

NRC SRO OPERATIONAL
SIMULATOR SCENARIO No. 1

REACTOR COOLANT PUMP RESTART, ASYMMETRIC ROD, LOSS OF MFW,
PRESSURIZER CODE SAFETY FAILURE, LOSS OF SCM

DEVELOPED BY/DATE:

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Facility: TMI

Scenario No.: 1

Op-Test No.:

Examiners:

Operators:

Initial Conditions:

Plant at 27% power, steady state.
 One Main Feedwater Pump and condensate string operating.
 Emergency Feedwater Pump 2A tagged out of service.

Turnover:

Plant at 27% power, steady state.
 Emergency Feedwater Pump 2A is tagged out for bearing replacement.
 Four hours into the 72 hour timeclock.
 Expected to be returned to service in another 24 hours.
 Reactor Coolant Pump 1B was secured due to a faulty relay.
 The relay has been replaced and RC-P-1B is ready for restart.

Orders for the shift:

1. Restart RC-P-1B.
2. Raise power to 100%.

Event No.	Malf. No.	Event Type *	Event Description
1		I (ALL)	Narrow Range RCS Pressure instrument slowly fails low.
2	N/A	N (ALL)	Start Reactor Coolant Pump 1B and verify feedwater ratio is restored properly.
3	N/A	R (RO)	Start raising power toward 100%.
4	RD0225; assign to Event #2 Event #3 an:g(9) dmf RD0225	C (ALL)	Control rod 7-4 sticks during power escalation. Rod 7-4 frees after becoming a 7" asymmetric rod, but before becoming a 9" asymmetric rod fault.
5	01A5S07- ZDIMSCA(3), SLOLO, ON; assign to Event #4	C (ALL)	Main Feedwater Pump runs off line causing loss of Feedwater. Reactor Coolant System temperature and pressure increase.
6	RD28; activate immediately	I (ALL) M(ALL)	The reactor will fail to trip on high Reactor Coolant System pressure (ATWS), requiring manual trip of the reactor.
7	RC27A; assign at 35% on Event #5 Event #5 RD:CFTRP RCA0505 > 2400	M (ALL) C(ALL)	Pressurizer code safety valve opens early on rising Reactor Coolant System pressure and results in a loss of Subcooling Margin.

	Event #6 RCA0505<10 00 DMF RC27A		
8	DH11A	I (RO)	Decay River Pump 1A fails to automatically start on Emergency Safeguards actuation.

* (N)ormal, (R)eactivity, (I)nstrument, (C)omponent, (M)ajor

[illegible]

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1.0 GENERAL DESCRIPTION OF SCENARIO

The plant is stable at 27% power with Reactor Coolant Pump 1B (RC-P-1B) secured. The crew will be tasked with starting RC-P-1B and performing a power escalation to 100% power.

The ICS selected Reactor Coolant System pressure instrument will slowly fail low. All Pressurizer heaters will energize. A single Reactor Protection System cabinet will trip on low RCS pressure. The crew will manually select the alternate pressure instrument and place the RPS cabinet in Manual Bypass.

The crew will successfully start RC-P-1B and verify that feedwater re-ratios correctly.

The crew will then start the power escalation to 100%, observing the Mechanical Maneuvering rate limitation of 30% power per hour (1/2% per minute).

During the power escalation, Rod 7-4 will stick and become asymmetric by 7 inches. The rod will begin moving again prior to becoming 9" out of alignment. When the crew implements the CRD malfunction procedure, they should determine operability of the rod.

While the crew is making preparations to restore the rod, Main Feedwater Pump 1A will run off line. This will require the crew to respond to rising RCS pressure and temperature.

The reactor will fail to trip in response to rising RCS pressure (ATWS), requiring manual trip of the reactor. The manual trip will be successful.

During the high RCS pressure condition, a Pressurizer code safety valve will fail open, eventually resulting in a loss of Subcooling Margin.

The crew will respond to the loss of subcooling margin by attempting to trip the RCPs within one minute. RC-P-1D cannot be tripped from its control switch and the 1B 6900V Bus cannot be de-energized. One RCP will have to be run in each loop.

The crew will continue the actions for loss of SCM by initiating High Pressure Injection (HPI), verifying Emergency Feedwater actuation, and start raising steam generator levels to 75 to 85% on the operating range.

Decay River Pump 1A will fail to start on ESAS actuation, requiring a manual start of the pump.

As RCS pressure decreases, the Pressurizer code safety will reseal, requiring termination of HPI and restoration of primary to secondary heat transfer.

Estimated scenario time - 60 minutes.

3 SRO Critical Tasks
4 RO Critical Tasks
2 BOP Critical Tasks

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2.0 REFERENCES

A. 10 CFR 55.45 Operating Tests, (a) Content (3), (4), (5), (6), (7), (8), (9), (12), (13)

B. PROCEDURES

1102-4 Power Operation (marked up copy)
1103-6 Reactor Coolant Pump Operation (marked up copy)
1105-9 Control Rod Drive System
1202-8 CRD Equipment Failure
1202-29 Pressurizer System Failures
1210-1 Reactor Trip
1210-2 Loss of 25°F Subcooled Margin
1210-6 Small Break LOCA
1210-9 HPI Cooling – Recovery from Solid Operations
1210-10 Abnormal Transient Rules, Guides and Graphs

Alarm Responses:

G-1-6 PZR SAFETY OR PORV OPEN (DP)
G-1-8 TSAT MARGIN A/B LO
G-2-1 CRD PATTERN ASYMMETRIC
H-3-2 SASS MISMATCH

C. OTHER

Maintenance Risk Document for EF-P-2A

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3.0 TASKS

- | | | | |
|----|-----|------------|---|
| A. | RO | | |
| | 1. | 0000050501 | Respond to an inoperable/stuck control rod. |
| | 2. | 0000070501 | Respond to a Reactor trip as PCRO |
| | 3. | 0000080501 | Respond to a Reactor trip as SCRO |
| CT | 4. | 0000080501 | Respond to an Abnormal Transient without a Reactor trip. |
| | 5. | 0000540501 | Respond to a loss of main feedwater. |
| CT | 6. | 000C190501 | Respond to a loss of 25°F subcooled margin. |
| | 7. | 000C210501 | Respond to a lack of heat transfer. |
| | 8. | 0020100101 | Establish natural circulation. |
| CT | 9. | 004C040101 | Throttle HPI flow. |
| | 10. | 0130040101 | Bypass an ES channel. |
| CT | 11. | 0130020101 | Manually initiate ESAS. |
| | 12. | 0408080501 | Operate EF-V-30s in various modes from the Control Room. |
| CT | 13. | 0418070101 | Operate Turbine Bypass Valves to control OTSG pressure and/or RCS heatup/cooldown rate. |
| | 14. | 0618000501 | Respond to an Emergency Feedwater actuation. |
| | 15. | 1198120601 | Communicate and respond to casualties as CRO. |
| | | | |
| B. | SRO | | |
| CT | 1. | 3410180313 | Apply Technical Specification directions for Safety Limits, LSSS, and LCO's for a plant operation which you are supervising. |
| | 2. | 3410420303 | Authorize and verify bypassing of Engineered Safeguards Actuation. |
| | 3. | 3418080102 | Direct and establish the transition to and from natural circulation. |
| | 4. | 3438230302 | Communicate and respond to casualties as SM/CRS. |
| | 5. | 3440060303 | Analyze indications to determine corrective actions. |
| | 6. | 3440090303 | Evaluate an Abnormal Event to determine if conditions and following the expected sequence. |
| CT | 7. | 3440110303 | Determine and direct actions to ensure that core cooling is maintained in an Abnormal Event. |
| | 8. | 3440240303 | Direct corrective actions to mitigate the consequences of an Emergency Event. |
| CT | 9. | 3448490503 | Evaluate and direct actions for pressurized thermal shock conditions. |
| | 10. | 3448540503 | Evaluate and verify primary to secondary heat transfer. |
| | 11. | 3448550503 | Direct response to a Reactor trip. |
| | 12. | 3520050105 | During all plant conditions, maintain responsibility and command authority over all shift operations, maintenance activities and radiological controls. |
| | 13. | 5001045001 | Identify and declare emergency classifications. |

CT = Critical Task

Expected Operator Actions to support Critical Tasks are boxed in the Sequence of Events.

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4.0 SIMULATOR INITIALIZATION

- A. IC16 100% power, steady state, MOC.
Reduce power to 27% and stabilize the plant.
Secure RC-P-1B
Place RC-P-2B-1 and RC-P-2B-2 in PTL
Secure all MOPs
Secure FW-P-1B
Start FW-P-1A and B aux. oil pumps
Secure both HD-Ps
Secure CO-P-2C and CO-P-1C
Tag EF-P-2A out of service.
- B. EVENT TRIGGERS
- #3 an:g(9)
dmf RD0225
- #5 rd:cfrp || rca0505 > 2400
- #6 rca0505 < 1000
dmf rc27a
- C. MALFUNCTIONS
1. NI27A RC3A-PT1 RC NR Press. Transmitter Failure; assign at **0% severity** over a **300 second** ramp to **Event #1**.
 2. RD0225 Stuck Rod 7-4; assign to **Event #2**
 3. RD28 Rx Auto Trip Block; insert **immediately**.
 4. RC27A Pzr Safety Valve Fails Open; assign at **35% severity** to **Event #5**.
 5. RW09A DR Pump ES Start Failure; insert **immediately**.
- D. REMOTE FUNCTIONS
1. FWR12 EF-P-2A Breaker; select **OUT immediately**.

Set up continues on next page.

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E. OVERRIDES

1. **02A3S23-ZDICSRC1D(1), PTL, OFF; insert immediately.**
02A3S23-ZDICSRC1D(2), STP, OFF; insert immediately.
02A3S23-ZDICSRC1D(3), NAP, OFF; insert immediately.
02A3S23-ZDICSRC1D(4), NAS, ON; insert immediately.
(Prevents tripping RC-P-1D with control switch.)
2. **10A1S15-ZDI1SB02(1), TRP, OFF; insert immediately.**
10A1S15-ZDI1SB02(3), NAT, OFF; insert immediately.
10A1S15-ZDI1SB02(4), NAC, ON; insert immediately.
10A1S15-ZDI1SB02(5), PTL, OFF; insert immediately.
(Prevents de-energizing 1B 6900V Bus.)
3. **01A5S07-ZDIMSCA(1), FSTLO, ON; assign to Event #4.**
(Runs FW-P-1A off line.)

F. MONITOR

Set **MSK2609A = 14.7 immediately** (auxiliary steam pressure).

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5.0 SCENARIO PREVIEW

A. EXAMINER PREVIEW

The plant is stable at 27% power with Reactor Coolant Pump 1B (RC-P-1B) secured. The crew will be tasked with starting RC-P-1B and performing a power escalation to 100% power.

- Lead Examiner* 1. The ICS selected Reactor Coolant System pressure instrument will slowly fail low. All Pressurizer heaters will energize. A single Reactor Protection System cabinet will trip on low RCS pressure. The crew will manually select the alternate pressure instrument and place the RPS cabinet in Manual Bypass.
2. The crew will successfully start RC-P-1B and verify that feedwater re-ratios correctly.
3. The crew will then start the power escalation to 100%, observing the Mechanical Maneuvering rate limitation of 30% power per hour (1/2% per minute).
- Lead Examiner* 4. During the power escalation, Rod 7-4 will stick and become asymmetric by 7 inches. The rod will begin moving again prior to becoming 9" out of alignment. When the crew implements the CRD malfunction procedure, they should determine operability of the rod.
- Lead Examiner* 5. While the crew is making preparations to restore the rod, Main Feedwater Pump 1A will run off line. This will require the crew to respond to rising RCS pressure and temperature.
6. The reactor will fail to trip in response to rising RCS pressure (ATWS), requiring manual trip of the reactor. The manual trip will be successful.
7. During the high RCS pressure condition, a Pressurizer code safety valve will fail open, eventually resulting in a loss of Subcooling Margin.
- The crew will respond to the loss of subcooling margin by attempting to trip the RCPs within one minute. RC-P-1D cannot be tripped from its control switch and the 1B 6900V Bus cannot be de-energized. One RCP will have to be run in each loop.
- The crew will continue the actions for loss of SCM by initiating High Pressure Injection (HPI), verifying Emergency Feedwater actuation, and start raising steam generator levels to 75 to 85% on the operating range.
8. Decay River Pump 1A will fail to start on ESAS actuation, requiring manual start of the pump.
- As RCS pressure decreases, the Pressurizer code safety will reseal, requiring termination of HPI and restoration of primary to secondary heat transfer.

Steps 1, 4 and 5 are entered at the discretion of the lead examiner.

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B. SHIFT BRIEFING

NOTE: This sheet is to be provided to the examinees for review.

Plant at 27% power, steady state.

Reactor was at 100% 4 hours prior to this.

Emergency Feedwater Pump 2A (EF-P-2A) is tagged out for bearing replacement.

Four hours into the 72 hour timeclock.

Expected to be returned to service in another 24 hours.

Reactor Coolant Pump 1B (RC-P-1B) was secured due to a faulty relay.

The relay has been replaced and RC-P-1B is ready for restart.

Electricians are standing by at the breaker to verify starting interlocks.

Orders for the shift:

1. Restart RC-P-1B.
2. Raise power to 100%.

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6.0 SEQUENCE OF EVENTS

<u>Examiner Notes and Actions</u>		<u>Expected Operator Actions</u>	
1.	ICO: Initialize the simulator per Section 4.0.		
2.	IPOI: Assign team positions and conduct the SHIFT BRIEFING per Section 5.B.	2.1	Assume assigned team positions.
	Allow crew 3-5 minutes to take turnover and assume the watch.	2.2	Take turnover and review plant status.
		2.3	Assume the watch and inform examiner.

Scenario Outline Event 1 – Narrow Range RCS Pressure Fails Low

3.	ICO: At the lead examiner's direction, activate Event #1 to cause the selected RCS pressure instrument to slowly fail low.	3.1	TEAM: Diagnose RCS pressure instrument failure by MAP H-3-2, SASS MISMATCH, red back-lit RCS pressure pushbuttons, all Pressurizer heaters energizing, redundant indication and RPS cabinet trip.
	<i>Diagnosis</i>		
		3.2	SRO: Implement ARP H-3-2, SASS MISMATCH.
		3.3	RO: Select alternate RCS pressure instrument.
	<i>Technical Specifications</i>	3.4	SRO: Determine that tripped RPS cabinet may be placed in Manual Bypass.
		3.5	BOP: Place RPS cabinet in Manual Bypass.
		3.6	RO: Place OOS sticker on failed instrument.

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Examiner Notes and Actions

Expected Operator Actions

Scenario Outline Event 2 – Reactor Coolant Pump 1B Restart

- | | | | |
|----|---|-----|--|
| 4. | Restart RC-P-1B | 4.1 | SRO: Directs 1103-6, Reactor Coolant Pump Operation, procedure steps to RO. |
| | <i>Directing Operations</i> | | |
| | <i>Control Board Operations</i> | 4.2 | RO: Starts backstop oil pump. |
| | | 4.3 | RO: Starts lift oil pump approximately two minutes later. |
| | ICO ROLE PLAY: Report as electrical at RC-P-1B breaker that starting interlocks are satisfied. | 4.4 | RO: Verifies starting interlocks are satisfied. |
| | | 4.5 | RO: Starts RC-P-1B approximately two minutes after starting lift oil pump. |
| | | 4.6 | RO: Verifies proper RCP flow and motor amps response. |
| | <i>System Response</i> | 4.7 | TEAM: Verify proper re-ratio of feedwater and plant stability. |

Scenario Outline Event 3 – Start Raising Power Toward 100%

- | | | | |
|----|---------------------------------|-----|--|
| 5. | Start power ascension. | 5.1 | SRO: Determine Mechanical Maneuvering Rate to be 30%/hr (1/2%/min). |
| | <i>Procedures</i> | | |
| | <i>Directing Operations</i> | 5.2 | SRO: Order power ascension at 1/2%/min. |
| | <i>Control Board Operations</i> | 5.2 | RO: Set ULD for 1/2%/min. |

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Examiner Notes and Actions

Expected Operator Actions

Communications 5.3

RO: Inform SRO that power ascension is beginning.

5.4

RO: Set ULD for higher Megawatt demand.

System Response 5.5

TEAM: Monitor plant during power ascension.

Scenario Outline Event 4 – Control Rod 7-4 Becomes Asymmetric

6. **ICO:** At the lead examiner's direction, **activate Event #2** to cause rod 7-4 to stick.

NOTE: Event #2 should be entered shortly after the power ascension begins because it will take several minutes for the rod to become asymmetric.

ICO: Verify Event #3 activates when MAP alarm G-2-1 comes in to free the stuck rod.

6.1

TEAM: Respond to MAP alarm G-2-1, CRD PATTERN AYSMMETRIC.

Alarms/Annunciators

Directing Operations 6.2

SRO/RO: Direct/Stop power ascension.

NOTE: The team may enter 1202-8, CRD Equipment Failure, in either the Asymmetric Rod Fault or the Stuck Rod sections. With the information available at this time for diagnosis, they have many of the symptoms for both sections. Either section will accomplish the required actions.

6.3

TEAM: Enter 1202-8, CRD Equipment Failure.

Procedures

Diagnosis 6.4

TEAM: Evaluate for a PI problem and diagnose that rod 7-4 is actually misaligned.

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Examiner Notes and Actions

Expected Operator Actions

Technical Specifications 6.5
Directing Operations

SRO: Determine that a power reduction is not necessary since power is less than 60% for the Reactor Coolant Pump combination..

Procedures 6.6

SRO: Prepare to realign the rod using the appropriate procedure:
1202-8, CRD Equipment Failure, Asymmetric Rod Fault follow up actions if 1202-8 entry was into this section.
1105-9, Control Rod Drive System, if entry was into 1202-8 Stuck Rod section.

Control Board Operations 6.7

TEAM: Place the following ICS stations to HAND to support realigning the asymmetric rod:
Both Feedwater Loop Demands
Reactor Demand
Diamond CRD Panel.

NOTE: The scenario may continue at any point during the actions to address the control rod problem.

Scenario Outline Event 5 – Main Feedwater Pump runs off line.

7. **ICO:** At the lead examiner's direction, **activate Event #4** to cause FW-P-1A to run off line.
System Response
Diagnosis

7.1 **TEAM:** Diagnose mismatch in primary to secondary heat transfer by alarms, and rising RCS temperatures and pressure.

NOTE: Attempt to restore Main Feedwater will be unsuccessful.
Directing Operations

7.2 **SRO:** Direct panel operators to attempt to restore Main Feedwater flow.

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Examiner Notes and Actions

Expected Operator Actions

Scenario Outline Event 6 – ATWS

8. **ICO: Verify Event #5 activates** when either RCS pressure exceeds 2400 psig or the reactor is manually tripped.

Diagnosis

NOTE: This meets the entry conditions of ATP 1210-1, Reactor Trip, and the task is critical because immediate response to an ATWS is vital since the plant may exceed a Safety Limit.

Procedures

Control Board Operations

- | | |
|-----|--|
| 8.1 | SRO/RO: Determine that RCS pressure has exceeded the Limiting Safety System Setpoint of 2355 psig and diagnose an ATWS. |
| 8.2 | RO: Manually trip the reactor by depressing both the Reactor Trip and DSS pushbuttons and enter ATP 1210-1, Reactor Trip. |
- 8.3 **RO:** Verify rod groups 1-7 on the bottom and power is less than 10%.
- 8.4 **BOP:** Verify Turbine stop valves closed and generator/field breakers are open.
- 8.5 **BOP:** Verify FW-V-5A/B stroking closed and since MFW was lost, verify Emergency Feedwater is operating.
- 8.6 **RO:** Verify ICS/NNI power.
- 8.7 **RO:** Verify 4160 volt power.
- 8.8 **RO:** Verify a Makeup Pump is operating and control Makeup tank level by opening MU-V-14A or B whenever less than 55"

NOTE: Emergency Feedwater will actuate on low steam generator levels.

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Examiner Notes and Actions

NOTE: Depending on the time spent performing immediate actions, RCS pressure may or may not be less than 1600 psig at this time. Scenario Event 7 (Decay River Pump 1A ES start failure) occurs upon 1600 psig ESAS actuation. The required operator action does not become critical until the formal team verification of the ESAS actuation.

Expected Operator Actions

8.9 **RO:** Verify Safety System Status.
If RCS pressure is below 1600 psig at this point, verify ESAS actuation.
Verify Emergency Feedwater actuation since steam generators were less than 10 inches in level.

Diagnosis 8.10 **TEAM:** Diagnose that the cause of the low RCS pressure is due to a stuck open Pressurizer Code Safety due to the presence of MAP alarm G-1-6, PZR SAFETY OR PORV OPEN (DP), the absence of MAP alarm G-1-7, PORV OPEN (ACOUSTIC), and console PORV and Code Safety delta-P indications.

Directing Operations 8.11 **TEAM:** Do not transition to 1202-29, Pressurizer System Failures, because ATOG remains the highest priority.

Communications 8.12 **BOP/ECRO:** Announce Reactor Trip over the plant page and radio.

NOTE: Depending on the time spent performing immediate actions, Subcooling margin may or may not be less than 25°F at this time.
As soon as SCM drops to less than 25°F, these actions and the procedural transfer are required. The scenario will then skip to section 9.

8.13 **RO:** Verify subcooling margin $\geq 25^{\circ}\text{F}$.
If subcooling margin at this point is $< 25^{\circ}\text{F}$, then:
Trip all four Reactor Coolant Pumps.
Initiate High Pressure Injection.
Verify Emergency Feedwater.
Tell BOP operator to raise OTSG level toward 75-85%.
And go to ATP 1210-2.

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Examiner Notes and Actions

Expected Operator Actions

- 8.14 **RO:** Verify RCS temperature/pressure and OTSG pressure is approaching the post trip temperatures and pressures.
Diagnose that although the plant is not approaching post trip conditions, that it is not due to excessive or lack of primary to secondary heat transfer.
- 8.15 **RO:** Verify that indications of OSTG tube leakage do not exist.
- 8.16 **TEAM:** Begin verification of ATP 1210-1, Reactor Trip, immediate manual actions performed above.

Scenario Outline Event 7 – Loss of 25°F Subcooling Margin.

9. Loss of 25°F Subcooling Margin.

Diagnosis
Procedures

- 9.1 **TEAM:** Recognize loss of 25°F subcooling margin from MAP alarm G-1-8, TSAT MARGIN A/B LO, and Thermohydraulic Panel indicators.

Control Board Operations

- 9.2 **RO:** Verify/trip all RCPs within one minute.
- 9.3 **RO:** Determine that RC-P-1D cannot be tripped from the console.
- 9.4 **RO:** Attempt to de-energize the 1B 6900V Bus in order to shutdown RC-P-1D.
- 9.5 **RO:** Determine that the 1B 6900V Bus cannot be de-energized and report to SRO.

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Examiner Notes and Actions

NOTE: This task is critical in order to prevent phase separation since all Reactor Coolant Pumps could not be secured.

NOTE: Team may recognize Decay River Pump 1A start failure immediately. Task does not become critical until formal verification of immediate actions.

NOTE: This task is critical in order to induce boiler-pool condensing as a method of primary to secondary heat transfer.

NOTE: Whenever core cooldown rate is less than 40°F/hr., minimum EFW flow is 215 gpm per OTSG. If core cooldown rate is greater than 40°F/hr, no minimum flow limit exists, as long as OTSG levels are increasing toward 75-85%.

Expected Operator Actions

9.6 **SRO:** Determine that it has been longer than one minute since 25°F subcooling margin was lost and the remedial action is to run one RCP in each loop until 25°F SCM is regained or LPI is > 1000 gpm per leg.

9.7 **RO:** Start either RC-P-1A or RC-P-1B.

9.8 **RO:** Verify/initiate HPI.

9.9 **RO/BOP:** Verify EFW

9.10 **BOP:** Raise OTSG levels to 75-85%.
This will require manual control of EF-V-30s once OTSG level reaches by the time OTSG levels reach 50%. Continuous progress must be made toward 75-85% if flow is throttled for over-cooling concerns.

9.11 **TEAM:** Begin/continue verification of ATP 1210-1, Reactor Trip, immediate actions if not completed earlier.

9.12 **TEAM:** Transition to ATP 1210-2, Loss of 25°F Subcooled Margin, at the step that asks for verification of $\geq 25^\circ\text{F}$ subcooling margin.

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Examiner Notes and Actions

Expected Operator Actions

NOTE: This task is critical at this time due to procedure transition and formal verification.

9.13 **TEAM:** Begin verification of ATP 1210-2, Loss of 25°F Subcooled Margin, immediate actions.

NOTE: This task is critical at this time due to procedure transition and formal verification.

9.14 **SRO/RO:** All four Reactor Coolant Pumps were not tripped within one minute of loss of 25° subcooling margin, therefore run one RCP in each loop until 25°F SCM is regained or LPI is > 1000 gpm per leg.

9.15 **SRO/RO:** High Pressure Injection was initiated.

Scenario Outline Event 8 – Decay River Pump 1A ESAS Auto Start Failure.

NOTE: This task is critical at this time due to procedure transition and formal verification.

System Response

Control Board Operations

9.16 **SRO/RO:** Recognize the ES start failure of Decay River Pump 1A during ESAS status verification

9.17 **RO:** Manually start DR-P-1A.

NOTE: This task is critical at this time due to procedure transition and formal verification.

9.18 **TEAM:** Verify Emergency Feedwater has actuated.

9.19 **SRO/BOP:** Raise OTSG level toward 75-85%.

NOTE: The reseating of the Pressurizer Code Safety valve is based upon RCS pressure dropping below 1000 psig. Depending upon the speed of procedure verification and usage, transfer to scenario section 9 may occur at any time.

When the Pressurizer Code Safety reseats, skip to section 10.

9.20 **TEAM:** Enter follow up actions of ATP 1210-2, Loss of 25°F Subcooled Margin.

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Examiner Notes and Actions

Expected Operator Actions

NOTE: None of the isolation steps will mitigate this event.

Directing Operations

- 9.21 **SRO:** Emergency classification will be obtained after the scenario since the examinee does not have the support of a Shift Manager for Emergency Plan implementation.
- 9.22 **SRO/RO:** isolate possible sources of leakage IAW ATP 1210-2, Loss of 25°F Subcooled Margin.
- 9.23 **SRO:** Skip transfer to ATP 1210-10, Abnormal Transient Rules, Guides and Graphs, because High Pressure Injection Flow does exist.
- 9.24 **SRO:** N/A and do not transition to ATP 1210-7, Large Break LOCA, because Core Flood Tanks are not emptying.
- 9.25 **SRO:** N/A step concerning Steam Generator Tube Rupture because it does not apply.
- 9.26 **SRO:** N/A and do not transition to ATP 1210-8, Superheat, because it does not apply.
- 9.27 **SRO:** N/A and do not transition to ATP 1210-9, HPI Cooling – Recovery from Solid Operations, because it does not apply.
- 9.28 **SRO:** N/A and do not transition to ATP 1210-3, Excessive Primary to Secondary Heat Transfer, because the cooldown is LOCA related.

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Examiner Notes and Actions

Expected Operator Actions

NOTE: Depending upon the condition of the RCS at this point in time, any of these three transitions could occur.

Procedures

9.29 **SRO:** N/A and do not transition to ATP 1210-4, Lack of Primary to Secondary Heat Transfer, because core cooling is sufficient at this time.

9.30 **SRO:** N/A and do not transition to ATP 1210-5, OTSG Tube Leakage, because no evidence of a tube leak exists.

9.31a **SRO:** If 25°F SCM is not being recovered at this time, transition to ATP 1210-6, Small Break LOCA.

9.31b **SRO:** If the RCS is solid at this time, transition to ATP 1210-9, HPI Cooling – Recovery from Solid Operations, follow-up actions.

9.31c **SRO:** Transition to ATP 1210-6, Small Break LOCA, since a know RCS break exists.

ICO: If the Pressurizer Code Safety did not reseal by the time of transition out of ATP 1210-2, **activate Event #6** to reseal the code safety.

10. Pressurizer Code Safety valve reseats.

Diagnosis

10.1 **TEAM:** Recognize increasing RCS pressure and reset of MAP alarm G-1-6, PZR SAFETY OR PORV OPEN (ACOUSTIC), and diagnose that the Pressurizer Code Safety valve has closed.

*Directing Operations
Control Board Operations*

10.2 **SRO:** Give authorization to bypass ESAS in order to gain control of equipment if not provided prior to this time.

NRC SRO OPERATIONAL
SIMULATOR SCENARIO No. 1

Examiner Notes and Actions

Expected Operator Actions

NOTE: This task is critical due to procedure requirements based upon mitigation of the loss of 25°F SCM.

Procedures

10.3 **SRO:** Do not allow manual throttling of HPI to less than 500 gpm per pump until 25°F SCM exists.

10.4 **RO:** Do not manually throttle HPI to less than 500 gpm per pump until 25°F SCM exists.

Directing Operations

10.5 **SRO:** Provide RCS pressure band or SCM band for HPI throttling when 25°F SCM exists.

NOTE: During the following steps, the Reactor Coolant System must not be allowed to reheat and repressurize to 2400 psig due to the previous failure on the Pressurizer Code Safety and the likelihood of causing it to fail again.

10.6 **RO:** Throttle/terminate HPI as necessary to gain RCS pressure control.

10.7 **SRO:** Provide direction to the BOP operator to pick up primary to secondary heat transfer to minimize Reactor Coolant System repressurization and reheat.

10.9 **BOP:** Reduce steam generator pressures to stop Reactor Coolant System reheat and the resulting repressurization.

10.10 **RO:** Gain Reactor Coolant System pressure control with makeup and coordination with the BOP operator upon obtaining primary to secondary heat transfer.

NRC SRO OPERATIONAL
SIMULATOR SCENARIO No. 1

7.0 TERMINATION POINT

When all of the following conditions exist:

1. Pressurizer Code Safety has reseated.
2. 25°F Subcooled Margin has been regained.
3. The team has stabilized or is controlling RCS pressure and temperature.
4. The examinees have had the opportunity to perform all critical tasks.

8.0 EMERGENCY PLAN CLASSIFICATION

ALERT A2.1 < 25°F SCM or PORV/Code Safety stuck open

or

ALERT A4.2 ATWS

9.0 TECHNICAL SPECIFICATIONS

- 3.4 Decay Heat Removal Capability
 - 3.4.1.1 a. (1) gives timeclock for one Emergency Feedwater Pump out of service.
- 3.5.1 Operational Safety Instrumentation
 - 3.5.1.2 allows for Reactor Protection System Manual (channel) Bypass.
Table 3.5-1 defines required number of operational Reactor Protection System components and minimum degree of redundancy.
- 3.5.2 Control Rod Group and Power Distribution Limits
 - 3.5.2.2 defines allowed operation with inoperable rods.
4.7.1 defines what constitutes an inoperable rod.

NRC SRO OPERATIONAL
SIMULATOR SCENARIO No. 2

SWAP MAKEUP PUMPS, MU-V-32 FAILURE, OTSG TUBE LEAK,
DEGRADATION TO OTSG TUBE RUPTURE, HPI FAILURE

DEVELOPED BY/DATE:

W. L. Ogilvie 5/27/01

REVIEWED BY/DATE:

James A. Roberts 6/3/01

APPROVED BY/DATE:

Randy S. Campbell 6-3-01

Facility: TMI

Scenario No.: 2

Op-Test No.:

Examiners:

Operators:

Initial Conditions:

Plant at 100% power, steady state.

Emergency Feedwater Pump 2A tagged out of service.

Turnover:

Plant at 100% power, steady state.

Emergency Feedwater Pump 2A is tagged out for bearing replacement.

Four hours into the 72 hour timeclock.

Expected to be returned to service in another 24 hours.

Makeup Pump 1A is running to support an oil change on Makeup Pump 1B.

Makeup Pump 1A is being cooled by Nuclear Services Closed Cooling Water.

The oil change has been completed and Makeup Pump 1B is ready to be returned to service.

Orders for the shift:

1. Continue 100% power operation.

2. Swap from Makeup Pump 1A to Makeup Pump 1B.

Event No.	Malf. No.	Event Type *	Event Description
1		I (ALL)	Selected Pressurized level instrument slowly fails low.
2	N/A	N (ALL)	Swap from Makeup Pump 1A to Makeup Pump 1B.
3	MU07 to 0% over 30 seconds assign to Event #2	I (RO)	MU-V-32, Seal Injection Control Valve, fails closed.
4	TH17A at 0.08 % severity assign to Event #3	C (ALL)	A small tube leak develops on the "A" Steam Generator.
5	N/A	R (ALL)	Commence plant shutdown as directed by 1210-5, OTSG Tube Leakage.
6	RD10C Assign to Event #4 CRQNRM<.95	I (ALL)	Diamond fails to respond in AUTO when power drops below 95%.
7	TH16A at 4% severity assign to Event #5	M (ALL)	A large tube leak develops.
8	MF ES01B MF ES02B OVERRIDE 03A4S02- ZDIPB1RBB OFF 03A4S01- ZDIPB1RCB OFF	I (ALL)	'B' Train High Pressure Injection fails to actuate automatically or manually using the pushbuttons.

* (N)ormal, (R)eactivity, (I)nstrument, (C)omponent, (M)ajor

[illegible]

NRC SRO OPERATIONAL
SIMULATOR SCENARIO No. 2

1.0 GENERAL DESCRIPTION OF SCENARIO

The scenario will be initiated at 100% power. Makeup Pump 1B (MU-P-1B) was removed from service for an oil change, and is now ready to be returned to service. Crew direction is to return MU-P-1B to service and maintain 100% Power steady state operation.

The selected Pressurizer level instrument slowly fails low. The crew will swap to the alternate Pressurizer level and temperature instruments.

The crew will swap from MU-P-1A to MU-P-1B IAW 1103-6, Makeup System Operations.

Once MU-P-1B is in operation, MU-V-32, Seal Water Injection Flow Control valve will fail closed, resulting in a loss of seal injection. The crew will respond IAW 1203-15, Loss of R.C. Makeup/Seal Injection and restore seal injection with MU-V-32 in HAND control.

A small tube leak will occur. Alarm C-1-1, High Radiation, will actuate to cue the crew to the tube leak. The crew will respond IAW Alarm response C-1-1, and implement 1210-5, OTSG Tube Leak Procedure.

The crew will commence a normal plant shutdown IAW 1210-5, C-1-1 and Technical Specification requirements.

After power has been reduced to approximately 95%, the rod control diamond station will fail to respond in Auto. The crew will be required to continue the shutdown with Manual control of the Diamond CRD station and Feedwater ICS stations.

A large OTSG tube rupture develops. The crew will have to evaluate plant conditions, and should trip the reactor and initiate High Pressure Injection.

The 'B' train of Engineered Safeguards Actuation System will fail to actuate automatically. Efforts to initiate it manually by pushbutton will also fail, requiring manual initiation of components.

Estimated scenario time - 60 minutes.

1 SRO Critical Tasks

3 RO Critical Tasks

2 BOP Critical Tasks

NRC SRO OPERATIONAL
SIMULATOR SCENARIO No. 2

2.0 REFERENCES

A. 10 CFR 55.45 Operating Tests, (a) Content (3), (4), (5), (6), (7), (8), (9), (12), (13)

B. PROCEDURES

1102-4 Power Operation
1104-2 Makeup and Purification System (marked up copy)
1105-4 Integrated Control System
1202-12 Excessive Radiation Levels
1202-29 Pressurizer System Failure
1203-15 Loss of R.C. Makeup/Seal Injection
1210-1 Reactor Trip
1210-5 OTSG Tube Leakage
1210-10 Abnormal Transient Rules, Guides and Graphs

Alarm Responses:

C-1-1 HIGH RADIATION
F-1-5 RCP SEAL TOT INJECT FLOW HI/LO
G-2-5 PZR LEVEL HI/LO
G-3-5 PZR LEVEL LO-LO

C. OTHER

Maintenance Risk Document for EF-P-2A

NRC SRO OPERATIONAL
SIMULATOR SCENARIO No. 2

3.0 TASKS

- | | | | |
|----|-----|------------|--|
| A. | RO | | |
| | 1. | 0000050501 | Respond to an inoperable/stuck control rod. |
| | 2. | 0000070501 | Respond to a Reactor trip as PCRO |
| CT | 3. | 000C220501 | Respond to an OTSG tube leak. |
| | 4. | 0000080501 | Respond to a Reactor trip as SCRO |
| CT | 5. | 004C040101 | Throttle HPI flow. |
| | 6. | 0130040101 | Bypass an ES channel. |
| CT | 7. | 0130020101 | Manually initiate ESAS. |
| CT | 8. | 0418070101 | Operate Turbine Bypass Valves to control OTSG pressure and/or RCS
heatup/cooldown rate. |
| | 9. | 1198120601 | Communicate and respond to casualties as CRO. |
| | | | |
| B. | SRO | | |
| | 1. | 3410180313 | Apply Technical Specification directions for Safety Limits, LSSS, and
LCO's for a plant operation which you are supervising. |
| | 2. | 3410420303 | Authorize and verify bypassing of Engineered Safeguards Actuation. |
| | 3. | 3438230302 | Communicate and respond to casualties as SM/CRS. |
| | 4. | 3440060303 | Analyze indications to determine corrective actions. |
| | 5. | 3440090303 | Evaluate an Abnormal Event to determine if conditions and following the
expected sequence. |
| | 6. | 3440110303 | Determine and direct actions to ensure that core cooling is maintained in
an Abnormal Event. |
| CT | 7. | 3440240303 | Direct corrective actions to mitigate the consequences of an Emergency
Event. |
| | 8. | 3448550503 | Direct response to a Reactor trip. |
| | 9. | 3520050105 | During all plant conditions, maintain responsibility and command authority
over all shift operations, maintenance activities and radiological controls. |
| | 10. | 5001045001 | Identify and declare emergency classifications. |

CT = Critical Task

Expected Operator Actions to support Critical Tasks are boxed in the Sequence of Events.

NRC SRO OPERATIONAL
SIMULATOR SCENARIO No. 2

4.0 SIMULATOR INITIALIZATION

- A. IC16 100% power, steady-state, MOC.
Place MU-P-1A on NS cooling (see remote below)
Start MU-P-1A
Secure MU-P-1B
Tag EF-P-2A out of service
- B. EVENT TRIGGERS
#4 CRQCRNRM < 0.95
- C. MALFUNCTIONS
1. **RC04A** Pressurizer Level Failure; assign at **100% severity** over a **240 second ramp** to **Event #1**.
 2. **MU07** MU-V-32 Seal Inj Ctrl Valve Fails; assign at **0% severity** over a **30 second ramp** to **Event #2**.
 3. **TH17A** OTSG Tube Rupture Low; assign at **0.08% severity** to **Event #3**.
 4. **RD10C** Grp 7 In-Motion Command Block (Auto); assign to **Event #4**.
 5. **TH16A** OTSG Tube Rupture Middle; assign at **4% severity** to **Event #5**.
 6. **ES01B** ESAS Fail To Act At HPI Setpt (1600#); insert **immediately**.
 7. **ES02B** ESAS Fail To Act At HPI Setpt (500#); insert **immediately**.
- D. REMOTE FUNCTIONS
1. **FWR12** EF-P-2A Breaker; select **OUT immediately**.
 2. **CCR12** MU-P1A Makeup Pump Cooling; select **NS immediately**.
- E. OVERRIDES
1. **03A4S02-ZDIPB1RBB, OFF, ON** insert immediately.
 2. **03A4S01-ZDIPB1RCB, OFF, ON** insert immediately.
- F. MONITOR
Set **MSK2609A = 14.7** immediately (auxiliary steam pressure).

NRC SRO OPERATIONAL
SIMULATOR SCENARIO No. 2

5.0 SCENARIO PREVIEW

A. EXAMINER PREVIEW

The scenario will be initiated at 100% power. Makeup Pump 1B (MU-P-1B) was removed from service for an oil change, and is now ready to be returned to service. Crew direction is to return MU-P-1B to service and maintain 100% Power steady state operation.

- Lead examiner* 1. The selected Pressurizer level instrument slowly fails low. The crew will swap to the alternate Pressurizer level and temperature instruments.
2. The crew will swap from MU-P-1A to MU-P-1B IAW 1103-6, Makeup System Operations.
- Lead examiner* 3. Once MU-P-1B is in operation, MU-V-32, Seal Water Injection Flow Control valve will fail closed, resulting in a loss of seal injection. The crew will respond IAW 1203-15, Loss of R.C. Makeup/Seal Injection and restore seal injection with MU-V-32 in HAND control.
- Lead examiner* 4. A small tube leak will occur. Alarm C-1-1, High Radiation, will actuate to cue the crew to the tube leak. The crew will respond IAW Alarm response C-1-1, and implement 1210-5, OTSG Tube Leak Procedure.
5. The crew will commence a normal plant shutdown IAW 1210-5, C-1-1 and Technical Specification requirements.
6. After power has been reduced to approximately 95%, the rod control diamond station will fail to respond in Auto. The crew will be required to continue the shutdown with Manual control of the Diamond CRD station and Feedwater ICS stations.
- Lead examiner* 7. A large OTSG tube rupture develops. The crew will have to evaluate plant conditions, and should trip the reactor and initiate High Pressure Injection.
8. The 'B' train of Engineered Safeguards Actuation System will fail to actuate automatically. Efforts to initiate it manually by pushbutton will also fail, requiring manual initiation of components.

Steps 1, 3, 4 and 7 are entered at the discretion of the lead examiner.

NRC SRO OPERATIONAL
SIMULATOR SCENARIO No. 2

B. SHIFT BRIEFING

NOTE: This sheet is to be provided to the examinees for review.

Plant at 100% power, steady state.

Emergency Feedwater Pump 2A (EF-P-2A) is tagged out for bearing replacement.

Four hours into the 72 hour timeclock.

Expected to be returned to service in another 24 hours.

Makeup Pump 1A is running to support an oil change on Makeup Pump 1B.

Makeup Pump 1A is being cooled by Nuclear Services Closed Cooling Water.

The oil change has been completed and Makeup Pump 1B is ready to be returned to service.

"A" and "C" Makeup Pumps are currently ES selected.

Orders for the shift:

1. Swap from Makeup Pump 1A to Makeup Pump 1B.
2. Continue 100% power operation.

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SIMULATOR SCENARIO No. 2

6.0 SEQUENCE OF EVENTS

<u>Examiner Notes and Actions</u>		<u>Expected Operator Actions</u>	
1.	ICO: Initialize the simulator per Section 4.0.		
2.	IPOI: Assign team positions and conduct the SHIFT BRIEFING per Section 5.B.	2.1	Assume assigned team positions.
	Allow crew 3-5 minutes to take turnover and assume the watch.	2.2	Take turnover and review plant status.
		2.3	Assume the watch and inform examiner.

Scenario Outline Event 1 – Pressurizer Level Failure

3.	ICO: At the direction of the lead examiner, activate Event #1 to cause the Pressurizer level instrument to slowly fail low.	3.1	TEAM: Diagnose Pressurizer level failure from MAP alarms G-2-5, PZR LEVEL HI/LO, G-3-5, PZR LEVEL LO-LO, MU-V-17 response and redundant indications.
	<i>Diagnosis</i>		
	<i>Direct Operations</i>	3.2	SRO: Implement 1202-29, Pressurizer System Failure.
		3.3	RO: Take MU-V-17 to Hand and adjust makeup flow to equal letdown flow minus seal injection.
		3.4	RO: Select alternate pressurizer level transmitter.
		3.5	RO: Select alternate pressurizer temperature transmitter.
		3.6	RO: Return MU-V17 to Auto.

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SIMULATOR SCENARIO No. 2

Examiner Notes and Actions

Expected Operator Actions

Scenario Outline Event 2 – Swap From Makeup Pump 1A to Makeup Pump 1B

- | | | | |
|----|---|-----|--|
| 4. | Swap From MU-P-1A to MU-P-1B.

<i>Direct Operations</i> | 4.1 | SRO: Direct Makeup Pump swap IAW OP 1104-2, Makeup and Purification System. |
| | | 4.2 | RO: Verify MU-P-1B lube oil system is running normally. |
| | ICO: MUR29 to MU-P1B | 4.3 | RO: Have AO ES select MU-P-1B. |
| | <i>Control Board Operations</i> | 4.4 | RO: Start MU-P-1B. |
| | | 4.5 | RO: Stop MU-P-1A when conditions stabilize. |
| | | 4.6 | RO: Monitor makeup and seal injection flows and adjust as necessary. |
| | ICO: MUR29 to MU-P1C | 4.7 | RO: Have AO ES select MU-P-1C. |
| | ICO: CCR12 to DC | 4.8 | SRO/RO: Swap MU-P-1A cooling water supply back to DCCW. |

Scenario Outline Event 2 – MU-V-32, Seal Injection Control Valve, Failure

- | | | | |
|----|--|-----|---|
| 5. | ICO: At the direction of the lead examiner, activate Event #2 to cause MU-V-32 to fail closed.

<i>Diagnosis</i> | 5.1 | RO: Diagnose decreasing seal injection flow from MAP alarm F-1-5, RCP SEAL TOT INJECT FLOW HI/LO, and console indication of seal injection flow. |
| | <i>Direct Operations</i> | 5.2 | SRO/RO: Enter Abnormal Procedure 1203-15, Loss of R.C. Makeup/Seal Injection. |

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SIMULATOR SCENARIO No. 2

Examiner Notes and Actions

Expected Operator Actions

- | | | |
|------------------------|-----|--|
| | 5.3 | RO: Determine that the cause for the decreasing seal injection flow is MU-V-32 failing closed. |
| | 5.4 | SRO/RO: Determine that since RC makeup is not affected, MU-V-17 does not have to be closed. |
| <i>System Response</i> | 5.5 | SRO/RO: Determine that since Pressurizer level is not affected, MU-V-3 does not have to be closed. |
| | 5.6 | SRO: Advise RO that if seal injection cannot be restored in less than 3 minutes, the MU-V-33 on any RCP with seal leakoff > 8 gpm or seal inlet water temperature approaching 225°F will have to be closed. |
| | 5.7 | SRO: Ask the STA to monitor RCP Seal No. 1 inlet temperatures and advise him if any exceed 225°F because that would require reducing power to 50-75% and tripping the affected pump. |
| | 5.8 | RO: Place MU-V-32 in Hand and restore seal injection flow by opening MU-V-32. |
| | 5.9 | RO: Verify Intermediate Closed Cooling flow to the RCPs is between 650-1300 gpm by console indication. |

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SIMULATOR SCENARIO No. 2

Examiner Notes and Actions

NOTE: With proper timeliness of restoring seal injection flow under these circumstances, this step should not be applicable because the RCP bearings will not have had a chance to heat up.

Expected Operator Actions

5.10 **SRO/RO:** Have STA monitor RCP bearing cooldown rate so RO can control seal injection flow with MU-V-32 to limit bearing cooldown rate to less than 1°F/min.

Scenario Outline Event 4 – Small Tube Leak Develops on “A” OTSG

6. **ICO:** At the direction of the lead examiner, **activate Event #3** to cause a small tube leak to occur on the “A” OTSG.

Diagnosis

6.1 **TEAM:** Diagnose a tube leak on the “A” OTSG from MAP alarm C-1-1, HIGH RADIATION, and rising indication/alarms on RM-G-26, RM-A-5 and RM-A-15.

Procedures 6.2

SRO: Enter Alarm Response for C-1-1, HIGH RADIATION.

Direct Operations 6.3

SRO: Implement or have ECRO implement 1202-12, Excessive Radiation Levels, immediate actions:
Page announcement
Maintenance, operations or sampling is N/A
Mark charts
Contact GRCS

6.4 **SRO:** Have ECRO place the Control Tower ventilation in the pressurized recirc. Mode.

6.5 **SRO:** Have STA start a one hour leakrate.

6.6 **SRO:** Direct RO/STA to perform a mass balance calculation for leakrate.

6.7 **RO:** Perform mass balance and validate OTSG leakrate greater than 1 gpm.

NRC SRO OPERATIONAL
SIMULATOR SCENARIO No. 2

Examiner Notes and Actions

Expected Operator Actions

Scenario Outline Event 5 – Commence Plant Shutdown as Directed by ATP 1210-5, OTSG Tube Leakage

- | | | | |
|----|--|-----|--|
| 6. | Entry into ATP 1210-5, OTSG Tube Leakage
<i>Procedures</i>
<i>Technical Specifications</i> | 7.1 | SRO: Implement ATP 1210-5, OTSG Tube Leakage. |
| | <i>Direct Operations</i> | 7.2 | SRO: Direct RO to close MU-V-3 as necessary and increase makeup to maintain Pressurizer level. |
| | | 7.3 | SRO: Direct a plant shutdown to commence at a specified rate. |
| | <i>Control Board Operations</i> | 7.4 | RO: Set ULD rate of change to specified value and reduce ULD megawatt demand to commence a plant shutdown. |
| | | 7.5 | TEAM: Monitor plant response as power reduction begins. |
| | | 7.6 | SRO: Emergency classification will be obtained after the scenario since the examinee does not have the support of a Shift Manager for Emergency Plan implementation. |
| | | 7.7 | SRO: Have STA or ECRO notify Chemistry and Rad Con and for sampling and surveys. |

Scenario Outline Event 6 – Diamond Fails to Respond in Auto

- | | | | |
|----|---|-----|--|
| 8. | ICO: When Reactor power is less than 95%,
verify Event #4 activates to fail the Diamond
CRD panel to respond in Auto.

<i>Diagnosis</i> | 8.1 | SRO/RO: Diagnose Diamond CRD panel failure to respond by ICS alarms and cessation of CRD movement. |
|----|---|-----|--|

NRC SRO OPERATIONAL
SIMULATOR SCENARIO No. 2

Examiner Notes and Actions

Expected Operator Actions

NOTE: Requires the following stations as a minimum:
Feedwater Demands (A & B) to Hand
Reactor Demand to Hand
Diamond CRD Panel to Manual

8.2

SRO: Direct ICS to be placed in Hand to continue the power reduction.

8.3

RO/BOP: Place ICS in Hand and recommence power reduction.

Scenario Outline Event 7 – Large OTSG Tube Rupture Develops

9. **ICO:** At the direction of the lead examiner, **activate Event #5** to cause a large tube rupture to develop on the "A" OTSG.

9.1

RO: Diagnose greatly increased leakrate form Pressurizer level decrease, MU-V-17 opening and subsequent increase in Makeup flow.

Diagnosis

Communications

9.2

RO: Notify team of change in OTSG leakage.

9.3

RO: Close MU-V-3 to conserve RCS inventory.

9.4

RO/BOP: Continue power reduction in Hand.

System Response

9.5

RO: Observe Pressurizer level dropping below 150 inches while Reactor power is greater than 25% and inform the team of the requirement for tripping the Reactor and initiating High Pressure Injection.

Procedures

9.6

RO: Trip the Reactor by depressing both Reactor Trip and DSS pushbuttons on the console.

NRC SRO OPERATIONAL
SIMULATOR SCENARIO No. 2

Examiner Notes and Actions

Expected Operator Actions

Scenario Outline Event 8 – “B” Train ESAS Fails to Actuate

- | | | | |
|-----|----------------------------------|------|---|
| 10. | “B” Train ESAS fails to actuate. | 10.1 | RO: Manually initiate 1600 psig ESAS. |
| | | 10.2 | BOP: Verify Turbine stop valves closed and generator/field breakers are open. |
| | | 10.3 | BOP: Verify FW-V-5A/B stroking closed and ICS is controlling MFW. |
| | | 10.4 | RO: Verify ICS/NNI power. |
| | | 10.5 | RO: Verify 4160 volt power. |
| | | 10.6 | RO: Verify a Makeup Pump is operating and control Makeup tank level by opening MU-V-14A or B whenever less than 55” |
| | | 10.7 | RO: Verify Safety System Status.
Recognize and announce the failure of “B” Train ESAS manual actuation. |
| | | 10.8 | RO: Attempt to actuate “B” ESAS Train by depressing the 4 psig manual actuation pushbutton. |

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SIMULATOR SCENARIO No. 2

Examiner Notes and Actions

NOTE: This task is critical to event mitigation strategy due to the degraded condition of high pressure injection.

Expected Operator Actions

10.9 **SRO:** Direct RO to start "B" Train HPI at the component level.

10.10 **RO:** Align minimum required "B" Train HPI components as follows:
Start DR-P-1A
Start DC-P-1A
Open MU-V-16C
Open MU-V-16D
Start MU-P-1C
Close MU-V-37

10.11 **BOP/ECRO:** Announce Reactor Trip over the plant page and radio.

10.12 **RO:** Verify subcooling margin $\geq 25^{\circ}\text{F}$.

10.13 **RO:** Verify RCS temperature/pressure and OTSG pressure is approaching the post trip temperatures and pressures.
Diagnose that although the plant is not approaching post trip conditions, that it is not due to excessive or lack of primary to secondary heat transfer.

Procedures 10.14 **RO:** Transition to ATP 1210-5, OTSG Tube Leakage.

10.15 **RO:** Close MU-V-3 if not closed prior to this point.

NRC SRO OPERATIONAL
SIMULATOR SCENARIO No. 2

Examiner Notes and Actions

Expected Operator Actions

- 10.16 **TEAM:** Perform formal verification of ATP 1210-1, Reactor Trip, and ATP 1210-5, OTSG Tube Leakage, immediate manual actions performed above.
- 10.17 **SRO:** Direct follow up actions of ATP 1210-5.
- 10.18 **BOP:** Cooldown to less than 540°F by steaming both OTSGs.

NOTE: This task is critical in order to reduce the primary to secondary leakrate to reduce the dose to the public.

10.19 **RO:** Turn off Pressurizer heaters and start Pressurizer spray to minimize Subcooled Margin.

Directing Operations
Control Board Operations

10.20 **SRO:** Give authorization to bypass ESAS in order to gain control of equipment if not provided prior to this time.

NOTE: This task is critical in order to reduce the primary to secondary leakrate to reduce the dose to the public.

10.21 **SRO:** Provide SCM band for HPI throttling.

NOTE: Minimized Subcooled Margin is 30-70°F.

10.22 **RO:** Throttle High Pressure Injection to minimize Subcooled Margin.

NRC SRO OPERATIONAL
SIMULATOR SCENARIO No. 2

7.0 TERMINATION POINT

When all of the following conditions exist:

1. Plant cooldown is in progress.
2. RCS temperature is less than 540°F.
3. Subcooled Margin has been reduced to between 30 and 70°F.
4. The examinees have had the opportunity to perform all critical tasks.

8.0 EMERGENCY PLAN CLASSIFICATION

UNUSUAL EVENT U2.1 10 gpm Primary to Secondary leak

or

UNUSUAL EVENT U2.1 Valid D-3-1 alarm

9.0 TECHNICAL SPECIFICATIONS

- 3.4 Decay Heat Removal Capability
 - 3.4.1.1 a. (1) gives timeclock for one Emergency Feedwater Pump out of service.
- 3.1.6 Leakage
 - 3.1.6.3 is LCO for exceeding 1 gpm primary to secondary leakage, however, the Operating License only allows 0.1 gpm above baseline leakage rate.
- 3.5.2 Control Rod Group and Power Distribution Limits
 - 3.5.2.2 a. initiates requires emergency boration.