FPL Energy
Seabrook Station

SIMULATOR EXAMINATION

2007-2009 LOIT NRC Examination Scenario B

Rev. 0

PREPARED BY: _____ DATE: _____
INSTRUCTOR

REVIEWED BY: _____ DATE: _____
SME (OPTIONAL)

APPROVED BY: Signature on File DATE: _____
TRAINING SUPERVISOR

SCENARIO

Mode 1, 8% power (IC #190, This IC has been stabilized).

Auto start of CS-P-2A is defeated. Both trains of Safety Injection fail to auto actuate. Both CBS pumps fail to auto start. The Supplemental Emergency Diesel Generator (SEPS) is unavailable (tagged out). The "A" ASDV is isolated and failed closed for maintenance.

Crew is performing a power increase to warm up the Main turbine. During the power increase a leak inside containment will develop that is within the capability of a centrifugal charging pump, and therefore will not require a Safety Injection. The crew should recognize this as a Technical specification entry.

After OS1201.02, RCS Leak abnormal has been entered and the leak rate estimated, MS-PT-507 fails HIGH. This will necessitate the manual closing of the condenser steam dumps via the P-12 Bypass/Interlock switches per ON1230.01, Steam Header Pressure PT-507 Instrument Failure. The crew may also enter OS1290.02, Response to Condensate or Feedwater Heater System Transient.

Failure of a SG Level transmitter, FW-LT-549, LOW will cause the "D" Bypass Feed Reg valve to fail open if it is automatic mode. The crew will respond per OS1235.03, SG Level Instrument Failure and manually control "D" SG Level.

Upon exiting ON1235.03, two control rods will simultaneously drop, causing the crew to call for a reactor trip, based upon the dropped rod abnormal procedure, OS1210.05. Upon entry into E-0, Reactor Trip or Safety Injection, the reactor coolant leak will increase requiring a Safety Injection. The crew will transition from E-0 to E-1 to ES-1.2.

E-plan: EAL SU5 (Unidentified or Pressure boundary leakage >10 GPM) Unusual Event.
Upgrade E-plan: SAE FS1 Loss and Potential Loss of Reactor Coolant system barrier.

Terminate the exam at Chief Examiner discretion.

SIMULATOR SETUP

1. Reset to IC 190, Verify Protected Train "B"

2. Rackout the SEPS breaker to Bus 6 and prevent Auto Start of SEPS:
   - ☐ Select: Sim Diagram SEPS
   - ☐ Select: bkSEPSA7A to Bus 6
   - ☐ Select: RACKOUT
   - ☐ Place Danger Tags on Bus 5 and Bus 6 SEPS Breaker control switches.
   - ☐ Verify that both RED and GREEN lights are out above the Bus 5 & 6 SEPS breakers

   Disable Auto Start of SEPS with following REMOTE Functions SEPS:
   - ☐ rfSEP003, SEPS DG 2A Auto Start Disable (No Alarm)
   - ☐ rfSEP004, SEPS DG 2B Auto Start Disable (No Alarm)

2. Prevent Automatic SI Actuation on Both Trains:
   - ☐ Select: Malfunctions Reactor Protection
   - ☐ Select: mfRPS007, SI Fails to Actuate (Train "A")
   - ☐ Select: Insert
   - ☐ Select: mfRPS008, SI Fails to Actuate (Train "B")
   - ☐ Select: INSERT

4. Prevent the Containment Spray Pumps From Starting:
   - ☐ Select: Malfunctions; Containment Building Spray
   - ☐ Select: mfCBS004, CBS-P-9A, Fails to Auto Start
   - ☐ Select: Insert
   - ☐ Select: mfCBS005, CBS-P-9B, Fails to Auto Start
   - ☐ Select: Insert

5. Set up Trigger for CS-P-2B Trip
   - ☐ Activate Event Trigger Len\CS-P-2B Trip on Rx Trip
   - ☐ Verify IMF mfCS017 is in the trigger

6. ☐ Ensure that FW-LT-549, is the controlling level channel on SG D.

7. To set up the ASDV "A" Closure and Isolation with MS-V5:
   - ☐ On Sim Diagram MS1 for MS-V5 Select the Remote Function, rfMS009, and Set Final value to 0
   - ☐ On MS-PK-3001, place the controller to Manual and Minimum Output
   - ☐ On Sim Diagram MS1, MS-PV-3001, Component Malfunction
   - ☐ SELECT: FAIL CLOSED
   - ☐ SELECT: INSERT
   - ☐ PLACE MCB jog switch to CLOSED for MS-PV-3001 and Danger Tag switch

SHIFT TURNOVER

- The plant is at 8% power.
- Increase plant power to 18% to warm up Main Turbine.
- No fuel preconditioning guidelines in effect.
- "A" MFP is in service. OS1000.02, "Plant Startup from Hot Standby to Minimum Load", step 4.2.7 in progress.
- SEPs is Tagged out for work on the Engine Air cooler radiators.
- Main Steam Atmospheric Steam Dump ("A"ASDV) valve, MS-PV-3001 is Danger tagged closed due to excessive seat leakage. MS-V-5 is closed and tagged. Tech. Spec. 3.7.1.6 and 3.6.3 were entered 4 hours ago.
- RCS temperature is being verified greater than minimum temp for criticality per T.S. 3.1.1.4.

SCENARIO OUTLINE

EVENT	INSTRUCTION	COMMENTS
Shift Turnover	Shift turnover information as stated.	
Event 1: Increase Plant Power to 18%	Crew makes preparations for rod withdrawal/boron dilution to raise power.	Once calculations are completed and power change has begun continue with exam. The crew should prepare for and initiate a power increase. **Unit Supervisor:** A brief reactivity review will take place discussing the temperature limits for Tave to be used in the power increase. The temperature band will normally be -2°F to +3°F. Control rods will be used for AFD and temperature control. **Turbine Operations**: The BOP will monitor the Feed Station and review the procedure for turbine startup. **Reactor Power change**: The crew will use control rods initially to increase temperature during the power increase. Using ODI-56, a dilution value will be determined to change the boron concentration and increase power/temperature. If control rods are used in manual the operator will verify rod speed, place the Rod Motion Selector (in-Hold-Out) switch to the OUT direction and WITHDRAW the rods a maximum of three steps. He will monitor temperature and power as confirmation of his actions. The high level steps for the dilution are: • Verify the pumps in AUTO • Verify the makeup valves are in AUTO • Place Blender Mode Start Switch to STOP • Place the Mode Selector Switch to Dilute • Set the quantity on CIS-FIQ-111 and CIS-FIQ-110 controllers • Set the Mode Start Switch to START • Verify the pumps and valves respond • Verify Plant Response. Restore System to Automatic control

EVENT	INSTRUCTION	COMMENTS
Event 2: 20 gpm RCS Leak	Go to Malfunctions, Reactor Coolant	
	☐ SELECT: MF List	Crew may use Skill of the Operator to take manual control of Charging and Letdown flow to prevent loss of Pressurizer heaters on low PZR level. PSO will maintain PZR level stable.
	☐ SELECT: Reactor Coolant System	
	☐ SELECT: mfRC048A, Loop 1 Leak	
	SELECT: Final Value: 20	
	☐ SELECT: Ramp Time: 120 seconds	
	☐ SELECT: Insert	The crew should enter OS1201.02, RCS Leak Abnormal. 1. Check If Pressurizer Level Can Be Maintained: a. Control charging and letdown flow as necessary to maintain PZR level on program • Check pressurizer level – STABLE OR INCREASING 2. Refer to ER 1.1, Classification of Emergencies: • Category S - System Malfunction (SU5) • Category F – Fission Product Barrier Degradation Matrix • Category C – Cold Shutdown/Refueling System Malfunction Once the crew estimates the RCS leakage is greater than 10 gpm the E-plan classification is: EAL SU5 (Unidentified or Pressure boundary leakage >10 GPM) Unusual Event

EVENT **INSTRUCTION** **COMMENTS**

3. Determine Appropriate Procedure Step Transition:
   IF the source of the leak is not readily apparent, THEN go to Step 4.

4. Isolate Potential RCS Leakage Sources: (Protected Ref: 1.0)
   a. Check for pressurizer safety or PORV leakage:
      - Safety valve or PORV tailpipe temperature – NORMAL
      - Acoustic monitor indications – NORMAL
   b. Check reactor head vent - ISOLATED:
      - RC-FV-2881 – CLOSED
      - RC-V323 – CLOSED

   c. Check excess letdown line - ISOLATED:
      - CS-V175 – CLOSED
      - CS-V176 – CLOSED

   d. Check RCS sample lines – CLOSED BY PHASE A STATUS PANELS:
      - Train A
      - Train B
   e. Check reactor vessel flange leakoff temperature:
      - RC - TI - 401 RX VESSEL FLANGE LEAKOFF TEMP – NORMAL
   f. Check valve stem leakoff header temperature:
      - D7805 INSIDE BARRIER STEM LEAKOFF TEMP HI – RESET
      - D7804 OUTSIDE BARRIER STEM LEAKOFF TEMP HI – RESET
   g. Check steam generator tubes - INTACT:
      - Main steamline radiation – NORMAL
      - Steam generator blowdown radiation – NORMAL
      - Condenser air evacuation radiation – NORMAL
      - Steam generator sample – NORMAL
   h. Check SI discharge header pressure - LESS THAN 800 PSIG

   i. Evaluate RCS Leakage - LEAKAGE ISOLATED **NO**

RNO: Go to step 16.

EVENT	INSTRUCTION	COMMENTS

16. Continue Efforts To Locate And Identify Source Of Leakage While Continuing With This Procedure:
    - Refer to Step 3
    - Plant walkdown:
        - Consult with HP when dispatching operators to perform plant walkdowns to determine leakage source
    - Containment entry:
        - Perform SH 6.5 Job Hazard Analysis prior to sending personnel into containment
        - Perform containment entry per ON1090.04, Containment Entry
        - Notify HP to perform HN0960.03, Radiological Requirements for Containment Entries
17. Estimate RCS Leak Rate:
    - Maintain Tavg – STABLE
    - Maintain pressurizer level – STABLE
    - Estimate leak rate using any of the following:
    - VCT level trend
    - Containment sump level trends
    - PZR/VCT mass balance
    - Steady state leak rate calculation
18. Verify Technical Specification Compliance:
    a) T.S. 3.4.6.2, Reactor Coolant System Leakage
    b) T.S. 3.4.10, Structural Integrity
19. Check VCT Makeup Control System:
    a) Makeup set for desired RCS boron concentration
    b) Makeup set for automatic control
20. Evaluate Continued Plant Operation:
    Check RCS leak – ISOLATED
    IF RCS leakage is greater than Tech spec limits THEN go to Step 21.

Goes to Step 21.

EVENT	INSTRUCTION	COMMENTS
CUE: Complete Step 20, of Abnormal before moving on to next event.		
Event 3: Main Steam Pressure Instrument, MS-PT-507 Fails High	☐ SELECT: MALFUNCTIONS Main Steam (Component) ☐ SELECT: ptMSPT507 ☐ SELECT: Fails High ☐ SELECT: INSERT	The crew responds with ON1230.01, Steam Header Pressure PT-507 Instrument Failure. Steam Dump Valves fail open in the STM Pressure mode. The BOP may close the Steam Dumps using the P-12 Interlock switches, or by operating MS-PK-507 in manual as a 'Skill of the Operator' task prior to entry into the abnormal procedure. Crew will have to monitor for minimum temperature for criticality, T.S. 3.1.1.4, and DNB T.R. 3.2.5, #2185 RCS psig. 1. Check Condenser Steam Dump System: a. Steam dumps in - TAVG MODE **NO** **RNO a.** IF steam dumps in steam press mode and PT-507 failed high THEN: 1) Close steam dumps by placing either steam dump interlock control switch to OFF position. 2) Place steam dump controller MS-PK-507 in MANUAL with minimum output. 3) Place steam dump interlock control switch to NA RESET NA BYPASS INTERLOCK position. 4) Manually control steam dumps as required. 5) Go to Step 2. 2. Transfer Main Feed Pump Master Speed Control To – MANUAL o Maintain feed header/steam header ΔP - AT PROGRAMMED ΔP 3. Check Secondary Plant Conditions - STABLE 4. Check Third Condensate Pump - NOT RUNNING 5. Initiate Instrument Repairs

EVENT	INSTRUCTION	COMMENTS
Event 4: FW-LT-549 Fails Low on SG D	Initiation of a malfunction of controlling level transmitter on SG D Feed Regulating Bypass Valve, fails LOW. ☐ Insert Malfunction: FEEDWATER (component) ☐ SELECT: ltFWLT549 ☐ SELECT: Fails LOW ☐ SELECT: INSERT	The crew responds with OS1235.03, SG Level Instrument Failure. The Feed Regulating Bypass Valve for SG D will open fully when in automatic control. The BOP operator will take manual control to restore level before high SG level trip. Enter T.S. 3.3.1, table 3.3-1, Item 13 and T.S 3.3-3, items 5.b, 6.a, 7.c, and 10C. **OS1235.03, SG Level Instrument Failure** Caution: *Failure of channels 519, 529, 539 or 549 will require manual feedwater regulating bypass valve control since a redundant level channel is not provided.* 1. Check Steam Generator Water Level Control: A. Identify failed instrument - CONTROLLING CHANNEL FAILED B. Place affected steam generator feed control valve – MANUAL C. Control feed flow to maintain narrow range level - 45% TO 55% o Steam generator feedwater regulating valve OR o Steam generator feedwater regulating bypass valve OR o Main feed pump speed controllers 2. Realign Steam Generator Level Instruments: a. Monitor feedwater system response and select an alternate level channel for control ***NOTE:*** *Feed regulating valve controller setpoint meter indicates level error and controller input meter indicates flow mismatch error. The Error signals will be zero if both input and setpoint indicators are matched at 50%.*

EVENT	INSTRUCTION	COMMENTS

3. Align Steam Generator Water Level Control:

a. Check the following:

- Steam flow/feed flow signals – MATCHED
- Steam generator level - AT PROGRAMMED LEVEL 50% (45% TO 55%)

b. Verify proper feed regulating valve controller setpoint and place controller – AUTO **(Note to examiner: Only applicable to Main Feed reg Valve. The Bypass valve must remain in manual.)**

4. Verify Redundant Channels Bistables - NOT TRIPPED
   - UL-1 - SG LVL HI HI FW ISO TURB TRIP
   - UL-6 - SG LVL LO LO
   - UL-12 - SG LVL HI HI FW ISO TURB TRIP
5. Verify Technical Specification Compliance:

   A. Refer to technical specifications:

   1. T.S. 3.3.1, Reactor Trip System Instrumentation; Table 3.3-1, Item 13
   2. T.S. 3.3.2, Engineered Safety Features Actuation System Instrumentation; Table 3.3-3, Items 5.b, 6.a, 7.c, 10.c
   3. T.S. 3.3.3.6, Accident Monitoring Instrumentation; Table 3.3-10, Item 7

EVENT	INSTRUCTION	COMMENTS
		B. Coordinate with I&C to perform the following: 1. If desired for testing or troubleshooting, place bistables to bypass using BTI panel toggle switches for up to 6 hours. Placing the channel in bypass does NOT satisfy compliance with the technical specification action statement. 2. Within 6 hours trip appropriate bistables per Attachment A, BISTABLES TO BE TRIPPED FOR SG LEVEL CHANNEL FAILURE NOTE: *ATWS actuation requires a 3/4 logic from the steam generator level input.* 6. Verify ATWS Mitigation Input Status: a. Check for an ATWS mitigation channel – FAILED SG: A 551; SG: B 552; SG C: 538; SG D: 547 b. Verify alternate ATWS mitigation channel bistables - NOT TRIPPED UL-28 SG LVL LO ATWS EFW INIT TURB TRIP c. Notify I&C and place failed channel in 1-MM-CP-519, ATWS mitigation system cabinet to - OPERATE BYPASS
	After step 6 of this abnormal or at lead examiners discretion continue to the next event.	

The next sequence of events require a manual reactor trip and safety injection demand due to two drop control rods and an increase in the RCS leak rate. The crew will very briefly enter OS1210.05, Dropped Rod. Based on the Caution prior to Step 1, the crew should initiate a reactor trip and transition to E-0, Reactor Trip or Safety Injection.

EVENT	INSTRUCTION	COMMENTS
Event 5: 2 Dropped Rods	☐ SELECT MALFUNCTIONS: Rod Control and Position ☐ SELECT: mfCP011 ☐ SELECT: INSERT	The crew should enter OS1210.05, Dropped Rod. Based on the caution prior to step 1 the Crew should trip the reactor and transition to E-0.
	UPON the manual reactor trip INCREASE the RCS Leakage to 50,000 gpm. ☐ From the MFS SELECT mfRC048A ☐ SELECT: Final Value: 50000 ☐ SELECT RAMP: 0 ☐ INSERT	**Crew Manually trips the reactor and verifies the need for safety injection.** E-plan: SAE FS1 Loss and Potential Loss of Reactor Coolant system barrier. Crew enters E-0, Reactor Trip or Safety injection: NOTE: • *Steps 1 through 4 are IMMEDIATE ACTION steps.* • *Initiate monitoring of critical safety function status trees at step 17 OR if exiting from this procedure.* • *Review OPERATOR ACTION SUMMARY periodically.* 1. Verify Reactor Trip: 2. Verify Turbine Trip: 3. Verify Power To AC Emergency Busses: a. AC emergency busses - AT LEAST ONE ENERGIZED b. AC emergency busses – BOTH ENERGIZED

EVENT	INSTRUCTION	COMMENTS
		4. Check If SI Is Actuated: Check SI annunciators lit • TRAIN A - OR - • TRAIN B **RNO: a.** Check if SI is required: • RCS pressure - LESS THAN 1800 PSIG Or • Pressurizer level - LESS THAN 7% Or • Containment pressure - GREATER THAN 4 PSIG Or • RCS subcooling - LESS THAN 40°F Or • Any SG pressure - LESS THAN 585 PSIG
	SI Fails to Auto actuate. The Crew Manually Initiates SI based on E-0 Step 4 immediate actions.	IF SI is required, THEN manually actuate. **(Note: Manual actuation will be required.)**
	PSO performs E-0, Attachment A while, US and BOP Continue procedure steps beyond Step 6. **NOTE: E-0 Attachment A will require manual start of CS-P-2B and both CBS-P-9A and CBS-P-9B.** **ATTACHMENT A is below in center column.** NOTE: *At least one train of ESF components should be aligned before aligning the redundant train.* *Verbal communication of manual actions is not required.*	5. Perform ESF Actuation Verification Per Attachment A. **(Located in center column for reference.)** 6. Monitor RCS Temperature - STABLE AT OR TRENDING TO 557°F

EVENT	INSTRUCTION	COMMENTS
	1. Verify Containment Isolation Phase A Actuation - ALL STATUS PANEL LIGHTS LIT • Train A • Train B	7. Check RCS Isolated: a. Check letdown valve(s) - CLOSED • CS-V145 - OR - • RC-LCV-459 - OR - • RC-LCV-460 b. PORVs – CLOSED c. Normal PZR spray valves – CLOSED
	2. Verify Safeguard Equipment Alignment - PROPER ALIGNMENT BY STATUS PANEL • TRAIN A - COLD LEG INJECTION • TRAIN B - COLD LEG INJECTION	8. Check If RCPs Should Be Stopped: a. ECCS pumps - AT LEAST ONE RUNNING • CCP Or • SI Pump b. RCS subcooling - LESS THAN **40^{0}F** c. Stop all RCPs **CREW STOPS RCPS** **Crew Stops RCPs Based on Subcooling <40^{0}F**

EVENT	INSTRUCTION	COMMENTS
	3. Verify Feedwater Isolation - PROPER ALIGNMENT BY STATUS PANEL	9. Check If SG Pressure Boundary Is Faulted: NO Goes to Step 10
	4. Verify PCCW Pumps Running: • Loop A – ONE PUMP RUNNING • Loop B – ONE PUMP RUNNING • Thermal barrier cooling pumps – AT LEAST ONE PUMP RUNNING	10. Check If SG U-Tubes Are Intact: Yes No SGTR, continues with Step 11. 11. Check If RCS Is Intact: NO **RNO:** Go to E-1, LOSS OF REACTOR OR SECONDARY COOLANT, Step 1. **Crew Transitions to E-1, Loss of REACTOR OR SECONDARY COOLANT, Step 1**
Event 6: Manual Start of 'B' CCP	5. Verify ECCS Flow: • CCP flow indicator - CHECK FOR FLOW TO RCS COLD LEGS • RCS pressure - LESS THAN 1700 PSIG • SI pump flow indicators - CHECK FOR FLOW - TRAIN A - TRAIN B • RCS pressure - LESS THAN 300 PSIG • RHR pump flow indicators - CHECK FOR FLOW - TRAIN A - TRAIN B 6. Verify MS-V129 – OPEN 7. Verify Service Water Pumps Running: • Train A - ONE PUMP RUNNING • Train B - ONE PUMP RUNNING	

EVENT	INSTRUCTION	COMMENTS
	8. Verify SW Flow To Train A And Train B Diesels - GREATER THAN REQUIRED 900 GPM on OCEAN Or 1800 GPM on cooling tower	
	9. Check If Main Steamlines Should Be Isolated: a. Check Main Steam Isolation required: • Any SG pressure - LESS THAN 585 PSIG WITHOUT PRIOR P-11 BLOCK Or • Main steam line isolation annunciator – LIT Or • Containment pressure - GREATER THAN 4 PSIG Or • SG pressure rate high bistable - LIT WITH PRIOR P-11 BLOCK b. Verify MSIV and MSIV bypass valves – CLOSED	
Event 7: Manual Start of CBS Pumps	10. Check Containment Pressure - HAS REMAINED LESS THAN 18 PSIG BY PRESSURE RECORDING **PSO manually starts CBS Pumps.**	
	11. Verify Total EFW Flow – GREATER THAN 500 gpm	

EVENT	INSTRUCTION	COMMENTS
	12. Reset RMO, as necessary	
	13. Notify US Of Actuation Verification Status	
Terminate Exam	When the crew has completed Attachment A of E-0 and transitioned to E-1, Loss of Reactor or Secondary Coolant, or at Chief Examiner's discretion.	Terminate the exam at Chief Examiner discretion.

CREW CRITICAL TASKS

1. Establish flow from at least one high head ECCS pump (CS-P-2A or 2B) before transition out of E-0.
2. Manually actuate at least one train of SI before any of the following: Transition to any E-1 series, or E-3 series procedure or transition to any FRG.
3. Manually actuate at least one train of CBS or start at least one train of Containment Building Spray Equipment before transition out of E-0

FPL Energy

Seabrook Station

SIMULATOR EXAMINATION

2007-2009 LOIT NRC Examination Scenario C

Rev. 0

PREPARED BY: _____ DATE: _____
INSTRUCTOR

REVIEWED BY: _____ DATE: _____
SME (OPTIONAL)

APPROVED BY: Signature on File DATE: _____
TRAINING SUPERVISOR

SCENARIO

Mode 1, 75% power. The motor driven EFW pump is removed from service (tagged out). The "A" ASDV is isolated and tagged closed due to seat leakage. MS-PV3001 was tagged out, and T.S 3.6.3 and TS 3.7.1.6 were entered 4 hours ago. The ASDV isolation valve MS-V5 is also closed.

Main Steam line isolation fails to auto actuate for Train 'A' and Train 'B'. The Reactor Trip Breakers are failed closed. An Automatic turbine trip is defeated. The manual turbine trip pushbutton is overridden to prevent a manual turbine trip from the Main Control room. The Start up feed pump will trip on overcurrent when a manual start attempt is made.

A Loop 1 Tcold failure High will occur. At the time of the Loop 1 Tcold failure, a 30 gpm RCS leak will start from the Tcold instrument line. The diagnosis of this event should lead the crew to commence a power decrease.

The "A" Steam Generator Steam Flow channel, FW-FT-512, will fail LOW. The "A" Feed regulating valve will CLOSE resulting in a decreasing "A" SG level. The total plant steam flow will also decrease, causing Main Feed Pump speed to decrease, resulting in the other SG levels also decreasing. The crew responds with OS1235.04, Steam Generator Steam Flow/Feed flow instrument failure. The BOP operator will place the "A" Feed Regulating Valve in manual and restore Steam Generator level to program (50%). The Crew will deselect the affected channel, and restore the Feed Pump and Feed Regulating Valve back to Automatic.

Main Feedwater Pump FW-P-32A will trip causing a setback of the turbine to less than 55% power. A trip of the remaining MFP will cause entry into E-0. Failure of the Reactor to trip will require transitioning to FR-S.1, Response to Nuclear Power Generation/ATWS. The turbine will fail to automatically or manually trip, and Turbine Control Valve 2 will stick open, requiring closure of the Main Steam Isolation Valves (MSIVs). The MSIVs will be prevented from automatically closing on rapidly decreasing SG pressure to ensure this must be done manually. A loss of the turbine driven EFW pump will cause a transition to FR-H.1, Response to Loss of Secondary Heat Sink upon completion of FR-S.1.

E-plan: Alert classification on EAL SU5 (RCS leakage due to unidentified leakage >10GPM).

Upgrade to Site Area Emergency based on SS2, ATWS and manual reactor shutdown from main control board NOT successful.

Terminate the exam at Chief Examiner discretion.

SIMULATOR SETUP

1. Select an IC for 75 % power. IC 31, 1139 ppm Boron

2. To set up the ASDV "A" Closure and Isolation with MS-V5:
   - ☐ On Sim Diagram MS1 for MS-V5 Select the Remote Function, rfMS009, and Set Final value to 0
   - ☐ On MS-PK-3001, place the controller to Manual and Minimum Output
   - ☐ On Sim Diagram MS1, MS-PV-3001, Component Malfunction
   - ☐ SELECT: FAIL CLOSED
   - ☐ SELECT: INSERT
   - ☐ PLACE MCB jog switch to CLOSED for MS-PV-3001 and Danger Tag switch

3. INSERT the following malfunctions to prevent an Automatic Turbine Trip
   - ☐ Select Malfunctions: Reactor Protection:
   - ☐ Select: mfRPS003, Automatic Turbine Trip Failure
   - ☐ Select: INSERT
   - ☐ On Panel PFF14 Override the Turbine Trip Pushbutton to "RELEASE"

4. Rack out the Motor Driven EFW pump, FW-P-37B
   - ☐ Place the MCB switch for FW-P-37B in PTL and place a Danger Tag on the switch
   - ☐ SELECT: Remote Functions Component: Feedwater
   - ☐ SELECT: bkFWP37B, right click
   - ☐ SELECT: RF: RACK-OUT
   - ☐ SELECT: INSERT

5. Set up the SUFP to trip when started on Bus E5.
   - ☐ SELECT: Malfunctions: Feedwater
   - ☐ SELECT: mfFW041, FW-P-113, Trip Bus E5 (Faulty 86 Device)
   - ☐ SELECT: INSERT

6. Set up the failure of the reactor to trip
   - ☐ SELECT: Malfunctions: Reactor Protection:
   - ☐ SELECT: mfRPS001 Automatic Reactor Trip Failure (Train "A")
   - ☐ SELECT: INSERT
   - ☐ SELECT: mfRPS002 Automatic Reactor Trip Failure (Train "B")
   - ☐ SELECT: INSERT
   - ☐ SELECT: Malfunctions Rod Control and Position (Component)
   - ☐ SELECT: bkCPRTA
   - ☐ SELECT: FAIL CLOSE
   - ☐ SELECT: INSERT
   - ☐ SELECT: bkCPRTB
   - ☐ SELECT: FAIL CLOSE
   - ☐ SELECT: INSERT

SHIFT TURNOVER

- Plant is at ~75% power. Cb = 1139 ppm
- Current power level was achieved 12 hrs ago.
- The Motor driven EFW pump has been tagged out for motor inspection. T.S. Action Statement 3.7.1.2 was entered at 0600.
- Plant is being held at 75% power, waiting ISO direction to return plant power to 100%.
- Main Steam Atmospheric Steam Dump ("A"ASDV) valve, MS-PV-3001 is Danger Tagged closed due to excessive seat leakage. MS-V-5 is closed and tagged. Tech. Spec. 3.7.1.6 and 3.6.3 were entered 4 hours ago.

SCENARIO OUTLINE

EVENT	INSTRUCTION	COMMENTS
Shift Turnover	Shift turnover information as stated.	

Allow the crew to perform a board walkdown and assume the watch prior to inserting the first malfunction:

Event 1: Tcold Fails Low and RCS Leak	Initiate a failure of RCS Tcold Temperature instrument, RC-TI-411, fails LOW. This failure is caused by a 30 gpm RCS leak with a 5 minute ramp. (leak not counted towards I/C requirements; added to provide realistic cause of failed instrument)	Upon the initial instrument failure the crew responds with "OS1201.08, Tavg/Delta T Instrument Failure". After verifying Secondary Load is STABLE the PSO will place rod control to MANUAL and defeat affected instrument.
RC-TT-411 Fails Low	☐ SELECT: MF List	Crew should recognize an RCS leak has initiated. The crew should respond to the RCS leak using OS1201.02. The PSO will control charging and letdown flow to restore PZR level.
	☐ SELECT: Reactor Coolant Component ☐ SELECT: ttRCtt411 SELECT: FAIL LOW ☐ SELECT: Insert	**OS1201.08, Tavg/Delta T Instrument Failure** 1. Check Any Tavg Channel – FAILED- YES 2. Stabilize Plant Conditions: • Place rod control – MANUAL • Check condenser steam dump valves – CLOSED • As necessary, manually restore pressurizer level to program using: o RC-LK-459 master level controller - OR - o CS-FK-121 controller
RCS Leak Loop 1 30 gpm ramped over 5 minutes	☐ SELECT: MF List ☐ SELECT: Reactor Coolant ☐ SELECT: mfRC049A ☐ SELECT: Final Value=30	

EVENT	INSTRUCTION	COMMENTS
	☐ SELECT: RAMP Time= 300	3. Defeat Affected Loop ΔT And Tavg Inputs: • Depress affected loop ΔT channel defeat pushbutton • Depress affected loop Tavg channel defeat pushbutton • Select a non affected channel forΔT,OT,OP recorder 4. Verify Operation Of Control Systems: a. Check Tavg - WITHIN 1°F OF Tref 1. If desired, place rod control in - AUTO b. Check pressurizer level - AT PROGRAMMED LEVEL c. Restore pressurizer level control to automatic, as necessary: 1. Adjust RC-LK-459 as needed to match the input on CS-FK-121 2. Place CS-FK-121 in AUTO 3. Adjust RC-LK-459 input to match program level setpoint 4. Place RC-LK-459 in AUTO d. Verify both steam dump interlock selector switches in the NA RESET NA BYPASS INTERLOCK (neutral) position 5. Verify Redundant Channel Bistables - NOT TRIPPED

EVENT	INSTRUCTION	COMMENTS
		UL-1: T AVG LO LOOP TO FW ISO T AVG LO-LO LOOP STM DMP ISO UL-6: RCS LOOP OTΔT RCS LOOP OPΔT UL-12: TAVG LO LOOP TO FW ISO
		6. Verify Technical Specification And Technical Requirement Compliance: • T.S. 3.3.1, Reactor Trip System Instrumentation; Table 3.3-1, Items 7 & 8 • T.R. 19, Feedwater Isolation On Low Tavg Coincident With Reactor Trip 7. Coordinate Repairs End of Procedure
	NOTE: Crew may process the instrument failure and RCS Leak abnormal procedures in parallel when the RCS leak is diagnosed.	**OS1201.02, RCS LEAK** 1. Check If Pressurizer Level Can Be Maintained: a. Control charging and letdown flow as necessary to maintain PZR level on program b. Check pressurizer level – STABLE OR INCREASING

EVENT **INSTRUCTION** **COMMENTS**

2. Refer to ER 1.1, Classification of Emergencies:
   - Category S - System Malfunction (SU5)
   - Category F – Fission Product Barrier Degradation Matrix
   - Category C – Cold Shutdown/Refueling System Malfunction

Once the crew estimates the RCS leakage is greater than 10 gpm the E-plan classification is: EAL SU5 (Unidentified or Pressure boundary leakage >10 GPM) Unusual Event

3. Determine Appropriate Procedure Step Transition:

   IF RCS leak is suspected, THEN go to Step 4.

4. Isolate Potential RCS Leakage Sources:

   a. Check for pressurizer safety or PORV leakage:
      - Safety valve or PORV tailpipe temperature – NORMAL
      - Acoustic monitor indications - NORMAL

   b. Check reactor head vent - ISOLATED:
      - RC-FV-2881 – CLOSED
      - RC-V323 - CLOSED

   c. Check excess letdown line - ISOLATED:
      - CS-V175 – CLOSED
      - CS-V176 - CLOSED

   d. Check RCS sample lines – CLOSED BY PHASE A STATUS PANELS

EVENT	INSTRUCTION	COMMENTS

e. Check reactor vessel flange leakoff temperature:
   - RC - TI - 401 RX VESSEL FLANGE LEAKOFF TEMP – NORMAL

f. Check valve stem leakoff header temperature:
   - D7805 INSIDE BARRIER STEM LEAKOFF TEMP HI – RESET
   - D7804 OUTSIDE BARRIER STEM LEAKOFF TEMP HI - RESET

g. Check steam generator tubes - INTACT:
   - Main steamline radiation – NORMAL
   - Steam generator blowdown radiation – NORMAL
   - Condenser air evacuation radiation – NORMAL
   - Steam generator sample - NORMAL

h. Check SI discharge header pressure - LESS THAN 800 PSIG

i. Evaluate RCS Leakage - LEAKAGE ISOLATED: RNO NO

RNO: Go to step 16.

16. Continue Efforts To Locate And Identify Source Of Leakage While Continuing With This Procedure:
17. Estimate RCS Leak Rate:
18. Verify Technical Specification Compliance:
    - T.S. 3.4.6.2, Reactor Coolant System Leakage
    - T.S. 3.4.10, Structural Integrity
19. Check VCT Makeup Control System:
20. Evaluate Continued Plant Operation:

EVENT	INSTRUCTION	COMMENTS
	NOTE: Continue to next Event at Chief Examiner's discretion.	21. Commence Controlled Plant Shutdown While Continuing With This Procedure: 22. Check CST level - GREATER THAN 390,000 GALLONS 23. Isolate Offsite Release Paths: 24. Minimize Effects Of Release To Containment: 25. Verify Plant In Hot Standby: RNO NO Continue shutdown to Hot Standby. Do NOT continue to Step 26 until Step 25 is complete.
Event 2: A SG Steam Flow Channel Failure	☐ SELECT: Malfunctions Feedwater (Component) ☐ SELECT: ftFWFT512 ☐ SELECT: FAIL LOW ☐ SELECT: INSERT	The "A" Feed regulating valve will CLOSE resulting in a decreasing "A" SG level. The total plant steam flow will also decrease, causing Main Feed Pump speed to decrease, resulting in the other SG levels also decreasing. The BOP operator will place the "A" Feed Regulating Valve in manual and restore Steam Generator level to program 50%. The Crew will deselect the affected channel, and restore the controls to Feed Pump back to Automatic. **The crew responds with OS1235.04, Steam Generator Steam Flow/Feed flow instrument failure.** NOTE: *Failure of a SG pressure instrument used for steam flow density-compensation will cause invalid steam flow indication.* *Steam flow channels provide input to the Main Feed Pump programmed DP signal for speed control.* 1. Check Steam Generator Water Level Control: a. Identify failed instrument - CONTROLLING CHANNEL FAILED

EVENT	INSTRUCTION	COMMENTS
		- Steam flow channel - Feed flow channel b. Place affected steam generator feed control valve – MANUAL c. Control feed flow to maintain narrow range level - 45% TO 55% 4. Realign Steam Generator Level Control Instruments: a. Monitor feedwater system response and select an alternate channel for control: - Steam flow channel OR - Feed flow channel 5. Align Steam Generator Water Level Control: a. Check the following: - Steam flow/feed flow signals – MATCHED - Steam generator level - AT PROGRAMMED LEVEL 50% (45% TO 55%) b. Verify proper feed regulating valve controller setpoint and place controller - AUTO 4. Check For Failure Of A Steam Generator Pressure Instrument: None: Return to Procedure and step in Effect.

Initiate the next event while crew is stabilizing from previous failure and before crew has rods in AUTO

Event 3: MFP-32A trip on low lube oil pressure.	☐ SELECT: Malfunctions; Feedwater ☐ SELECT: mfFW038, MFP-32A trip on low lube oil pressure ☐ SELECT: INSERT	The crew responds using OS1231.03, Turbine Runback/Setback Abnormal. PSO will be required to insert control rods in MANUAL or place rods in Automatic in order to decrease RCS temperature. Plant will trip on Low SG level if RCS temp/steam demand is not lowered below the capability of one MFP. The crew will verify load decreases and plant responds as required.

EVENT	INSTRUCTION	COMMENTS

OS1231.03, Turbine Runback/Setback Abnormal

1. Verify Turbine Generator Load - DECREASING

2. Verify Proper Rod Control Response:
   a. Verify Rod bank selector switch position – AUTO
   b. Verify Rod motion – INWARD
3. Verify Proper Steam Dump Operation
4. Check Steam Generator Pressure - LESS THAN 1150 PSIG
5. Check Main Feed Pump Bias Control Status:
   - Check Main feed pump master speed controller bias potentiometer set – AT GREATER THAN OR EQUAL TO 5.0
   - Check BOTH main feed pump slave speed controller bias potentiometers set – AT ZERO

NOTE: *Plant may not survive a runback/setback at higher power levels due to a challenge to the SG level low-low reactor trip setpoint.*

6. Verify Steam Generator Narrow Range Levels - TRENDING TO 50%

7. Monitor Control Rod Position:
   - Check rod insertion limit LO-LO alarms – RESET
   - Check ΔI -AFD WITHIN ADMINISTRATIVE LIMIT

8. Check Generator VARs – AT ZERO

EVENT	INSTRUCTION	COMMENTS

NOTE: *IF the steam dumps have opened due to a load rejection, THEN Tref indications may not reflect actual program temperature. T cold can be used to ensure RCS is at program temperature.*

9. Monitor RCS Temperature:

   a. Check turbine load condition:

      - Turbine generator load – STABLE
      - EHC load set meter - STABLE

   b. Verify steam dump system response:

      1. Steam dump valves modulating closed as RCS temperature is restored
      2. WHEN steam dumps are closed and Tavg is within 2°F of Tref, THEN reset condenser steam dump arming signal C-7

   c. Verify Tavg - STABLE AT OR TRENDING TO PROGRAM VALUE

      - T cold - STABLE AT PROGRAM TEMPERATURE

      - OR -

      - Tavg indication

      - OR -

      - Tavg/Tref indication

EVENT	INSTRUCTION	COMMENTS
		10. Stop Any Boron Dilution In Progress: 11. Determine Cause of Runback/Setback Condition On UL-29: a. Check for turbine generator setback condition: • FEEDWATER PUMP LOST (55%) b. Initiate repair activities to clear system malfunctions: Go to Step 14 14. If Power Reduction Exceeded 15%, Notify Chemistry To Sample The RCS 15. Notify Load Dispatcher Of Load Capabilities 16. Verify Technical Specification Compliance: a. T.S. 3.2.1, Axial Flux Difference b. T.S. 3.1.3.6, Control Rod Insertion Limits

Initiation of a failure of Main Turbine Stop valve to FAIL AS IS. This failure provides a CCT on subsequent plant trip. Initiate trip of Second Main Feed Pump to require plant trip, and a Loss of Feedwater event.

Event 4: Failure of #2 MS Stop Valve	☐ SELECT: Main Steam Component	The crew should recognize that insufficient feedwater is available and there is a need for a Reactor Trip. The crew will enter E-0, Reactor Trip or Safety Injection.
	☐ SELECT: avMSVSV2	An AUTO Reactor Trip will not occur so the PSO will perform a MANUAL Trip.
	☐ SELECT: FAIL OPEN	The Reactor will not trip and the crew will transition to FR-S.1, Response to Nuclear Power Generation/ATWS.

EVENT	INSTRUCTION	COMMENTS
Event 4: FW-P-32B Trip for Loss of FW	☐ SELECT: INSERT ☐ SELECT: Malfunctions Feedwater ☐ SELECT: mfFW054 ☐ SELECT: INSERT **CUE:** **90 seconds after the crew directs a local trip the Trip breakers will be opened locally to Shutdown the reactor.** ☐ **Go to Components Malfunction Summary on toolbar** ☐ **SELECT: bkCPRTA** ☐ **Right Click and SELECT DELETE** ☐ **SELECT: bkCPRTB** ☐ **Right Click and SELECT DELETE**	

EVENT	INSTRUCTION	COMMENTS
	BOP should recognize that AUTO turbine trip has not occurred. After performing a MANUAL Turbine trip the BOP operator should recognize #2 Turbine Stop valve has FAILED OPEN (malfunction previously inserted). BOP operator will manually runback the turbine. When SV-2 remains OPEN the BOP will initiate a Main Steam Line Isolation Manually. BOP operator will follow up with direction to the NSO to trip the Main Turbine from the front standard per FR-S.1. **CUE: When directed by crew remove Main Turbine trip override** ☐ **SELECT Malfunction Summary on the tool bar** ☐ **Select: mfRPS003** ☐ **Select: Delete** ☐ **Select: EXECUTE** ☐ **Select Override Summary on the toolbar** ☐ **Delete override for turbine trip pushbutton.**	**E-0, Reactor Trip or Safety Injection:** 1. Verify Reactor Trip: No **RNO:** Manually trip reactor. IF reactor will NOT trip, THEN go to: **FR-S.1, RESPONSE TO NUCLEAR POWER GENERATION/ATWS, Step 1.** 1. Verify Reactor Trip: • Rod bottom lights - LIT ON DRPI • Reactor trip AND bypass breakers - OPEN • Neutron flux – DECREASING **RNO:** Manually trip reactor. IF reactor will NOT trip, THEN: • Verify control rods are being inserted in auto Or • Manually insert control rods 2. Verify Turbine Trip a. All turbine stop valves – CLOSED NO RNO: Manually trip turbine. IF turbine will NOT trip, THEN manually run back turbine. IF turbine can NOT be run back, THEN close MSIVs and bypass valves. WHEN generator output is ZERO MWe, THEN open generator breaker. b. Generator breaker – OPEN Yes

EVENT	INSTRUCTION	COMMENTS
Event 5: Loss of EFW Turbine Driven Pump, FW-P-37A	**CUE: After the crew has passed step 3 of FR-S.1 AND Wide Range level on all SGs >/= 50% and increasing then TRIP MS-V-129, Steam Supply to Turbine Driven EFW pump.** **Go to Sim Diagram FW3:** **Select: rmvMSV129** **Select: manual adjust** **Select: Final Value = 0** **Select: INSERT** **NOTE: Delay local restart of Turbine driven EFW pump until the crew has entered FR-H.1, Loss of Heat Sink.**	3. Check EFW Pumps Running: a. Motor driven pump – RUNNING **NO** a. **RNO:** Manually start motor driven EFW pump. **(Can not be started due to tag out)** IF motor driven EFW pump can NOT be started, THEN start the SUFP per Attachment A; **SUFP NOT Available due to 86 LO Fault on breaker.** b. Turbine-driven pump – RUNNING • MS-V393 - OPEN • MS-V394 - OPEN • MS-V395 - OPEN • MS-V129, Trip Valve – OPEN—**NO** **b. RNO:** Open valves to establish at least one steam supply path. IF the turbine driven pump can NOT be started from the control room, THEN perform the following: Locally start turbine driven pump per OS1036.03, RESETTING THE STEAM DRIVEN EFW PUMP TRIP VALVE. Crew should dispatch an operator to restart the EFW Pump turbine. The NSO will ask for the recirc valve FW-V346 to be opened.

EVENT	INSTRUCTION	COMMENTS
	NOTE: The crew should exit FR-S.1 at step 7. ○ **If a RED "H": does not exist, transition from FR-S.1 to E-0. When heat sink becomes RED or at step 7 of E-0 , transition to FR-H.1.** ○ **If a RED "H" exists, transition to FR-H.1 from FR-S.1.**	4. Initiate Emergency Boration Of RCS: a. At least one CCP running. b. Align boration path: 1. Start at least one - BORIC ACID PUMP 2. Open emergency borate valve - CS-V426 c. Align charging flow path: 1. Place CS-FK-121 in manual and charge at maximum rate 2. Align CCP suction to RWST • OPEN CS-LCV-112D • OPEN CS-LCV-112E 3.Isolate VCT: • CLOSE CS-LCV-112B • CLOSE CS-LCV-112C d. Check PZR pressure - LESS THAN 2385 PSIG 5. Verify Containment Ventilation Isolation: a. Containment purge isolation valves – CLOSED • COP-V1 • CAP-V1 • COP-V2 • CAP-V2 • COP-V3 • CAP-V3 • COP-V4 • CAP-V4
Event 6: Loss of SUFP, FW-P-113	The crew will attempt to start the SUFP. The SUFP will trip (faulty 86 device) due to an event trigger inserted prior to the scenario.	

EVENT	INSTRUCTION	COMMENTS

CAUTION: *If an SI signal exists or occurs, ATTACHMENT A of E-0, REACTOR TRIP OR SAFETY INJECTION should be performed while continuing with this procedure.*

6. Check If The Following Trips Have Occurred:
   a. Reactor Trip

      Yes Reactor Trip Breakers have been opened locally.

   b. Turbine trip- NO

RNO Dispatch operator to locally trip turbine at the turbine front standard.

7. Check If Reactor Is Subcritical:

a. Check power range channels - LESS THAN 5%

b. Check intermediate range flux rate – ZERO OR NEGATIVE

c. Check gammametrics intermediate range flux level - LESS THAN 5%

d. Check gammametrics intermediate range flux rate - ZERO OR NEGATIVE

e. Continue boration to obtain adequate shutdown margin during subsequent actions

f. Return to procedure and step in effect

EVENT **INSTRUCTION** **COMMENTS**

The crew should exit FR-S.1 at step 7.

- If a RED "H": does not exist, transition from FR-S.1 to E-0. When heat sink becomes RED or at step 7 of E-0 , transition to FR-H.1.
- If a RED "H" exists, transition to FR-H.1 from FR-S.1.

A RED Path will exist so crew should go to FR-H.1.

FR-H.1, Response to Loss of Secondary Heat Sink

1. Check If Secondary Heat Sink Is Required:
   a. RCS pressure - GREATER THAN ANY NON-FAULTED SG PRESSURE
   b. RCS hot leg temperature - GREATER THAN 350°F [320°F FOR ADVERSE CONTAINMENT]
2. Check CCP Status - AT LEAST ONE AVAILABLE

CAUTION: *If wide range level in any 3 SGs is less than 30% [51% for adverse containment] OR PZR pressure is greater than or equal to 2385 PSIG due to loss of secondary heat sink, Steps 1 through 10 should be immediately initiated for bleed and feed.*

EVENT	INSTRUCTION	COMMENTS
Event 7: Recovery of FW-P-37A	**CUE: After entry into FR-H.1 and the crew has dispatched an NSO to start the Turbine Driven EFW Pump, then restore MS-V-129.** **Go to Sim Diagram FW3:** **Select: rmvMSV129** **Select: manual adjust** **Select: Ramp Time = 60** **Select: Final Value = 1** **Select: INSERT** SG WR Levels should be greater than 45%. When EFW flow is restored the crew should return to FR-H.1, step 3 to determine procedure transition. o If FR-H.1 was entered from FR.S.1 then procedure and step in effect is E-0, step 1. As FR-H.1 was entered from FR-S.1 the transition is back to E-0, Step 1 and verification of Immediate action steps 1-4, and then transition to ES-0.1, Reactor Trip Response, Step 1.	3. Establish EFW Flow To At Least One SG: a. Check SG Blowdown isolation valves - CLOSED AS INDICATED ON PHASE A STATUS PANEL • SB-V9 • SB-V10 • SB-V11 • SB-V12 b. Check control room indications for cause of EFW failure: • CST level low • EFW pump power supply (Bus E6 or steam) • EFW valve alignment (MCB) • EFW pump failure c. IF any SG wide range level is less than 14% [30% ADVERSE CONTAINMENT], THEN OBSERVE dry SG cautions and notes on OAS page. d. Try to restore EFW flow • FW-P-37A • FW-P-37B e. Check total flow to SGs - GREATER THAN 500 GPM f. Determine procedure transition: • IF bleed and feed is NOT in progress, THEN return to procedure and step in effect Or • IF bleed and feed is in progress, THEN return to bleed and feed step in effect

EVENT	INSTRUCTION	COMMENTS

E-0 Reactor Trip or Safety injection

NOTE:

- *Steps 1 through 4 are IMMEDIATE ACTION steps.*
- *Initiate monitoring of critical safety function status trees at step 17 OR if exiting from this procedure.*
- *Review OPERATOR ACTION SUMMARY periodically.*

1. Verify Reactor Trip:
   - Rod bottom lights – LIT
   - Reactor trip and bypass breakers – OPEN
   - Neutron flux - DECREASING
2. Verify Turbine Trip:
   - All turbine stop valves – CLOSED
   - Generator breaker - OPEN
3. Verify Power to AC Emergency Busses:
   - AC emergency busses - AT LEAST ONE ENERGIZED
   - AC emergency busses – BOTH ENERGIZED
4. Check If SI Is Actuated:
   Check SI annunciators lit
   - TRAIN A

   OR -
   - TRAIN B

Step 4 RNO:

EVENT	INSTRUCTION	COMMENTS
		Step 4 RNO: a. Check if SI is required: • RCS pressure - LESS THAN 1800 PSIG - OR - • Pressurizer level - LESS THAN 7% - OR - • Containment pressure - GREATER THAN 4 PSIG - OR - • RCS subcooling - LESS THAN 40°F - OR - • Any SG pressure - LESS THAN 585 PSIG IF SI is required, THEN manually actuate. IF SI is NOT required, THEN go to ES-0.1, REACTOR TRIP RESPONSE, Step 1
Terminate Exam	Terminate the Exam on the Transition to ES-0.1. Terminate the exam at Chief Examiner discretion.	Site Area Emergency E-plan classification based on SS2, ATWS and manual reactor shutdown from main control board NOT successful.

CREW CRITICAL TASKS

1. Insert negative reactivity into the core by at least one of the following methods in accordance with FR-S.1:
    - Automatic and or manual insertion of the RCCAs.
    - Establish Emergency Boration flow to the RCS.
2. Establish feedwater flow into at least one SG before RCS bleed and feed is required.
3. Isolate the main turbine from the SGs before proceeding to step 5 of FR-S.1 on an ATWS initiated by a loss of Feedwater.

FPL Energy

Seabrook Station

SIMULATOR EXAMINATION

2007-2009 LOIT NRC Examination Scenario D

Rev. 0

PREPARED BY: _____ DATE: _____
INSTRUCTOR

REVIEWED BY: _____ DATE: _____
SME (OPTIONAL)

APPROVED BY: Signature on File DATE: _____
TRAINING SUPERVISOR

SCENARIO

Mode 1, 52% power. The crew will commence a power increase of 10% per hour to 100% power.

After the power increase has begun, the seal water pump of the "A" Air Removal pump will fail causing a loss of Condenser Vacuum. The automatic start of the standby Air removal pump has been defeated. The crew will address the failure by starting the standby Air removal pump, then securing the "A" Air Removal pump to isolate the failed seal.

When the plant is stable Pressurizer Level transmitter RC-LT-459 will fail low, causing a letdown isolation. The crew will address the failure with OS1201.07, PZR Level Instrument Failure and restore letdown flow and recover PZR level to programmed level.

The "B" SG will have a SG tube Rupture creating a Primary to Secondary leak. The crew will address this with OS1227.02, Steam Generator Tube leak. At step 2 of OS1227.02, the crew should determine that PZR Level can not be maintained. The crew should trip the reactor and initiate a Safety Injection.

On the Manual Reactor trip the "A" PCCW pump will trip, and the "C" PCCW pump will fail to auto start. The crew should recognize no PCCW cooling is available for Train A components and manually start the "C" PCCW pump.

On the Manual Reactor trip the SG "B" Atmospheric Steam Dump Valve (ASDV) will fail partially open, causing a reactor coolant release to atmosphere. The crew should recognize the "B" SG is ruptured and faulted. The crew should transition from E-0 to E-2.

The crew will isolate the Faulted Ruptured SG in E-2 and direct local closure of the "B" SG ASDV to terminate the release to the atmosphere.

In E-3, the crew will verify the isolation of the faulted "B" SG with the closure of the other MSIVs on the other SGs.

Prior to the crew performing a cooldown of the RCS, the SG pressure will have decreased to <350 psig, creating a transition to ECA-3.1. The crew should recognize that the "B" SG pressure can not be maintained high enough above the intact SGs.

The Crew should transition to ECA-3.1.

The E-Plan Classification is an Alert classification based on EAL FA1, Reactor Coolant System Barrier potential loss with Unisolable leak > capacity of one Centrifugal charging pump in the normal charging mode. An upgrade Site Area Emergency E-plan classification is based on Fission Product Barrier Degradation Matrix: FS1, Reactor Coolant System Barrier potential loss with Unisolable leak > capacity of one Centrifugal charging pump in the normal charging mode, plus Containment Barrier Loss for Ruptured Faulted SG outside of containment.

Terminate the exam at Chief Examiner discretion.

SIMULATOR SETUP

1. Reset to a 52% Power MOL IC

2. Rackout the SEPS breaker to Bus 6 and prevent Auto Start of SEPS:
   - ☐ Select: Sim Diagram SEPS
   - ☐ Select: bkSEPSA7A to Bus 6
   - ☐ Select: RACK OUT
   - ☐ Place Danger Tags on Bus 5 and Bus 6 SEPS Breaker control switches.
   - ☐ Verify that both RED and GREEN lights are out above the Bus 5 & 6 SEPS breakers

   Disable Auto Start of SEPS with the following REMOTE Functions SEPS:
   - ☐ rfSEP003, SEPS DG 2A Auto Start Disable (No Alarm)
   - ☐ rfSEP004, SEPS DG 2B Auto Start Disable (No Alarm)

3. For the PCCW Train "A" Pump Failures:
   - ☐ Select: Malfunctions Primary Component Cooling
   - ☐ Select: mfCC014, CC-P-11C Fails to Auto Start
   - ☐ Select: Insert
   - ☐ Activate the Trigger to Trip the CC-P-11A pump on the reactor trip
   - ☐ Select: Event Triggers: Len\Len PCCW PMP A Trip, Activate

4. Activate the Triggers for the Condenser Air Leak:
   - ☐ Select: Event Triggers: Len\Condenser Air Leak, Activate
   - ☐ Select: Event Triggers: Len\Mod Vacuum Leak, Activate
   - ☐ Select: Event Triggers: Demo Exams\ Exam 04 Delete Vacuum Malf

5. Activate the Triggers to set up the ASDV and MS Safety Valve Failures:
   - ☐ Select: Event Triggers: Len\ASDV Failure On Trip, Activate
   - ☐ Select: Event Triggers: Len\Safety Open On ASDV Close

6. Insert the Failure of Automatic Main Steamline Isolation Train "A" and Train "B"
   - ☐ Select: Malfunctions Reactor Protection
   - ☐ Select: mfRPS019, MS Isolation Fails to Auto Actuate (Train "A")
   - ☐ Select: INSERT
   - ☐ Select: mfRPS019, MS Isolation Fails to Auto Actuate (Train "A")
   - ☐ Select: INSERT
   - ☐ Select: mfRPS020, MS Isolation Fails to Auto Actuate (Train "B")
   - ☐ Select: INSERT

7. To set up the ASDV "A" Closure and Isolation with MS-V5:
   - ☐ On Sim Diagram MS1 for MS-V5 Select the Remote Function, rfMS009, and Set Final value to 0
   - ☐ On MS-PK-3001, place the controller to Manual and Minimum Output

- ☐ On Sim Diagram MS1, MS-PV-3001, Component Malfunction
- ☐ SELECT: FAIL CLOSED
- ☐ SELECT: INSERT
- ☐ PLACE MCB jog switch to CLOSED for MS-PV-3001 and Danger Tag switch

8. Initiation of a failure of the "B" Main Steam Isolation Valve, MS-V-88, OPEN. This will set up a later failure of a B SG ASDV.
   - ☐ Insert Malfunction: Main Steam (Component)
   - ☐ SELECT: svMSV88
   - ☐ SELECT: FAIL OPEN
   - ☐ SELECT: INSERT

SHIFT TURNOVER

- The plant is at 52% power preparing to do a power increase of 10%/hr to 100% following repairs to FW-P-32B.
- The plant has been stable at current power level for 12 hrs.
- SEPs is Tagged out for work on the Engine Air cooler radiators.
- Main Steam Atmospheric Steam Dump ("A"ASDV) valve, MS-PV-3001 is Danger Tagged closed due to excessive seat leakage. MS-V-5 is closed and tagged. Tech. Spec. 3.7.1.6 and 3.6.3 were entered 4 hours ago.
- The Crew is in OS1000.05, Power Increase at step 4.3.15.
- RCS Boron is 1150 ppm.

SCENARIO OUTLINE

EVENT	INSTRUCTION	COMMENTS
Shift Turnover	Shift turnover information as stated.	
Event 1: Power Increase at 10%/hr from 52%	Crew makes preparations for rod withdrawal/boron dilution to raise power.	Once calculations are completed and power change has begun continue with exam. **Unit Supervisor:** A brief reactivity review will take place discussing the temperature limits for Tave to be used in the power increase. The temperature band will normally be -2°F to +3°F. Control rods will be used for AFD and temperature control. **Turbine Operations**: The BOP will monitor the Feed Station and control the power increase with the turbine controls, monitoring for RCS temperature increase and adjusting turbine load control potentiometer 3 to 5 increments, or 'flats' as it is called here at Seabrook, to raise load. **Reactor Power change**: Using ODI-56, a dilution value will be determined to change the boron concentration and increase power/temperature. Control rods may be used for power/temperature increase, but would most likely be used for AFD control during the power increase. If control rods are used in manual the operator will verify rod speed, place the Rod Motion Selector (in-Hold-Out) switch to the OUT direction and WITHDRAW the rods a maximum of three steps. He will monitor temperature and power as confirmation of his actions. The high level steps for the dilution are: • Verify the pumps in AUTO • Verify the makeup valves are in AUTO • Place Blender Mode Start Switch to STOP

EVENT	INSTRUCTION	COMMENTS
		• Place the Mode Selector Switch to Dilute • Set the quantity on CIS-FIQ-111 and CIS-FIQ-110 controllers • Set the Mode Start Switch to START • Verify the pumps and valves respond • Verify Plant Response.
		Restore System to Automatic control
Event 2: Condenser Air Leak	Go to Malfunctions, Reactor Coolant	The BOP responds to start the third (standby) Air Removal pump. BOP should identify that the seal pump has failed on "A" AR pump and isolate the pump.
	☐ SELECT: MF List ☐ SELECT: Condenser Air Evacuation System ☐ SELECT: mfAR006C, AR-P-50C Fails to Auto Start ☐ SELECT: SELECT INSERT ☐ SELECT panel PFF21 ☐ Override AR-P-50A Seal Water Pump RED Light (right most one) to OFF.	Verify that the Malfunction is deleted when "A" AR pump control switch is placed in the PTL position.
	This begins the vacuum leak **NOTE: Scenario triggers insert the condenser vacuum leak and with staring the standby AR pump reduce the leak and putting the 'A' AR pump in PTL, deletes the condenser leak.**	The crew responds with ON1233.01, Loss of Condenser Vacuum. **ON1233.01, Loss of Condenser Vacuum.** 1. Verify All Mechanical Vacuum Pumps Running. RNO: Manually start vacuum pump(s).

EVENT	INSTRUCTION	COMMENTS

2. Check Condenser Vacuum – DECREASING

RNO: IF cause of the loss of vacuum has been corrected AND vacuum is greater than 25 inches, THEN:

- Stop generator load reduction, as necessary.
- Go to Step 6.

6. Locate Source Of Vacuum Loss:

- Condenser vacuum breaker
- Water box priming system operation
- Steam packing exhauster operation
- Main feed pump seal drop out tank
- Condensate pump seals
- Air removal pump seal water tank
- MSR scavenging lines
- Feedwater heater vents
- Condensate Polishing System
- Condenser penetrations. Refer to ON1433.01, CONDENSER/ MECHANICAL VACUUM PUMP AIR INLEAKAGE SURVEILLANCE for a detailed listing of condenser penetrations
- Any work in progress affecting vacuum or systems required to support condenser vacuum

EVENT	INSTRUCTION	COMMENTS
		7. Notify Chemistry As Required: 8. Check If Turbine Generator Operation Can Continue: a. Condenser vacuum - GREATER THAN 25 INCHES OF HG VACUUM b. Loss of vacuum condition - IDENTIFIED AND CORRECTED c. Notify Dispatcher and increase load as necessary RNO: Return to Step 3;
	By the end of the procedure where they return to Step 3, the crew should have corrected AR Pump issues and would be able to exit the abnormal procedure.	
Event 3: Pressurizer Level Transmitter RC-LT-459, Fails Low	☐ SELECT: MALFUNCTIONS Reactor Coolant (Component) ☐ SELECT: ltRCLT459 ☐ SELECT: Fails Low ☐ SELECT: INSERT	Initiation of a failure of Pressurizer level Transmitter, RC-LT-459, LOW. This will cause an isolation of letdown flow and increasing charging flow. The PSO using 'Skill of the Operator' and direction from the US, may reduce charging flow to seal injection flow only before entering the abnormal procedure. **OS1201.07, PZR Level Instrument Failure.** NOTE: *Channel L-459/L-460 are normally selected for level control because the channel selector relays are deenergized in this position. Relay failure should not cause protective actuation.* 1. Check Pressurizer Level Channels: • Controlling channel – FAILED YES, LT-459 Failed LOW OR -

EVENT	INSTRUCTION	COMMENTS

- Backup channel - FAILED

OR -

- Recorder channel - FAILED

Caution: *Selecting an alternate channel on the PZR level may cause letdown isolation and heater trip if the channel currently selected is failed high or low.*

NOTE: *Charging may have to be reduced to flow to the RCP seals only, in order to control pressurizer level.*

2. Realign Pressurizer Level Instruments:

a. Manually control pressurizer level - AT PROGRAM:

- Pressurizer level controller - RC-LK-459

OR

- Letdown and charging flow

b. Select an alternate level channel for CONTROL/BACKUP as necessary

c. Select an alternate level channel for RECORDER as necessary

3. Verify Pressurizer Heaters – ON

a. Reset or manually control pressurizer heaters as necessary.

4. Check If Letdown Was Isolated: YES

EVENT	INSTRUCTION	COMMENTS

a. Letdown isolation valves – CLOSED

- RC-LCV-459

OR

- RC-LCV-460

5. Check If Normal Letdown Can Be Established:

a. Verify charging flow - GREATER THAN 50 GPM

b. Pressurizer level - GREATER THAN 17%

c. Establish normal letdown:

1. Align PCCW to letdown heat exchanger:

1. CC-V341 – OPEN
2. CS-TK-130 - AUTO

2. Close letdown flow control valves:

- CS-HCV-189
- CS-HCV-190

3. Open letdown line isolation valves:

- RC-LCV-459
- RC-LCV-460
- CS-V145

EVENT	INSTRUCTION	COMMENTS

4. Manually control OR monitor CS-PK-131 response AND establish letdown flow using letdown flow control valves

   - CS-HCV-189
   - CS-HCV-190

5. Go to Step 7

7. Align Pressurizer Level Control:

   a. Verify proper controller setpoint and place controller in - AUTO

      - Pressurizer level control - RC-LK-459
      - Charging flow control - CS-FK-121

8. Verify Redundant Channel Bistables - NOT TRIPPED

   UL-6 PRESSURIZER LEVEL HI

9. Verify Technical Specification Compliance:

   a. Refer to technical specifications:

      1. T.S. 3.3.1, Reactor Trip System Instrumentation; Table 3.3-1, Item 11
      2. T.S. 3.3.3.6, Accident Monitoring Instrumentation; Table 3.3.10, Item 5
      3. T.S. 3.3.3.5, Remote Shutdown Systems; Table 3.3-9, Item 5

EVENT	INSTRUCTION	COMMENTS
		b. Coordinate with I&C to perform the following: 1. If desired for testing or troubleshooting, place bistable to bypass using BTI panel toggle switches for up to 6 hours. Placing the channel in bypass does NOT satisfy compliance with the technical specification action statement 2. Within 6 hours trip appropriate bistables per ATTACHMENT A, BISTABLES TO BE TRIPPED FOR PRESSURIZER LEVEL CHANNEL FAILURE END of procedure.
Event 4: "B" SG Tube Leak at 75 gpm	Initiation of a "B" Steam Generator Tube rupture at 75 gpm. ☐ SELECT MALFUNCTIONS: Steam Generator ☐ SELECT: mfSG002B ☐ SELECT: Final Value: 75 ☐ SELECT: Ramp: 300 ☐ SELECT: INSERT	The crew responds with OS1227.02, Steam Generator Tube Leak. PSO controls charging and letdown flow to maintain PZR level stable in order to quantify the leakage. Crew should determine that plant shutdown is required. **OS1227.02, Steam Generator Tube Leak** 1. Check RCP Status: a. RCPs - AT LEAST ONE RUNNING 2. Check If Pressurizer Level Can Be Maintained: a. Control charging and letdown flow as necessary to maintain PZR level on program b. Level - STABLE OR INCREASING 3. Try To Identify Affected SG:

EVENT	INSTRUCTION	COMMENTS

a. Notify chemistry to implement CS0905.08, RESPONSE TO A PRIMARY TO SECONDARY LEAK

b. Try to identify affected SG:

- Unexpected increase in any SG narrow range level

  Or

- High radiation from any SG steamline--**YES**

  Or

- High radiation from any SG blowdown line

  Or

- High radiation from any SG blowdown line sample

NOTE: Crew determines "B" SG has tube leak.

4. Check if VCT Level Can Be Maintained

a. VCT level - MAINTAINED GREATER THAN 15%

NOTE: *Leak rate is defined as gallons per day (GPD) and Leak rate of change is defined as change in gallons per day per hour (GPD/HR).*

Leak rate of change criterion applies to progressively increasing leak rates and does not apply to leak rate spikes followed by decreasing leak rates. The leak rate of change, in GPD per hour, should be evaluated over a time interval of 30 minutes.

EVENT	INSTRUCTION	COMMENTS
		5. Determine SG Tube Leakage: a. Check primary to secondary leak rate - LESS THAN 1 GPM (1440 GPD) • VCT level trend • PZR/VCT mass balance • Steady state leak rate calculation b. Determine steam generator tube leakage and monitoring requirements per ATTACHMENT A • Leak rate • Leak rate of change • Leak monitoring requirements
	Once crew has determined a leak rate based on step 5 of OS1227.02, move on to the next event at the direction of the Chief Examiner.	
Event 5: "B" SGTR increases in size	☐ From the MFS SELECT mfSG002B ☐ SELECT: Final Value: 300 ☐ SELECT RAMP: 300 ☐ MODIFY	The crew recognizes that OS1227.02 ability to control PZRlevel has been exceeded. Crew should manually trip the Reactor and Actuate SI. The crew should transition from OS1227.02 to E-0.

EVENT	INSTRUCTION	COMMENTS

Crew enters E-0, Reactor Trip or Safety injection: NOTE:

- *Steps 1 through 4 are IMMEDIATE ACTION steps.*
- *Initiate monitoring of critical safety function status trees at step 17 OR if exiting from this procedure.*
- *Review OPERATOR ACTION SUMMARY periodically.*

1. Verify Reactor Trip:
2. Verify Turbine Trip:
3. Verify Power To AC Emergency Busses:
4. Check If SI Is Actuated:

   Check SI annunciators lit

   - TRAIN A
   - OR -
   - TRAIN B

RNO: a. Check if SI is required:

- RCS pressure - LESS THAN 1800 PSIG
  Or
- Pressurizer level - LESS THAN 7%
  Or
- Containment pressure - GREATER THAN 4 PSIG
  Or
- RCS subcooling - LESS THAN 40°F
  Or
- Any SG pressure - LESS THAN 585 PSIG

IF SI is required, THEN manually actuate.

EVENT	INSTRUCTION	COMMENTS
	PSO performs E-0, Attachment A, while US and BOP Continue procedure steps beyond Step 6.	5 .Perform ESF Actuation Verification Per ATTACHMENT A.
	NOTE: *At least one train of ESF components should be aligned before aligning the redundant train.*	6. Monitor RCS Temperature - STABLE AT OR TRENDING TO 557°F
	Verbal communication of manual actions is not required.	
	1. Verify Containment Isolation Phase A Actuation - ALL STATUS PANEL LIGHTS LIT • Train A • Train B	
Event 6: On the Manual Reactor trip the "A" PCCW pump will trip, and the "C" PCCW pump will fail to auto start. The crew should recognize no PCCW cooling is available for Train A components and manually start the "C" PCCW pump. (CCT) during E-0, Attachment A	2. Verify Safeguard Equipment Alignment - PROPER ALIGNMENT BY STATUS PANEL • TRAIN A - COLD LEG INJECTION • TRAIN B - COLD LEG INJECTION	
	3. Verify Feedwater Isolation - PROPER ALIGNMENT BY STATUS PANEL	
	4. Verify PCCW Pumps Running: • Loop A – ONE PUMP RUNNING • Loop B – ONE PUMP RUNNING • Thermal barrier cooling pumps – AT LEAST ONE PUMP RUNNING	

EVENT	INSTRUCTION	COMMENTS
	5. Verify ECCS Flow: • CCP flow indicator - CHECK FOR FLOW TO RCS COLD LEGS • RCS pressure - LESS THAN 1700 PSIG • SI pump flow indicators - CHECK FOR FLOW - TRAIN A - TRAIN B • RCS pressure - LESS THAN 300 PSIG • RHR pump flow indicators - CHECK FOR FLOW - TRAIN A - TRAIN B	7. Check RCS Isolated: a. Check letdown valve(s) - CLOSED • CS-V145 - OR - • RC-LCV-459 - OR - • RC-LCV-460 b. PORVs – CLOSED c. Normal PZR spray valves – CLOSED 8. Check If RCPs Should Be Stopped: a. ECCS pumps - AT LEAST ONE RUNNING • CCP Or • SI Pump b. RCS subcooling - LESS THAN 40°F--**NO, Go to Step 9.** c. Stop all RCPs

EVENT	INSTRUCTION	COMMENTS
	6. Verify MS-V129 – OPEN	9. Check If SG Pressure Boundary Is Faulted: Yes
	7. Verify Service Water Pumps Running: • Train A - ONE PUMP RUNNING • Train B - ONE PUMP RUNNING	**Transitions to E-2, Faulted SG Isolation**
	8. Verify SW Flow To Train A And Train B Diesels - GREATER THAN REQUIRED 900 GPM on OCEAN Or 1800 GPM on cooling tower	

EVENT	INSTRUCTION	COMMENTS
PSO may close the MSIVs at this point, but the pressure drop may not be large enough at this time to force the closure of the MSIVs.	9. Check If Main Steamlines Should Be Isolated: a. Check Main Steam Isolation required: • Any SG pressure - LESS THAN 585 PSIG WITHOUT PRIOR P-11 BLOCK Or • Main steam line isolation annunciator – LIT Or • Containment pressure - GREATER THAN 4 PSIG Or • SG pressure rate high bistable - LIT WITH PRIOR P-11 BLOCK b. Verify MSIV and MSIV bypass valves – CLOSED 10. Check Containment Pressure - HAS REMAINED LESS THAN 18 PSIG BY PRESSURE RECORDING 11. Verify Total EFW Flow – GREATER THAN 500 GPM 12. Reset RMO, as necessary 13. Notify US Of Actuation Verification Status **END of ATTACHMENT A**	

EVENT	INSTRUCTION	COMMENTS
Event 7: ASDV Fails 20% Open	Verify the Trigger has fired to fail the "B" ASDV to 20% open on the reactor trip. If not perform the following:	
	☐ SELECT: MF List ☐ SELECT: Main Steam (Component) ☐ SELECT: svMSV3002 ☐ SELECT: Go To Position ☐ SELECT: Final Value: 20 ☐ SELECT: Ramp Time: 0 ☐ SELECT: INSERT	The BOP operator should recognize the "B" SG ASDV is open without a valid demand. BOP operator should manually close the "B" ASDV with direction from the US.

EVENT	INSTRUCTION	COMMENTS
Event 8: "B" SG Safety Valve Opens	After a time delay a Safety Valve on the "B" SG will lift below setpoint re-initiating the release. The crew should transition from E-0 to E-2 The crew should isolate the remaining three intact Steam generators by closure of the other Main Steam Isolation valves (AUTO isolation defeated in set up). **NOTE: If crew does not close the ASDV, Force the trigger for the SG Safety valve to drive to proper point in E-3.** **CUE: If directed by the crew to locally close the "B" MSIV report back that it appears to be mechanically bound and will not close.**	When the ASDV is closed the trigger for the SG Safety will actuate and with a short time delay a safety valve on the "B" SG will fail open. **E-2, Faulted SG Isolation:** Caution: • *At least one SG must be maintained available for RCS cooldown.* • *Any faulted SG or secondary break should remain isolated during subsequent recovery actions, unless needed for RCS cooldown.* 1. Check Main Steamline Isolation And Bypass Valves Of All SGs CLOSED----NO "B" SG MSIV Open RNO: Manually close valves. IF valves can NOT be closed, THEN locally close valves. 2. Check If SG Pressure Boundary Is Intact: a. Check pressure in all SGs - ANY STABLE OR INCREASING 3. Identify Faulted SG(s): a. Check pressures in all SGs: • ANY SG PRESSURE DECREASING IN AN UNCONTROLLED MANNER Or • ANY SG COMPLETELY DEPRESSURIZED

EVENT	INSTRUCTION	COMMENTS

Caution: *If the turbine driven EFW pump is the only available source of feed flow, steam supply to the EFW pump must be maintained from one SG.*

4. Check Faulted SG(s) Isolated:
   a. Main feedline - ISOLATED
   b. EFW flow - ISOLATED
   c. Isolate the faulted SG steam supply to the turbine driven EFW pump by closing the applicable valve:
      SG A MS-V393
      SG B MS-V394
   d. SG ASDV - CLOSED
   e. Main steam drain(s) - CLOSED
      SG A MSD-V44
      SG B MSD-V45
      SG C MSD-V46
      SG D MSD-V47
   f. SG blowdown - ISOLATED
      SG A SB-V9
      SG B SB-V10
      SG C SB-V11
      SG D SB-V12

CAUTION: *CST makeup should be commenced as soon as possible to avoid low inventory problems.*

5. Check CST Level - GREATER THAN 250,000 gallons

6. Check Secondary Radiation:
   a. Main steamline radiation - NORMAL ON EACH LINE

EVENT	INSTRUCTION	COMMENTS
		b. Condenser air evacuation radiation - NORMAL c. Steam generator blowdown radiation - NORMAL d. SG narrow range level - NO UNCONTROLLED LEVEL INCREASE **NO, "B" SG Ruptured** **RNO: Go to E-3, STEAM GENERATOR TUBE RUPTURE, Step 1.** 1. Check If RCPs Should Be Stopped: a. ECCS pumps - AT LEAST ONE RUNNING • CCP Or • SI pump b. RCS subcooling - LESS THAN 40°F **NO Go to Step 2** **2. Identify Ruptured SGs:** • Uncontrolled increase in any SG narrow range level OR - • High radiation from any SG steamline OR - • High radiation from any SG sample OR - • High radiation from any SG blowdown line
	CUE: Crew Should identify "B" SG as Ruptured.	

EVENT	INSTRUCTION	COMMENTS
		CAUTION: • *If the turbine-driven EFW pump is the only available source of feed flow, steam supply to the turbine-driven EFW pump should be maintained from at least one SG.* • *At least one SG must be maintained available for RCS cooldown.*
		3. Isolate Flow From Ruptured SG(s): a. Adjust ruptured SG(s) ASDV controller setpoint to 1125 PSIG b. Check ruptured SG(s) ASDV – CLOSED c. Isolate the ruptured SG(s) steam supply to turbine driven EFW pump by closing the applicable valve: ▪ SG A MS-V393 ▪ SG B MS-V394 d. Verify blowdown isolation valve(s) from ruptured SG(s) – CLOSED ▪ SG A SB-V9 ▪ SG B SB-V10 ▪ SG C SB-V11 ▪ SG D SB-V12 e. Close ruptured SG(s) upstream drain valves: ▪ SG A MSD-V44 ▪ SG B MSD-V45 ▪ SG C MSD-V46 ▪ SG D MSD-V47
Due to Safety being open on B SG the RNO for this step should be done.		f. Close ruptured SG(s) MSIV and bypass valve(s) f. RNO Perform the following

EVENT	INSTRUCTION	COMMENTS
		1. Close all remaining MSIVs and MSIV bypass valves. 2. Verify following valves closed: • Main turbine stop valves • MSR steam supply valves • Dispatch operator to locally close valves per ATTACHMENT A while continuing with this procedure.
	CUE: If directed by the crew to locally close the "B" MSIV report back that it appears to be mechanically bound and will not close.	3. Transfer RCS temperature control from steam dumps to intact SG ASDVs as follows: a. Use intact SG ASDVs to lower RCS temperature to 557°F. b. Disable condenser steam dumps by placing both steam dump interlock control switches to OFF.
	CUE: The "B" SG should be able to be isolated from the other SGs at this point in the procedure.	IF any ruptured SG can NOT be isolated from at least one intact SG, THEN go to ECA-3.1, SGTR WITH LOSS OF REACTOR COOLANT - SUBCOOLED RECOVERY DESIRED, Step 1
		CAUTION: *If any ruptured SG is faulted, feed flow to that SG should remain isolated during subsequent recovery actions unless needed for RCS cooldown.*
	CUE: EFW Flow should remain isolated to "B" SG as it is faulted.	4. Check Ruptured SG(s) Level: a. Narrow range level - GREATER THAN 6% [15% FOR ADVERSE CONTAINMENT] b. Open EFW pump mini-flow valves AND stop feed flow to ruptured SG(s).

EVENT	INSTRUCTION	COMMENTS
		5. Check Ruptured SG(s) Isolated From Intact SG(s): • Ruptured SG(s) MSIV and MSIV bypass valves – CLOSED OR • At least ONE intact SG MSIV and MSIV bypass valve - CLOSED 6. Check Ruptured SG(s) Pressure - GREATER THAN 350 PSIG
	At this time in validation "B" SG Pressure was <350 psig requiring transition to ECA-3.1.	**NO Pressure is <350 psig in "B" SG** **RNO: Go to ECA-3.1, SGTR WITH LOSS OF REACTOR COOLANT - SUBCOOLED RECOVERY DESIRED, Step 1** **NOTE: If the "B" SG pressure is not less than 350 psig at this transition point, the next procedural transition is after Step 14 and the completion of the cooldown.** NOTE: *If the ruptured SG pressure decreases after RCS cooldown is stopped, isolation of the SG should be verified before transferring to ECA-3.1, SGTR WITH LOSS OF REACTOR COOLANT - SUBCOOLED RECOVERY DESIRED.* 15. Check Ruptured SG Pressure - STABLE OR INCREASING— **NO** **RNO:** IF pressure continues to decrease to less than 250 PSIG above the pressure of the intact SGs used for cooldown, THEN go to ECA-3.1, SGTR WITH LOSS OF REACTOR COOLANT - SUBCOOLED RECOVERY DESIRED, Step 1.
Terminate Exam	Terminate the exam at the Chief Examiner's discretion.	

CREW CRITICAL TASKS

1. Manually start at least one PCCW pump for the available train, to provide adequate cooling for the operating safeguards train before transition out of E-0.
2. Isolate the faulted Steam Generator before transition out of E-2.