Panel IS34 in the Aux Control Room:
  - FU-8
  - FU-9

RO/BOP Continued

- Position 11 and 12 Feedwater FCV as necessary to maintain required level

Role Play: When directed as NAO to pull fuses FU-8 and FU-9, wait 2 minutes and **insert remote**:

FW24, REMOVAL OF HPCI FUSES FU8/FU9, FINAL VALUE=PULL

TRG 26

Then report that fuses FU-8 and FU-9 have been pulled

EVENTS 7, 8 and 9 Continued

while maintaining less than 1.5 E6 lbm/hr through each feed pump

TERMINATING CUE

- RPV Blowdown in progress
- RPV water level above -84 inches (TAF) and controlled in assigned band
- Containment pressure controlled in accordance with N1-EOP-1 Att 17

XI. POST SCENARIO CRITIQUE

C. N/A, NRC Exam

XII. REFERENCE EVENTS AND COMMITMENTS

E. Reference Events

1. None

F. Commitments

3. None

XIII. LESSONS LEARNED

A. None

NMP SIMULATOR SCENARIO

NRC Scenario 4 **REV. 0** **No. of Pages: 35**

SERVICE WATER STRAINER CLOGGING, FEEDWATER FLOW TRANSMITTER FAILURE, LOW LEVEL IN THE INTAKE STRUCTURE, ATWS WITH A LOCA AND FAILURE OF THE FEEDWATER ISOLATION VALVES CLOSED

PREPARER		DATE
VALIDATED	Frank Payne, Kyle James, Bruce Williams	DATE 5/18/08
GEN SUPERVISOR OPS TRAINING		DATE
OPERATIONS MANAGER	N/A – Exam Security	DATE
CONFIGURATION CONTROL	N/A – Exam Security	DATE

SCENARIO SUMMARY

Length: 90 minutes

Initial Power Level: Approximately 90%, 4 loop operation

Mitigating Strategy Code: AT3, high power ATWS with small LOCA, Blowdown required, re-inject with Core Spray

The scenario begins with the crew performing a control rod pattern adjustment. Next, the crew will be directed to return TBCLC Pump 12 to service and secure TBCLC Pump 11. Next the crew must respond to high D/P across one of the Service Water Pump Discharge Strainers. This will require placing another Service Water Pump in service. Once the standby Service Water Pump has been started, Main Steam Line Radiation Monitor 111 will become inoperable. The SRO will determine the Technical Specification implications.

When this is complete, an RPS pressure transmitter will fail low, followed closely by the in-service feedwater system pressure transmitter also failing low. The crew will be required to shift to manual feedwater level control. The crew may then shift reactor pressure/level columns and return to automatic feedwater level control. Technical Specifications must be addressed due to the RPS pressure transmitter failure. Next the intake structure traveling screens clog causing high D/Ps. This will eventually result in a low level in the intake structure with the subsequent tripping of the Circulating Water pumps. This will require entering N1-SOP-18.1, Service Water Failure/Low Intake Level. As intake level continues to lower, the crew will insert a manual scram.

When the scram occurs the control rods will not insert. This ATWS is complicated by the total loss of the normal heat sinks. Additionally, following the ATWS, a Recirculation Line break will cause RPV water level to lower, requiring the crew to re-establish injection. When the crew attempts to re-establish Feedwater flow, the Feedwater isolation valves will not re-open. When it is determined that RPV water level cannot be restored and maintained above -109 inches, the crew will perform an RPV Blowdown, and re-inject with Core Spray.

Major Procedures: N1-SOP-1.1, N1-SOP-16.1, N1-SOP-18.1, N1-EOP-1, N1-EOP-2, N1-EOP-3, N1-EOP-3.1, N1-EOP-4, N1-EOP-8

EAL Classification: Site Area Emergency, EAL 2.2.2

Termination Criteria: RPV Blowdown in progress, RPV water level above -109 inches and controlled in assigned band, containment pressure controlled in accordance with N1-EOP-1 Att 17

I. SIMULATOR SET UP

M. IC Number: IC 174

N. Presets/Function Key Assignments

7. Malfunctions:

m. RR01D, RR PUMP 14 DRIVE BREAKER TRIP	PRESET
n. NM21C, APRM CHANNEL 13 FAILURE – INOP	PRESET
o. CW16A, SW PUMP 11 STRAINER 72-05 CLOGGING, FINAL VALUE=10%	TRG 1
p. RM1A, MAIN STEAM LINE RAD MONITOR 111 INOP	TRG 2
q. RP16B, RPV PT 36-07B FAILED LOW	TRG 3
r. RR92, RX VESL PRES XMTR 36-31 (LOCAL-FW CONTROL) FAILS, DELAY TIME=15 SEC	TRG 3
s. CW12, CIRCULATING WATER INTAKE STRUCTURE BLOCKAGE (TRASH), FINAL VALUE=20%	TRG 4
t. RD33A, CONTROL ROD BANK BLOCKED BANK 1, INSERT FAIL POSITION, FINAL VALUE=12	PRESET
u. RD33B, CONTROL ROD BANK BLOCKED BANK 2, INSERT FAIL POSITION, FINAL VALUE=12	PRESET
v. RD33C, CONTROL ROD BANK BLOCKED BANK 3, INSERT FAIL POSITION, FINAL VALUE=18	PRESET
w. RD33D, CONTROL ROD BANK BLOCKED BANK 4, INSERT FAIL POSITION, FINAL VALUE=12	PRESET
x. RD33E, CONTROL ROD BANK BLOCKED BANK 5, INSERT FAIL POSITION, FINAL VALUE=12	PRESET
y. RR29, RR LOOP RUPTURE (LOCA), DELAY TIME=3 MINUTES, RAMP TIME=4 MINUTES, FINAL VALUE=15%	TRG 18
z. FW24, FEEDWATER 13 FCV FAILS CLOSED	TRG 20
aa. FW28A, HPCI MODE FAILURE TO INITIATE 11	TRG 20
bb. FW28B, HPCI MODE FAILURE TO INITIATE 12	TRG 20

3. Remotes:

a. FW24, REMOVAL OF HPCI FUSES FU8/FU9, FINAL VALUE=PULL	TRG 25

3. Overrides:

a. OVR-5S5DI309 POS_3 1F10/31-03A POS C, FINAL VALUE=INSYS	TRG 19
b. OVR-5S6DI3012 POS_3 1F10/31-03A POS C, FINAL VALUE=INSYS	TRG 19

c. OVR-5A144P1DI354 SET 1F27/ID15B MAN, FINAL VALUE=INSYS TRG 20
d. OVR-5A144P1DI355 SET 1F27/ID15B AUTO, FINAL VALUE=INSYS TRG 20
e. OVR-5A144P1AI3100 1F27/ID158 BAL R1, FINAL VALUE=0 TRG 20
f. OVR-5A145P1DI356 SET 1F28/ID15C MAN, FINAL VALUE=0.00 TRG 20
g. OVR-5A145P1DI357 SET 1F28/ID15C AUTO, FINAL VALUE=0.00 TRG 20
h. OVR-5A145P1AI3120 1F28/ID15C BAL R1, FINAL VALUE=0 TRG 20
i. OVR-5A300S1DI3123 SET FOX 11 LOW FLOW AUTO SWITCH, FINAL VALUE=0.00 TRG 20
j. OVR-5A300S3DI3121 1 FOX 11 LOW FLOW EMER INCREASE, FINAL VALUE=0.00 TRG 20
k. OVR-5A300S3DI3122 POS_2 FOX 11 FLOW FLOW NORM INCREASE, FINAL VALUE=0.00 TRG 20
l. OVR-5A301S1DI31211 SET FOX 12 LOW FLOW AUTO SWITCH, FINAL VALUE=0.00 TRG 20
m. OVR-5A301S3DI3127 1 FOX 12 LOW FLOW EMER. INCREASE, FINAL VALUE=0.00 TRG 20
n. OVR-5A301S3DI3128 POS_2 FOX 12 LOW FLOW NORM. INCREASE, FINAL VALUE=0.00 TRG 20

4. Annunciators:
   a. H2-1-3, CIRCULATING WATER PUMP INTAKE LEVEL LOW – ON/OFF, FINAL VALUE=CRYWOLF TRG 4
5. Triggers;
   a. TRG 18 – Activates the coolant leak when the mode switch is taken to shutdown
      i. Event Action: zdrpstdn==1
      ii. Command: None
   b. TRG 19 – When both FWIV 11 and 12 green lights are lit, activates the FWIV 11 and 12 control switch OPEN position to off, preventing reopening of the valves
      i. Event Action: hzlfwisg(1)==1&&hzlfwisg(2)==1
      ii. Command: None
   c. TRG 20 – If both FWP 11 and 12 control switches are placed in PTL, activates malfunction to fail FW FCV 13 closed, and activates overrides on FW FCVs 11 and 12 to turn AUTO position off, MAN position on, and give a full close signal; also fails FW Low FCVs
      i. Event Action: zdfwfpk(1)==1&&zdfwfpk(2)==1

ii. Command: None

d. TRG 21 – Activates when the RPS jumpers are installed, ARI is overridden and RPS has been reset to allow a manual scram to achieve further inward rod movement

i. Event Action: zdrpjb11(5)==1&&hzlrp12g1==1&&zdrrarov==1

ii. Command: bat n08scen4RH1.bat

6. Batch Files:

a. n08scen4RH1.bat – Allows further rod movement using N1-EOP-3.1

i. dmf rd33a

ii. dmf rd33b

iii. dmf rd33c

iv. dmf rd33d

v. dmf rd33e

vi. imf rd33a (0 0) 6

vii. imf rd33b (0 0) 6

viii. imf rd33c (0 0) 10

ix. imf rd33d (0 0) 8

x. imf rd33e (0 0) 8

C. Equipment Out of Service

1. APRM 13 bypassed and yellow tagged

2. Recirc Pump 14 control switch in PTL and yellow tagged

D. Support Documentation

1. RMI for control rod pattern adjustment

E. Miscellaneous

None

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, CSO, CRE)

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

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

Evolutions/General Information/Equipment Status:

Reactor Power = 90%, 4 loop operation

TBCLC pump 12 motor bearing repair complete

APRM 13 bypassed due to failed power supply

Recirc Pump 14 OOS due to high vibrations

PART III: Remarks/Planned Evolutions:

1. Control rod pattern adjustment
2. TBCLC pump 12 to be returned to service
3. Power ascension to rated

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
SM		CRE/OATC	
CRS		E	
STA		E	
CSO		Other	

VI. PERFORMANCE OBJECTIVES

G. Critical Tasks:

CT-1.0 Given a failure of the reactor to scram with power above 6% or unknown and RPV water level above -41 inches, the crew will terminate and prevent all injection except boron and CRD, in accordance with N1-EOP-3.

CT-2.0 Given a failure of the reactor to scram with RPV water level unable to be restored and maintained above -109 inches with Condensate/Feedwater and CRD, the crew will perform an RPV Blowdown and re-establish injection with Core Spray, in accordance with N1-EOP-3.

CT-3.0 Given a LOCA in the Drywell, the crew will initiate Containment Sprays to prevent exceeding PSP, in accordance with N1-EOP-4.

B. Performance Objectives:

PO-1.0 Given the plant at power, the crew will perform a control rod pattern adjustment, in accordance with N1-OP-5.

PO-2.0 Given the plant operating at power, the crew will shift operating TBCLC Pumps, in accordance with N1-OP-24.

PO-3.0 Given the plant operating at power with clogging of the operating Service Water Pump Discharge Strainer, the crew will shift to the alternate Service Water pump and strainer, in accordance with N1-OP-18.

PO-4.0 Given the plant operating at power and a failed Main Steam Line Radiation Monitor, the crew will determine the appropriate Technical Specification actions, in accordance with N1-ARP-F1.

PO-5.0 Given the plant operating at power and a failure of RPV pressure instruments, the crew will diagnose the failures and take manual control of RPV water level to prevent a reactor scram, in accordance with N1-SOP-16.1.

PO-6.0 Given the plant operating at power and lowering intake level, the crew will operate Circulating Water pumps, perform an emergency power reduction and scram the reactor, in accordance with N1-SOP-18.1.

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.

Take the simulator out of freeze before the crew enters for the pre-shift walkdown and briefing

Allow no more than 5 minutes to walkdown panels

CREW

- Walkdown panels
- Conduct shift turnover brief
- Assume the shift

EVENT 1

Control rod pattern adjustment

PO-1.0

Note: There are no Control Console activities required for this event

Note: Reactivity briefing, procedure review and RMI review should occur prior to scenario start, in secure briefing room

SRO

- Conducts reactivity brief for power restoration (previously performed)
- Reviews Reactivity Maneuver Instruction (previously performed)
- Directs RO to perform control rod pattern adjustment in accordance with the RMI and N1-OP-5
- Provides Reactivity SRO monitoring

RO

- Acknowledges direction from SRO
- Obtains copy of RMI form
- Moves control rods in accordance with N1-OP-5 and RMI
- Reports to SRO when control rod pattern adjustment is complete

EVENT 1 Continued

BOP

- Monitors feedwater controls for proper response
  - FWP 13 FCV responding to power change
  - RPV Water Level remains within program band (65" - 75")
- Provides peer checks as required

EVENT 2

Return TBCLC Pump 12 to service and secure TBCLC Pump 11

After performing the control rod pattern adjustment, the crew shifts operating TBCLC pumps per N1-OP-24, Section F.1.0

Note: There are no Control Console activities required for this event

Role Play: When contacted as NAO to perform pre-start checks, immediately report pre-start checks are SAT and you are standing by for pump start

Role Play: When contacted as NAO for proper pump start, immediately report pump start SAT

Role Play: When contacted as NAO for pump venting, wait 1 minute and report the pump has been vented

EVENT 2 Continued

PO-2.0

SRO

- Provide pre-evolution brief
- Direct BOP to start TBCLC Pump 12 and secure TBCLC Pump 11 IAW N1-OP-24, Section F.1.0

RO

- Monitor plant parameters

BOP

- Acknowledges direction to start TBCLC Pump 12 and secure TBCLC Pump 11 IAW N1-OP-24, Section F.1.0
- Obtains and reviews N1-OP-24
- Starts TBCLC Pump 12
- May direct AO to vent pump through 71-192, as follows:
  - Uncap AND open 71-192
  - WHEN venting complete, close AND cap 71-192

BOP Continued

- Confirms standby pump is operating correctly by verify stable pump amps and discharge pressure
- Stops TBCLC Pump 11, then places control switch for TBCLC Pump 11 in AUTO START

EVENT 3

Service Water Pump Discharge Strainer High D/P

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

CW16A, SW PUMP 11 STRAINER 72-05 CLOGGING, FINAL VALUE=10%

TRG 1

Expected Annunciator:
H1-3-2, SERVICE WTR P STR 11-12 TRIP-LO VOLT DIFF PRESS

PO-3.0

CREW

- Acknowledge/respond to annunciator H1-3-2, SERVICE WTR P STR 11-12 TRIP-LO VOLT DIFF PRESS

SRO

- Acknowledge report of SW Annunciator
- Direct entry into ARP for H1-3-2
- Acknowledge report that SW strainer BV-72-408, Backwash VLV is open and that D/P is not lowering
- Determine the alarm cannot be cleared
- Direct shifting to SWP 12 per N1-OP-18 section F.2.0
- Acknowledge report that SWP 12 has been started
- Acknowledge report of current D/P

EVENT 3 Continued

RO

- Monitor plant parameters

Role Play: When directed as NAO to investigate, wait two minutes, then report that Service Water pump 11 Strainer D/P is 10 psid and slowly rising due to a small amount of grass coming in the intake.

Role Play: When directed as NAO to verify strainer backwash valve, 72-408 open, wait one minute, then report that 72-408 is open, backwash is in progress, but it does not appear to be lowering D/P

Role Play: When directed as NAO to report on pump start, immediately report that SWP 12 is operating normally

Role Play: When requested as NAO after start of Service Water Pump 12, report Service Water Pump 12 Adams Strainer D/P is 3 psid, and report that Service Water Pump 11 Adams Strainer D/P is 9 psid (if still running)

BOP

- Enter ARP for H1-3-2
- Direct an NAO to the Intake area to check the SW Pump Strainer
- IF strainer D/P is high perform the following:
- Confirm BV-72-408, ADAMS STRNR 11 Backwash VLV open
- Determine the alarm cannot be cleared
- Start SWP 12 per N1-OP-18, Sect. F.
- Place the SERVICE WTR PUMP 12 control switch at H Panel in Start
- Observe normal motor running current, system flow, and discharge pressure

EVENT 4

Main Steam Line Radiation Monitor 111 Fails Inop

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

RM1A, MAIN STEAM LINE RAD MONITOR 111 INOP

TRG 2

Expected Annunciator:
F1-2-7, MAIN STEAM RAD MONITOR CH 11 HI/LO

Role Play: When requested to investigate the MSL rad monitor failure, report that you will begin an immediate investigation

EVENT 4 Continued

PO-4.0

CREW

- Acknowledge/report Annunciator F1-2-7, MAIN STEAM RAD MONITOR CH 11 HI/LO
- Diagnose failure of MSL Rad Monitor 111

SRO

- Acknowledges report of MSL Rad Monitor Ch 11 alarm
- Directs execution of ARP for F1-2-7
- Acknowledges report that MSL Rad Monitor has failed
- Notifies WEC and requests investigation of the failure
- Enters TS Table 3.6.2.h (requires placing channel in the tripped condition within 12 hours or verifying Mechanical Vacuum pump isolated)
- Briefs crew on failure of MSL Rad Monitor

RO

- Monitors plant parameters

BOP

- Executes ARP for F1-2-7

- Goes to back panel and determines the other MSL Rad Monitors indicate normal readings
- Observes downscale light on MSL Rad Monitor Ch 11 and diagnoses the Monitor is INOP
- Notifies crew that MSL Rad Monitor Ch 11 is INOP

EVENT 5

Reactor pressure transmitter failures

PO-5.0

CREW

When the TBCLC Pumps are shifted and directed by examiner, **insert malfunctions**:

RP16B, RPV PT 36-07B FAILED LOW

TRG 3

RR92, RX VESL PRES XMTR 36-31 (LOCAL-FW CONTROL) FAILS, DELAY TIME=15 SEC

TRG 3

Two RPV pressure instruments indicate downscale
Controlling RPV water level instrument indicates lower than actual
Feedwater flow rises
RPV water level rises
Expected Annunciators:
F4-4-2, RPS CH 12 REACTOR PRESS LOW
F4-4-7, RPS CH 12 MAIN STEAM ISOLATION AUTO OPERATE
F2-3-3, REACT VESSEL LEVEL HIGH-LOW (delayed >15 sec)

Note: This event may cause a turbine trip and subsequent reactor scram on high RPV water level if Feedwater flow is not controlled properly. In the event of a scram, the scenario will continue at event 7. Additionally, in the event of a scram, event 6 malfunctions should be immediately inserted (TRG 4, CW 16 and H2-1-3).

- Acknowledge/report Annunciators
  - F4-4-2, RPS CH 12 RX PRESS LOW
  - F4-4-7, RPS CH 12 MS ISO AUTO OPERATE
  - F2-3-3, REACT VESSEL LEVEL HIGH-LOW (Delayed >15 sec)
- Diagnose failure of the pressure instruments on the F Panel then diagnose failure of FWLC Pressure/Level Column

SRO

- Acknowledge report of pressure transmitter failures
- Diagnose the relationship between pressure transmitter 36-31 and the FWLCS
- Acknowledge report of RPV water level rising

SRO Continued

EVENT 5 Continued

- Direct entry into N1-SOP-16.1 for failure of FWLC
- Directs placing FWLC in Manual
- Directs Shifting Reactor Pressure/Level Columns IAW N1-OP-16, section F.10.0
- Acknowledge report of pressure and level columns shifted
- Enter T.S. Table 3.6.2.a (o), for pressure transmitter 36-07B (Place RPS Channel 11 in the tripped condition within 12 hours)
- Notify WEC/Ops Mgmt

Note: Switching level columns may result in Annunciator F2-3-3, REACT VESSEL LEVEL HIGH-LOW, due to circuit interruption.

Note: The same channel of level and pressure should be selected

- Monitor plant parameters
- If directed to shift FWLC pressure/level columns:
  - Verifies feedwater lineup
  - Verifies BOP has manual control of FWLC
  - Shifts reactor pressure and level columns using the key lock switches on the E Panel
  - Coordinates with BOP to return FWLC to auto:
  - Places FEEDWATER MASTER CONTROL M/A station mode switch in MAN

EVENT 5 Continued

RO Continued

- Nulls FWP 13 VALVE CONTROL

by adjusting the FEEDWATER MASTER CONTROL M/A station output with the manual knob until the deviation meter indicates 50% on FWP 13 VALVE CONTROL GEMAC

- Controls RPV water level with the manual knob at the FEEDWATER MASTER CONTROL LBS/HR controller in MAN mode
- Nulls FEEDWATER MASTER CONTROL setpoint error by adjusting Thumb/Setpoint tape to align setpoint (orange arrow) directly under automatic setpoint (green band)
- Places FEEDWATER MASTER CONTROL M/A station mode switch in AUTO or BAL
- Confirms system response by adjusting the thumbwheel on FEEDWATER MASTER CONTROL to maintain RPV water level

- Enters N1-SOP-16.1 due to failure of FWLC
  - Takes manual control of Feedwater pump 13 FCV

EVENT 5 Continued

BOP Continued

- Manually restores RPV water level to normal band
- If directed to shift FWLC pressure/level

Note: Once the FWP 13 VALVE CONTROL M/A STATION mode switch is in BAL, manual FWLC is shifted to the RO at E-panel

Role Play: When directed as NAO to check ATS cabinet indication, wait 2 minutes and report that PT 36-07B is downscale with the gross failure light lit

columns:

- Coordinates with RO to return FWLC to auto:
- Places FWP 13 VALVE CONTROL M/A STATION mode switch in BAL

- Dispatch NAO to investigate indications at ATS Cabinet

EVENT 6

Intake Structure blockage resulting in loss of the Intake Structure

When the SRO has declared the Tech Specs and directed by examiner, **insert malfunction and annunciator**:

CW12, CIRCULATING WATER INTAKE STRUCTURE BLOCKAGE(TRASH), FINAL VALUE=20%

TRG 4

H2-1-3, CIRCULATING WATER PUMP INTAKE LEVEL LOW, FINAL VALUE=CRYWOLF

TRG 4

Circ Water Pumps 11 and 12 amps fluctuate
Circ Water Pumps 11 and 12 eventually trip
Expected Annunciators:
H2-1-3, CIRCULATING WATER PUMP INTAKE LEVEL LOW
H1-4-3, SCREEN WASH PUMP-SCREEN TRIP LOW VOLT DIFF PRESS
H1-4-2 R. BUILDING SW PRESS/SERV W. PUMP HDR PRESS

PO-6.0

CREW

- Acknowledge/report annunciators:
  - *H2-1-3, CIRCULATING WATER PUMP INTAKE LEVEL LOW*
  - *H1-4-3, SCREEN WASH PUMP-SCREEN TRIP LOW VOLT DIFF PRESS*
  - *H1-4-2 R. BUILDING SW PRESS/SERV W. PUMP HDR PRESS*
- Analyze fluctuating CW Pump amps and diagnose loss of intake structure

SRO

- Acknowledge crew reports
- Directs execution of ARP for H2-1-3
- Directs entry into N1-SOP-18.1
- Direct rapid power reduction to reduce load for one Circ Water Pump
- Determine intake level is NOT being restored
- Direct a Reactor Scram

EVENT 6 Continued

Role Play: When dispatched as NAO to investigate intake level, wait one minute and report that there are some weeds on the traveling screens, level in the intake is approximately 238' and slowly lowering

Role Play: When contacted as NAO to give an update on intake level following a power reduction, immediately report that intake level is 237' and still lowering at the same rate as before, and that the traveling screens will not rotate

Note: When the plant is scrammed, an ATWS will occur, and subsequent actions in N1-SOP-18.1 may be prioritized

RO

- **Monitor plant parameters**
- **Rapidly lower Recirc Flow to lower power for one CW Pump operation**
- When directed to manually scram:
- Place Reactor Mode Switch in SHUTDOWN
- Recognize control rods did NOT fully insert

BOP

- Execute ARP for H2-1-3
- Dispatch an operator to the screen house to investigate
- Enter N1-SOP-18.1
- Determine problem is with intake bay
- Trip one Circ Water pump
- Monitor pumps taking a suction from the Forebay for abnormal operation
- Request updates from NAO on intake level
- When directed by the SRO
  - Trip the remaining CW Pump
  - Verify one SW Pump operating
  - Verify one SW Pump secured
  - Perform actions of N1-SOP-1, Reactor Scram
  - Initiate Emergency Condensers
  - Start ESW Pumps
  - Secure SW Pump
  - Close MSIVs

- Trip all Recirc Pumps

EVENTS 7 and 8

ATWS and LOCA

The following **malfunctions** are **preset** to cause an ATWS:

RD33A, CONTROL ROD BANK BLOCKED BANK 1, INSERT FAIL POSITION, FINAL VALUE=12
RD33B, CONTROL ROD BANK BLOCKED BANK 2, INSERT FAIL POSITION, FINAL VALUE=12
RD33C, CONTROL ROD BANK BLOCKED BANK 3, INSERT FAIL POSITION, FINAL VALUE=18
RD33D, CONTROL ROD BANK BLOCKED BANK 4, INSERT FAIL POSITION, FINAL VALUE=12
RD33E, CONTROL ROD BANK BLOCKED BANK 5, INSERT FAIL POSITION, FINAL VALUE=12

Control rods partially insert
Reactor power remains > 6%

When the mode switch is taken to shutdown, the following **malfunction** is automatically **inserted**:

RR29, RR LOOP RUPTURE (LOCA), DELAY TIME=3 MINUTES, RAMP TIME=4 MINUTES, FINAL VALUE=15%

TRG 18

Drywell leakage, humidity, pressure, and temperature rise

EVENTS 7 & 8 Continued

Expected Annunciators:
H2-4-7, DRYWELL WATER LEAK DETECTION SYS

CREW

- Diagnose failure of control rods to insert
- Diagnose degrading primary containment parameters

K2-4-3, DRYWELL PRESSURE HIGH - LOW

SRO

- Acknowledges scram report
- Enters N1-EOP-2 due to reactor power above 6% when scram required
- Answers "All rods in to at least 04" NO
- Answers "Will the reactor stay shutdown without boron" NO
- Exits N1-EOP-2, enters N1-EOP-3
- Directs ADS bypassed
- Directs prevent Core Spray injection per N1-EOP-1 Att 4
- Determines Reactor power is above 6% and RPV level is above -41 inches
- **Directs terminate and prevent of all injection except boron and CRD, N1-EOP-1 Att 24**

CT-1.0

Note: Further RPV level actions are detailed in Event 9

- Directs RPV level lowered to at least -41 inches
- If an ERV is cycling:
  - Directs initiation of Emergency Condensers
  - Directs open ERVs to lower RPV pressure to less than 965 psig
- Directs RPV pressure controlled below 1080 psig using Emergency Condensers and ERVs

EVENTS 7 & 8 Continued

- Monitors Figure M, Heat Capacity Temperature Limit
- Directs initiation of ARI
- Answers "Turbine Generator on-line?"

NO

- Answers "Reactor power?" above 6%
- Directs Recirc Pumps tripped
- Directs execution of N1-EOP-3.1
- Before torus temperature reaches 110°F:
  - Records Liquid Poison tank level
  - Directs Liquid Poison injection
- Acknowledge report that Primary Containment parameters (pressure, temperature, humidity) rising
- Enters N1-EOP-4 on high drywell pressure, high drywell temperature and/or high torus temperature
- Directs Containment Spray pumps in PTL
- When torus pressure exceeds 13 psig or before drywell temperature reaches 300°F:
- Verifies inside Figure K, Containment Spray Initiation Limit
- Verifies that Recirc Pumps are tripped
- Directs trip of drywell cooling fans
- **Directs initiation of Containment Spray per N1-EOP-1 Att 17**

CT-3.0

- Monitors Figure L, Pressure Suppression Pressure

EVENTS 7 & 8 Continued

RO

- Provides scram report
- Bypasses Core Spray IV interlocks per N1-EOP-1 Att 4 by installing six jumpers inside Panel N
- When directed performs N1-EOP-3.1, Section 3 (driving rods) and/or 4 (manual

scrams) (See actions below)
- Reports when APRMs <6%
- Reports status of control rod insertion

Possible N1-EOP-3.1 Section 3 Actions:
- Verify a CRD Pump running
- Place Reactor Mode Switch in REFUEL
- Place ARI OVERRIDE switch in OVERRIDE
- Install RPS jumpers (5, 6, 12, 13)
- Reset the scram
- Insert rods to 00 using EMER ROD IN starting with high power regions of core (use LPRM indications)
- If more drive pressure is required, then perform one or more of the following:
  - Fully open CRD Flow Control Valve (F panel)
  - Close 44-04, Control Rod Drive Water Cont V (F Panel)
  - Close 44-167, Charging Water Header Blocking Valve (RB 237')

Note: *Control rods will successfully insert using RMCS*

Note: *RO will likely have to fully open the CRD flow control valve and/or close 44-04 in order to achieve rod movement via RMCS; these methods are preferential to closing 44-167 due to ability to perform from the control room and not preventing further scram attempts by blocking the charging water header*

EVENTS 7 & 8 Continued

RO Continued

Possible N1-EOP-3.1 Section 4 Actions:
- Place ARI OVERRIDE switch in OVERRIDE
- Install RPS jumpers (5, 6, 12, 13)
- Reset the scram
- Verify open 44-167, Charging Water Header Blocking Valve (RB 237')

Note: *When the RPS jumpers have been installed, ARI is overridden, and the scram is reset, then* ***TRG 21*** *will activate. This runs a batch file which* ***deletes*** *the following* ***malfunctions****:*

RD33A, CONTROL ROD BANK BLOCKED BANK 1
RD33B, CONTROL ROD BANK BLOCKED BANK 2
RD33C, CONTROL ROD BANK BLOCKED BANK 3
RD33D, CONTROL ROD BANK BLOCKED BANK 4
RD33E, CONTROL ROD BANK BLOCKED BANK 5

And **inserts malfunctions**:

RD33A, CONTROL ROD BANK BLOCKED BANK 1, FINAL VALUE=6
RD33B, CONTROL ROD BANK BLOCKED BANK 2, FINAL VALUE=6
RD33C, CONTROL ROD BANK BLOCKED BANK 3, FINAL VALUE=10
RD33D, CONTROL ROD BANK BLOCKED BANK 4, FINAL VALUE=8
RD33E, CONTROL ROD BANK BLOCKED BANK 5, FINAL VALUE=8

Control rods partially insert

EVENTS 7 & 8 Continued

- When the SDV is drained, then initiate a manual scram

BOP

- Bypasses ADS
- **Terminates and prevents all injection except boron and CRD per N1-EOP-1 Att 24:**

CT-1.0

Role Play: When directed as NAO to pull HPCI fuses FU-8 and FU-9, wait one minute and **insert remote**:

FW24, REMOVAL OF HPCI FUSES FU8/FU9, FINAL VALUE=PULL

TRG 25

Then report that HPCI fuses FU-8 and FU-9 have been pulled

Note: Further RPV level actions are detailed in Event 9

EVENTS 7 & 8 Continued

- Closes both FEEDWATER ISOLATION Valves 11 and 12 OR places FEEDWATER Pumps 11 and 12 in PTL
- Selects Manual on 11, 12 and 13 FWP Valve Control selector switches
- Closes 11, 12 and 13 Feedwater FCV (Knurled Knob) full counterclockwise
- Directs NAO to remove fuses FU-8 and FU-9 from Panel IS34 in the Aux Control Room
- Verifies closed, FEEDWATER PUMP 13 BLOCKING VALVE
- Verifies in MAN, FWP 11 BYPASS VALVE, AND set to zero output
- Verifies in MAN, FWP 12 BYPASS VALVE, AND set to zero output

- Informs SRO when RPV water level reaches -41 inches
- If any ERV is cycling:
  - Initiates Emergency Condensers
  - Manually opens ERVs to lower RPV pressure <965 psig

BOP Continued

- Controls RPV pressure below 1080 psig with Emergency Condensers and ERVs
- Initiates ARI
- Verifies all Recirc Pumps tripped
- Initiates Liquid Poison as directed
  - Reports initial tank level
  - Starts Liquid Poison pump 11 or 12
  - Verifies RWCU isolated

- Places Containment Spray pumps in PTL
- Initiates Containment Spray (N1-EOP-1 Att 17)
  - **Starts Containment Spray Pump 111 or 122**

    CT-3.0
  - Starts at least one of the other three Containment Spray Pumps
  - May start Containment Spray Raw Water Pumps as needed for torus cooling
  - Verifies Containment Spray flow
  - Monitors containment pressure and temperature to ensure lowering trend
  - Terminates Containment Sprays when drywell pressure is below 3.5 psig
  - Reports containment spray terminated

BOP Continued

- Monitors DWP and reports if DWP reaches 3.5 psig, after spray is terminated
- IF directed, initiates Containment Spray again

EVENTS 7 & 8 Continued

EVENT 9

Feedwater unavailable for RPV injection

If the crew terminates and prevents by closing the FWIVs, then the following **overrides** will be automatically **inserted** to prevent re-opening of the valves:

OVR-5S5DI309 POS_3 1F10/31-03A POS C, FINAL VALUE=INSYS
OVR-5S6DI3012 POS_3 1F10/31-03A POS C, FINAL VALUE=INSYS

TRG 19

If the crew terminates and prevents by placing FW pumps 11 and 12 in PTL, then the following **malfunctions** and **overrides** will be automatically **inserted** to fail all five FW FCVs closed:

FW24, FEEDWATER 13 FCV FAILS CLOSED
FW28A, HPCI MODE FAILURE TO INITIATE 11
FW28B, HPCI MODE FAILURE TO INITIATE 12
OVR-5A144P1DI354 SET 1F27/ID15B MAN, FINAL VALUE=INSYS
OVR-5A144P1DI355 SET 1F27/ID15B AUTO, FINAL VALUE=INSYS
OVR-5A144P1AI3100 1F27/ID158 BAL R1, FINAL VALUE=0
OVR-5A145P1DI356 SET 1F28/ID15C MAN, FINAL VALUE=0.00
OVR-5A145P1DI357 SET 1F28/ID15C AUTO, FINAL VALUE=0.00
OVR-5A145P1AI3120 1F28/ID15C BAL R1, FINAL VALUE=0

CREW

- Recognizes/reports failure of FWIVs and/or FW FCVs to open

TRG 20

EVENT 9 Continued

OVR-5A300S1DI3123 SET FOX 11 LOW FLOW AUTO SWITCH, FINAL VALUE=0.00

OVR-5A300S3DI3121 1 FOX 11 LOW FLOW EMER INCREASE, FINAL VALUE=0.00

OVR-5A300S3DI3122 POS_2 FOX 11 FLOW FLOW NORM INCREASE, FINAL VALUE=0.00

OVR-5A301S1DI31211 SET FOX 12 LOW FLOW AUTO SWITCH, FINAL VALUE=0.00

OVR-5A301S3DI3127 1 FOX 12 LOW FLOW EMER. INCREASE, FINAL VALUE=0.00

OVR-5A301S3DI3128 POS_2 FOX 12 LOW FLOW NORM. INCREASE, FINAL VALUE=0.00

TRG 20

SRO

- Acknowledges RPV water level below -41 inches
- If torus temperature is above 110°F, then directs level lowered until:
  - Power drops below 6%, OR
  - Level drops to -84 inches (TAF)
- Records final actual level
- Directs RPV injection with Condensate/Feedwater and CRD
- Acknowledge report that Condensate/Feedwater is not available for injection
- When RPV water level cannot be maintained above -109 inches, enters N1-EOP-8, RPV Blowdown
- Answers "Are all control rods inserted to at least position 04?" NO
- Answers "Will the reactor stay shutdown without boron?" NO/UNKNOWN
- Directs terminate and prevent of all RPV injection except boron and CRD
- Directs Emergency Condensers initiated
- Answers "Torus water level?" Above 8 feet
- **Directs open 3 ERVs**

CT-2.0

- Returns to N1-EOP-3 at circle 10
- Answers "Is any ERV open?" YES

SRO Continued

EVENT 9 Continued

- Waits until RPV pressure drops below 288 psig
- Answers "Was level intentionally lowered before you entered N1-EOP-8?" YES
- Returns to circle 9
- **Directs RPV injection between -109 inches and previous final actual level with Core Spray per N1-EOP-1 Att 4**

CT-2.0

- Acknowledges report of RPV level restored above -109 inches

RO/BOP

- Acknowledges direction to re-establish RPV injection with Condensate/Feedwater and CRD
- Attempts to re-inject with Condensate/Feedwater per N1-EOP-1 Att 24:
  - Reopens at least one FEEDWATER ISOLATION Valve 11 and / or 12, if closed in step 2.1 OR
  - Restarts FEEDWATER Pumps 11 and/or 12, if shutdown in step 2.1 (if required)

EVENT 9 Continued

RO/BOP Continued

- IF RPV level restoration is required using the FEEDWATER System, THEN, Position FEEDWATER FCV

11 and/or 12 to maintain required RPV level

- Reports Condensate/Feedwater not available for RPV injection
- Reports RPV water level below -109 inches
- Re-establishes terminate and prevent lineup per N1-EOP-1 Att 24 as necessary
- Initiates Emergency Condensers
- **Opens 3 ERVs**

CT-2.0

- **Re-establishes RPV injection using Core Spray per N1-EOP-1 Att. 4:**

CT-2.0

  - Installs Core Spray Jumpers
  - Throttles Core Spray Inboard IV(s) (40-01, 40-09, 40-10, 40-11) as necessary to restore RPV level above -109" and maintain Core Spray within NPSH limits
- Reports RPV water level restored above -109 inches

TERMINATION CRITERIA

- RPV Blowdown in progress
- RPV water level above -109 inches and being controlled in assigned band
- Containment pressure controlled in accordance with N1-EOP-1 Att 17

XIV. POST SCENARIO CRITIQUE

D. N/A, NRC Exam

XV. REFERENCE EVENTS AND COMMITMENTS

G. Reference Events

None

H. Commitments

4. None

XVI. LESSONS LEARNED

A. None