

Facility: IP2

Scenario No.: 4 Op Test No.: 1

Examiners: _____

Candidates: _____

CRS

RO

PO

Initial Conditions: 50% power MOL

21 Charging Pump OOS

21 CCW Pump OOS

Small SG Tube Leak < 5 GPD

Turnover:

Turbine 21 rupture disc is leaking. Reduce Power to 250 MWe at 200 MWe per hour and remove Main Turbine and Generator from service

Critical Tasks:

Manually actuate at least one train of SIS-actuated safeguards before any of the following:

- Transition to any E-1 series, E-2 series, or E-3 series procedure or transition to any FRP
- Completion of step 5.a of ES-0.1

Trip all RCPs prior to completion of E-0 step 12

Isolate the LOCA outside of containment before transition out of ECA-1.2

Event No.	Malf. No.	Event Type*	Event Description
1		R (RO) N (BOP) N (CRS)	Reduce load
2	MAL-CRF002AV	C (ALL)	Rod P-6 Dropped Rod during rod motion
3	MOT-CFW001B	C (ALL)	21 Condensate Pump Failure
4	MAL-SGN004A	M (ALL)	Steam Line Rupture Downstream of MSIVs. Reactor trip required.
5	RLY-PPL487 RLY-PPL488	C (RO)	Failure of automatic actuation of Safety Injection. Manual initiation required.
6	PLP-RHR022	M (ALL)	RCS Leak Outside of VC

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

Scenario Event Description

IP2 Simulator Scenario 4

The team will assume the shift and continue with a load reduction in progress in accordance with POP-3.1, beginning at step 4.14.

When rod motion occurs, Control Rod P-6 will ratchet into the core due to a moving gripper failure, requiring the load reduction to be stopped and the condition evaluated IAW AOP-ROD-1.

When the plant is stable, a bearing failure on 21 Condensate Pump will occur. The team will start the standby Condensate Pump IAW AOP-FW-1, Loss of Feedwater.

When SG Levels are stable, a Steam Line Rupture downstream of the MSIVs will occur, requiring a reactor trip. Subsequently, Automatic SI actuation will fail to occur when demanded, requiring manual actuation. Simultaneous with reactor trip, a rupture will occur on the RHR discharge header outside of containment.

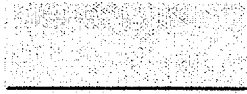
EOP flow path: E-0 – ECA-1.2 – E-1

Indian Point Unit 2
2003 NRC Initial License Examination
Simulator Scenario Setup
Scenario 4

Reset simulator to IC-226 (PW nano1007)

Place diskette in A drive

Click the button to run batch file New#1.bat and verify that the following malfunctions are active or pending:



21 Charging Pump OOS:

IRF LOA-EPS010 (-1 0) OUT

Place pump control switch in TPO and apply danger tag

21 CCW Pump OOS:

IRF LOA-EPS013 (-1 0) OUT

Place pump control switch in TPO and apply danger tag

Auto SI Master Relays Stuck Contacts

IMF RLY-PPL487 (-1 0) 2

IMF RLY-PPL488 (-1 0) 2

MAL-CRF002AV P6 Dropped Rod

IMF MAL-CRF002AV (-1 0) 1

BRG 1 Failure Condensate Pump 21 MTR

IMF MOT-CFW001B (2 0) 0.000 600 0.000
Event trigger #2

S/G 21 HDR LEAK DNSTRM CHK VLV

MAL-SGN004A

Event trigger #3

RHR PUMP DISCHARGE HDR Leak

IMF FLX-RHR008 (30 0) 0.000 0 0.000

IRF PLP-RHR033 (30 0) 100.000 0

IRF PLP-RHR022 (30 0) 100.000 0

Event trigger #30 on reactor trip

Materials needed for scenario:

- POP-3.1 marked up to step 4.14
- Graph Book
- Tags for tagged equipment
- Reactivity Summary Sheet

Note: None

Indian Point Unit 2
2003 NRC Initial License Examination
Simulator Scenario Turnover Information
Scenario 4

- The plant is at 50% power, steady state conditions exist.
- Middle of Life, C_b is 1029 ppm.
- EFPD = 340
- Control Bank D = 195 steps
- $T_{avg} = 553.5$ °F
- RCS Pressure = 2235 psig
- Pressurizer Level = 42%
- A small Steam Generator Tube Leak exists on 23 SG, less than 5 gallons per day.
- Risk Assessment = GREEN
- Daily Risk Factor = 0.94

The following equipment is out of service:

- 21 Charging Pump. Return expected in approximately 6 hours.
- 21 Component Cooling Water Pump. Return to service in approximately 8 hours.

Team instructions:

- The Main Turbine 21 Rupture Disc is leaking approximately 12 SCFM.
- In accordance with POP-3.1, continue to shut down at a rate of 200 MWe per hour and remove the Main Turbine and Generator from service.

Op Test No.: 1 Scenario # 4 Event # 1 Page 5 of 25

Event Description: Reduce Load

Time	Position	Applicant's Actions or Behavior
------	----------	---------------------------------

		Note: Proceed to event 2 when rod motion causes the dropped/misaligned rod malfunction to occur.
	CRS	Refers to POP 3.1
		Note: CRS may review previously performed steps in the POP to verify that they have been completed.
	RO	BORATE per SOP 3.2, Reactor Coolant System Boron Concentration Control, as necessary to maintain control banks above insertion limits required by GRAPH RPC-6, Cycle 14 Core Operating Limits Report. Note: Actions for boration are on pages 7 of this scenario guide
	RO	<u>IF</u> necessary, PLACE rod control in MANUAL to maintain rods above the Insertion Limit.
	RO	MAINTAIN delta flux within the target band.
	BOP	MONITOR condenser sextants for sodium increase.
	RO	VERIFY T_{AVE} AND Pressurizer Level are maintained on program per Graph RCS-2, Pressurizer Level V.S. T_{AVE} .
	RO	MAINTAIN steam generator levels between 40 and 50 percent Narrow Range.

Op Test No.:	<u>1</u>	Scenario #	<u>4</u>	Event #	<u>1</u>	Page	<u>6</u>	of	<u>25</u>
Event Description:		Reduce Load							
Time	Position	Applicant's Actions or Behavior							

	RO	NULL manual setpoint on feedwater regulating valve control to facilitate rapid transfer from AUTOMATIC to MANUAL control.
<p style="text-align: center;"><u>NOTE</u></p> <p><u>WHEN</u> erratic governor operation is observed, governor oil pressure may be raised above the controlling load limit to avoid adverse Main Turbine operation.</p>		
	RO	INITIATE load decrease using either of the following as directed by CRS: <ul style="list-style-type: none">○ Governor control○ Load Limit control

Op Test No.: 1 Scenario # 4 Event # 1 Page 7 of 25

Event Description: Reduce Load

Time	Position	Applicant's Actions or Behavior
------	----------	---------------------------------

	RO	Refers to SOP-3.2 for boration
	RO	<p>DETERMINE RCS Boron concentration from reactor coolant sample analysis.</p> <ul style="list-style-type: none"> ○ IF analysis following concentration adjustment is <u>NOT</u> yet available, ESTIMATE Boron concentration based on latest readings.
<p style="text-align: center;"><u>NOTE</u></p> <p>Determinations should be based upon rod position, RCS Boron concentration, Xenon level variations, incremental Boron and rod worth, and operating experience.</p>		
	RO	<p>DETERMINE magnitude of increase in Boron concentration necessary to accomplish desired reactivity change using one or more of the following references:</p> <ul style="list-style-type: none"> ○ GRAPH CVCS-3A, Boration Nomograph for Hot RCS ○ GRAPH CVCS-3B, Boration Nomograph for Cold RCS ○ GRAPH CVCS-6, Boration - Dilution Tables ○ GRAPH RV-2, Total Power Defect (PCM) as a Function of Power and Boron Concentration at MOL ○ GRAPH RV-3, Differential Boron Worth (Hot Zero Power) at MOL ○ GRAPH RV-4, Total Temperature Defect (PCM) as a Function of Temperature and Boron Concentration at MOL ○ GRAPH RV-9, IP2 Cycle 15 Reactivity Equivalents ○ POP 1.2, Reactor Startup ○ WCR 1, Reactivity Summary
	RO	<p>IF the change in RCS Boron concentration is anticipated to be greater than or equal to 25 ppm, OPERATE Pressurizer heaters to open spray valve.</p>

Op Test No.: 1 Scenario # 4 Event # 1 Page 8 of 25

Event Description: Reduce Load

Time	Position	Applicant's Actions or Behavior
------	----------	---------------------------------

	RO	ESTIMATE total volume of boron required for boration from boration graphs or references listed in step 4.5.2.
	RO	PLACE the RCS Makeup Control switch to STOP.
	RO	SET Boric Acid Integrator to amount determined in step 4.5.3.
	RO	PLACE the RCS Makeup Mode Selector switch to BORATE.
	RO	FCV-110A, Boric Acid Flow Control, may be left in AUTO or placed in MANUAL as directed by CRS.
	RO	VERIFY boric acid transfer pumps are in AUTO.
	RO	PLACE the RCS Makeup Control switch to START.
<p style="text-align: center;"><u>NOTE</u></p> <p>BATPs shifting to fast speed is verified by both counter operation and by the respective fast speed lights illuminating.</p>		
	RO	VERIFY BATPs shift to fast speed.
	RO	IF in manual, ADJUST FCV-110A, Boric Acid Flow Control, to obtain desired boric acid flow rate (may be greater than meter range).

Op Test No.: 1 Scenario # 4 Event # 1 Page 9 of 25

Event Description: Reduce Load

Time	Position	Applicant's Actions or Behavior
------	----------	---------------------------------

	RO	<p><u>IF</u> desired to maximize Boron flow, CLOSE the appropriate BATP recirculation valve.</p> <ul style="list-style-type: none"> ○ HCV-104 Inlet CVCS/Boric Acid Tank 22 BA ○ HCV-105 Inlet CVCS/Boric Acid Tank 21 BA
	RO	MONITOR Nuclear Instrumentation, Rod position, and RCS temperature closely during any reactivity changes.
	RO	<p><u>WHEN</u> boration operation has been completed, PERFORM the following:</p> <ul style="list-style-type: none"> ○ PLACE the RCS Makeup Control switch to STOP. ○ PLACE the Makeup Mode Selector switch to MANUAL. ○ ADJUST FCV-110A, Boric Acid Flow Control, dial setting to the new RCS Boron concentration per applicable CVCS Graph: ○ GRAPH CVCS-1A, Blended Makeup - (0-500) with 120 Gpm PW ○ GRAPH CVCS-1B, Blended Makeup - (0-2000) with 120 Gpm PW ○ GRAPH CVCS-1C, Blended Makeup with Various PW Flows
	RO	VERIFY FCV-110A control switch in AUTO.
	RO	PLACE the RCS Makeup Control switch to START.

Op Test No.: 1 Scenario # 4 Event # 1 Page 10 of 25

Event Description: Reduce Load

Time	Position	Applicant's Actions or Behavior
------	----------	---------------------------------

	RO	VERIFY approximately 30 gallons of blended makeup flows through blender.
	RO	PLACE RCS Makeup Control switch to STOP.
	RO	SELECT AUTO on RCS Makeup Mode Selector switch.
	RO	PLACE the RCS Makeup Control switch to START.
	CRS	<u>IF</u> Reactor is shutdown, REQUEST a sample for RCS Boron concentration within 30 minutes of completing the boration.
	RO	LOG amount of boric acid added to system for boration in CCR Log Book.
When rod motion occurs, proceed to event 2		

Op Test No.: 1 Scenario # 4 Event # 2 Page 11 of 25

Event Description: Misaligned/Dropped Control Rod P-6

Time	Position	Applicant's Actions or Behavior
------	----------	---------------------------------

Booth Instructor: When rod motion occurs, Control Rod P-6 should ratchet into the core.

Note: The more Control Bank D inserts the more deviation rod P-6 will experience.

Indications received:

Alarm SF 2-7 Control Rod or Power Distribution Trouble

Alarm FC 2-4 NIS Power Range Channel Deviation 3%

Control Rod P-6 IRPI indicates lower than the rest of Control Bank D

PICS alarms for Rod to Bank deviation and Rod to Rod deviation

	CRS	Implements AOP-ROD-1 Rod Control and Indication Systems Malfunctions
	RO	Determines continuous unwarranted rod motion is NOT occurring.
	RO	Determines that indication of a dropped or misaligned rod or IRPI failure exists.
	RO	Diagnoses malfunction as a misaligned control rod

Op Test No.: 1 Scenario # 4 Event # 2 Page 12 of 25

Event Description: Misaligned/Dropped Control Rod P-6

Time	Position	Applicant's Actions or Behavior
------	----------	---------------------------------

	RO	Places rod control in MANUAL
	CRS	Refers to the following Technical Specifications ◇ 3.10.3, Quadrant Power Tilt Limits ◇ 3.10.5, Rod Misalignment Limitations ◇ 3.10.7, Inoperable Rod Limitations
	CRS	Notify I&C to investigate for cause of misaligned rod
	RO	Determines actual position of misaligned rod
Booth Operator: Call as I&C and inform that time compression is being utilised. I&C has determined that the cause of the failure was a blown fuse and the fuse has been replaced.		
	CRS	Initiates a CR to document malfunction
	RO	Determines that affected rod is below remainder of rods in its group.

Op Test No.:	<u>1</u>	Scenario #	<u>4</u>	Event #	<u>2</u>	Page	<u>13</u>	of	<u>25</u>
Event Description:		Misaligned/Dropped Control Rod P-6							
Time	Position	Applicant's Actions or Behavior							

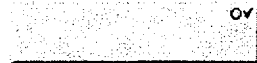
	BOP	Obtains the following from Reactor Engineer:
Booth Operator: Respond as RE that reactor should stay at or below current power level for rod withdrawal, and no rate limitation on withdrawal.		
<i>When ready to realign the rod, or at Lead Evaluator's discretion, proceed to Event 3</i>		

Op Test No.: 1 Scenario # 4 Event # 3 Page 14 of 25

Event Description: 21 Condensate Pump Trips

Time	Position	Applicant's Actions or Behavior
------	----------	---------------------------------

Booth Instructor: When directed by lead evaluator, insert the following command:

**TRG!2, Actuates event trigger 2:****BRG 1 Failure Condensate Pump 21 MTR IMF MOT-CFW001B (2 0) 100 600 0.000**

Indications available:

*Increasing amps on panel SC meter for 21 Condensate Pump Amps**21 MBFP speed slowly increases**Alarm SE 3-2 Bearing Monitor after about 3 minutes**21 Condensate Pump trips after about 4.5 minutes*

After pump trip:

*S/G levels decrease**Multiple S/G level alarms**21 MBFP Low Suction Pressure Cutback actuates*

	BOP	Diagnoses 21 Condensate Pump malfunction
NOTE: The CRS may direct the BOP operator to manually trip 21 Condensate pump due to indications of failure.		
	CRS	Direct performance of immediate actions of AOP-FW-1 Loss of Feedwater
	RO	Checks if any MBFP is operating (yes) Announces immediate actions complete
	CRS	Reviews Immediate actions using the procedure
	ALL	Determine that a Condensate Pump has tripped

Op Test No.: 1 Scenario # 4 Event # 3 Page 15 of 25

Event Description: 21 Condensate Pump Trips

Time	Position	Applicant's Actions or Behavior
------	----------	---------------------------------

	BOP	Determine that 22 Condensate pump is not running Start 22 Condensate Pump
	RO	Check if load reduction is necessary to maintain FF>SF and MBFP suction pressure >310 (expected result is no load reduction necessary)
	RO	Check Tave maintained on program
	RO	Check if MBFP suction pressure cutback is actuating
Evaluator Note: Continue with Event 4 when SG levels are increasing with FF>SF, or at the discretion of the lead evaluator		

Op Test No.: 1 Scenario # 4 Event # 4, 5, 6 Page 16 of 25

Event Description: Steam Line Rupture, Auto SI Actuation Failure, LOCA Outside Containment

Time	Position	Applicant's Actions or Behavior
------	----------	---------------------------------

Booth Instructor: When directed, insert the following command:

**TRG13, Actuates Event Trigger 3**S/G 21 HDR LEAK DNSTRM CHK VLV IMF MAL-SGN004A (3 0) 25 180 0.000

Actuates when reactor trip breakers open:

RHR PUMP DISCHARGE HDR Leak IMF FLX-RHR008 (30 0) 100 0.00 0

IRF PLP-RHR033 (30 0) 100.000 0

IRF PLP-RHR022 (30 0) 100.000 0

Indications available:

*Reactor Power Increases**Turbine Load Decreases**S/G levels increase**ALARM SA 3-2, PZR Low Pressure 2185**ALARM SA 3-3, PZR Low Level**Auto Reactor Trip**SI First Out Alarm*

	TEAM	Determine reactor trip required.
	CRS	Direct reactor trip and entry to E-0, Reactor Trip or Safety Injection
	RO	Verify reactor trip
	RO	Verify Turbine Trip
	BOP	Verify Power to 480 V Buses

Op Test No.: 1 Scenario # 4 Event # 4, 5, 6 Page 17 of 25

Event Description: Steam Line Rupture, Auto SI Actuation Failure, LOCA Outside Containment

Time	Position	Applicant's Actions or Behavior
------	----------	---------------------------------

Critical Task:

Manually actuate at least one train of SIS-actuated safeguards before any of the following:

- ◇ Transition to any E-1 series, E-2 series, or E-3 series procedure or transition to any FRP
- ◇ Completion of step 5.a of ES-0.1

Critical Task	RO	Check if SI is actuated (no) Determines that SI is required but not actuated. PERFORMS Manual SI actuation by depressing both manual SI actuation pushbuttons on panel SB-2
	CRS/BOP	CRS directs BOP to perform E-0 Attachment 1
	RO	Verify AFW Pumps Running (yes)
	RO	Verify total AFW flow greater than 400 gpm (yes)
	RO	Verify SI System Flow Places one RHR pump to pullout
Booth Instructor: Call as Nuclear Watch NPO and report a large leak of apparently RCS steam/Liquid in the piping penetration area. The leak appears to be on RHR discharge piping and you cannot get close due to steam temperature and radiation levels.		
	RO	Check RCP Seal Cooling Starts 22 Service Water Pump

Op Test No.: 1 Scenario # 4 Event # 4, 5, 6 Page 18 of 25

Event Description: Steam Line Rupture, Auto SI Actuation Failure, LOCA Outside Containment

Time	Position	Applicant's Actions or Behavior
------	----------	---------------------------------

	RO	Check RCS Temperatures
	RO	Check PRZR PORVs and Spray valves closed
Critical Task		
Trip all RCPs prior to completion of E-0 step 12		
Critical Task	TEAM	Check if RCPs should be stopped Check SI pumps – At Least One Running Checks subcooling less than 23°F. PERFORMS - Stops all RCPs
	RO	Check if any SG is faulted (no)
	RO	Check if SG tubes are Intact (yes)
	RO	Check if RCS is intact (yes) NOTE: All containment parameters are normal
	RO	Check if SI should be terminated (no)
	CRS/BOP	Check if Attachment 1 is complete.
	CRS	Initiate monitoring of CSF Status trees

Op Test No.: 1 Scenario # 4 Event # 4, 5, 6 Page 19 of 25

Event Description: Steam Line Rupture, Auto SI Actuation Failure, LOCA Outside Containment

Time	Position	Applicant's Actions or Behavior
------	----------	---------------------------------

	RO	Reset SI
	RO	Check if RHR Pumps should be stopped (yes)
	RO	Check SG Levels
	RO	Check PAB Radiation – Normal (NO)
	TEAM	Diagnose cause of abnormal PAB Radiation levels due to a Loss of RCS inventory outside of containment
	CRS	Transition to ECA-1.2, LOCA Outside Containment
	RO	Verify Proper valve alignment (all in correct position)
	CRS/RO	Verify SI has been reset
	BOP	Reset Containment isolation Phase A and Phase B
	BOP	Establish Instrument Air to Containment

Op Test No.:	<u>1</u>	Scenario #	<u>4</u>	Event #	<u>4, 5, 6</u>	Page	<u>20</u>	of	<u>25</u>
Event Description: Steam Line Rupture, Auto SI Actuation Failure, LOCA Outside Containment									
Time	Position	Applicant's Actions or Behavior							

Critical Task: Isolate the LOCA outside containment before transition out of ECA-1.2		
Critical Task	TEAM	Try to identify and Isolate Break Sequentially close and open the following valves (or sets of valves) and monitor for an RCS pressure increase ◇ RHR Pump cold leg injection valves MOV-746 and MOV-747. Determines that the Leak is isolated when MOV-746 and MOV-747 are closed.
	RO	Check if break is isolated (yes) Determines RCS pressure is increasing
	CRS	Transitions to E-1, Loss of Reactor or Secondary Coolant
Terminate scenario when transition is announced to E-1		

Op Test No.: 1 Scenario # 4 Event # Attachment 1 Page 21 of 25

Event Description: Attachment 1, Automatic Action Verification

Time	Position	Applicant's Actions or Behavior
------	----------	---------------------------------

Note

This attachment must be terminated upon CRS transition to ECA-0.0, Loss of All AC Power.

	BOP	<p>Verify proper Charging system operation:</p> <ul style="list-style-type: none"> a. Start at least one charging pump in manual at maximum speed b. Align charging pump suction to the RWST <ul style="list-style-type: none"> • Open charging pump suction valve from RWST <ul style="list-style-type: none"> ○ LCV-112B • Close charging pump suction valve from VCT <ul style="list-style-type: none"> ○ LCV-112C • Place RCS Makeup Control switch to STOP
--	-----	---

Note

- **Notify CRS of any automatic actions that failed to occur during performance of this attachment**
- **Equipment found misaligned due to operator action should NOT be repositioned.**

	BOP	<p>Check 345 KV MO Disc Switch F7-9 – Open (no) Checks generator output breakers – OPEN</p>

Op Test No.: 1 Scenario # 4 Event # Attachment 1 Page 22 of 25

Event Description: Attachment 1, Automatic Action Verification

Time	Position	Applicant's Actions or Behavior
------	----------	---------------------------------

	BOP	<p>Check status of 480 volt busses:</p> <ol style="list-style-type: none"> 1. All 480V busses – ENERGIZED BY OFF-SITE POWER 2. Dispatch NPO to reset: <ul style="list-style-type: none"> ◇ All lighting ◇ MCC 24A ◇ MCC 27A ◇ MCC 29A 1. Stop all Condensate Pumps
	BOP	<p>Verify FW Isolation:</p> <ul style="list-style-type: none"> ○ Main Boiler Feed Pumps – TRIPPED ○ Main Boiler Feed Pump Discharge Valves – CLOSED ○ FW Regulating valves – CLOSED ○ FW Stop Valves – CLOSED ○ SG Blowdown Isolation Valves - CLOSED
	BOP	<p>Check if Main Steam Lines should be isolated:</p> <ol style="list-style-type: none"> a. Check for either: <ul style="list-style-type: none"> • High Steam Line flow with EITHER Tave less than 541 deg F OR Steam line pressure less than 525 psig. OR • Containment pressure – EVER GREATER THAN 24 psig b. Verify MSIVs - CLOSED
	BOP	<p>Verify proper Service Water System operation:</p> <ol style="list-style-type: none"> 1. Three Service Water Pumps – Running on Essential Header 2. Service Water valves from Diesel Generator - OPEN

Op Test No.: 1 Scenario # 4 Event # Attachment 1 Page 23 of 25

Event Description: Attachment 1, Automatic Action Verification

Time	Position	Applicant's Actions or Behavior
------	----------	---------------------------------

	BOP	Verify SI system pumps running: <ul style="list-style-type: none"> a. Three SI pumps – RUNNING b. 22 SI pump discharge isolation MOV-851A AND MOV-851B – OPEN c. Two RHR pumps - RUNNING
	BOP	Verify proper emergency SI System valve alignment: <ul style="list-style-type: none"> a. SI pump cold leg injection valves – OPEN <ul style="list-style-type: none"> o 856A o 856E o 856C o 856D b. RHR HX CCW outlet valves – OPEN <ul style="list-style-type: none"> o 822A o 822B c. RHR HX MOVs – OPEN <ul style="list-style-type: none"> o 746 o 747
	BOP	Verify Containment Fan Coolers – IN SERVICE: <ul style="list-style-type: none"> a. Five fan coolers - RUNNING b. NORM OUT valves - OPEN c. TCV-1104 and TCV-1105 – BOTH OPEN
	BOP	Verify AFW flow to all SGs

Op Test No.: 1 Scenario # 4 Event # Attachment 1 Page 24 of 25

Event Description: Attachment 1, Automatic Action Verification

Time	Position	Applicant's Actions or Behavior
------	----------	---------------------------------

	BOP	<p>Verify Containment Ventilation Isolation:</p> <ol style="list-style-type: none"> 1. Containment Purge Valves – CLOSED <ul style="list-style-type: none"> ◇ FCV-1170 ◇ FCV-1171 ◇ FCV-1172 ◇ FCV-1173 2. Containment Pressure Relief Valves - CLOSED <ul style="list-style-type: none"> ◇ PCV-1190 ◇ PCV-1191 ◇ PCV-1192
<p style="text-align: center;"><u>Note</u></p> <p>Attachment 2 provides a list of Phase A valves</p>		
	BOP	<p>Verify Containment Isolation Phase A</p> <ol style="list-style-type: none"> 1. Phase A – ACTUATED <ul style="list-style-type: none"> ◇ Train A master relay CA1 (above rack E) ◇ Train B master relay CA2 (above rack F) 2. Phase A valves – CLOSED <ul style="list-style-type: none"> ◇ IVSW valves – OPEN ◇ 1410 ◇ 1413 ◇ SOV-3518 ◇ SOV-3519 ◇ WCP valves – OPEN: ◇ PCV 1238 ◇ PCV 1239 ◇ PCV 1240 ◇ PCV 1241 3. Place personnel and equipment hatch solenoid control switches to INCIDENT on SM panel 4. Dispatch NPO to periodically check <ul style="list-style-type: none"> ◇ IVSW Tank ◇ Level – GREATER THAN 92% ◇ Pressure – GREATER THAN 57 PSIG ◇ WCP header pressures – GREATER THAN 52 PSIG

Op Test No.: 1 Scenario # 4 Event # Attachment 1 Page 25 of 25

Event Description: Attachment 1, Automatic Action Verification

Time	Position	Applicant's Actions or Behavior
------	----------	---------------------------------

Evaluator note: The following step is intended for High Containment pressure condition. It will not be performed if conditions aren't met

	BOP	<p>Check if Containment Spray should be actuated:</p> <ol style="list-style-type: none"> 1. Containment Pressure – EVER GREATER THAN 24 PSIG 2. Verify spray pumps – RUNNING 3. Verify spray pump discharge valves – OPEN <ul style="list-style-type: none"> ◇ MOV-866A ◇ MOV-866B ◇ MOV-866C ◇ MOV-866D 4. Verify Containment Isolation Phase B valves – CLOSED 5. STOP all RCPs 6. Verify IVSW Isolation Valves – OPEN <ul style="list-style-type: none"> ◇ 7864 ◇ 7865 ◇ 7866 ◇ 7867
	BOP	Verify CCR Air Conditioner Train A and B – RUNNING IN INCIDENT MODE 2
	BOP	Notify CRS that Attachment 1 is complete

Facility: IP2

Scenario No.: 5 Op Test No.: 1

Examiners: _____

_____Candidates: _____ CRS
_____ RO
_____ POInitial Conditions: 15% power MOLTurnover: The plant tripped 76 hours ago due to a switchyard fault. Repairs have been completed and plant startup is in progress IAW POP 1.3 at step 4.53. Continue with the plant startup at a rate of 200 MW per hour.Critical Tasks: Establish at least 400 gpm AFW flow to the SGs before SG dry-out occurs (WR level less than 14%)

Isolate RCP Seal Injection before starting a Charging Pump.

Event No.	Malf. No.	Event Type*	Event Description
1		R (RO) N (BOP) N (CRS)	Increase Load
2	XMT-RCS028A	I (RO)	PT-455 PRZR Pressure Controlling Channel fails high
3	MAL-EPS007D	C (ALL)	Loss of 480V Bus 6A
4	FLX-CFW050	M (ALL)	Feed water Header leak inside containment
5		M (ALL)	Loss of all AC power

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

Scenario Event Description
IP2 Simulator Scenario 5

The team will assume the shift and continue with a plant startup in progress in accordance with POP-1.3, beginning at step 4.53.

During the power increase, PRZR Pressure Controlling Transmitter PT-455 will fail high requiring manual control of PRZR Pressure IAW AOI-28.0 and AOI-28-5. The CRS will refer to Technical Specifications.

480V AC Bus 6A will fault requiring implementation of AOI-27.1.13. The team will perform immediate operator actions that include starting a Charging Pump, and starting a Service Water Pump on the essential header. Bus 6A will not be recovered due to failure.

A rupture of the feed water piping to 21 SG inside of containment will result in a reactor trip and safety injection actuation. Simultaneous to the reactor trip, a fault will occur on the Station Auxiliary Transformer resulting in a loss of offsite power. 21 EDG will start, but its output breaker will not close. 22 EDG will fail to start. 23 EDG will start but cannot be used to energize faulted bus 6A. The team will diagnose a loss of all AC power and transition to ECA-0.0. During execution of ECA-0.0, Bus 5A will be energized from the 13.8KV power source. The scenario will be terminated when transition to ECA-0.2 is announced.

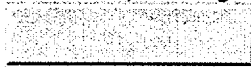
EOP flow path: E-0 – ECA-0.0 – ECA-0.2

Indian Point Unit 2
2003 NRC Initial License Examination
Simulator Scenario Setup
Scenario 5

Reset simulator to IC-227(PW nano1007)

Place diskette in A drive

Click button to run batch file New#2.bat and verify that the following malfunctions are active or pending:



bat New#2.bat

PT-455 PZR PRESS CH.1 fails high

XMT-RCS028A (1 0) 2255 60 2235
Event trigger #1

480V Bus 6A Fault

IMF MAL-EPS007D (2 0) TRUE
Event Trigger #2

Feedwater Header Leak in VC

IMF FLX-CFW050 (3 0) 25 900 0.000
Event Trigger #3

EDG 21 Output Breaker Failed As-Is

IMF BKR-DSG001 (-1 0) 5

EDG 22 Air Start Failure

IMF MAL-DSG003B (-1 0) TRUE

LOA to transfer BA Pumps

IRF LOA-CVC093 (30 0) 0.000000 0
IRF LOA-CVC084 (30 2) 100.000 5
Event trigger #30

Trigger to Close Seal Water MOVs

IMF MOV-CVC002 (29 0) 2
IMF MOV-CVC005 (29 5) 2
IMF MOV-CVC006 (29 10) 2
IMF MOV-CVC007 (29 15) 2
IMF MOV-CVC008 (29 20) 2
IMF MOV-CCW004 (29 30) 2
Event trigger #29

Trigger to open Bus 5A MCC breakers

IRF LOA-EPS052 (28 0) TRIP
IRF LOA-EPS049 (28 5) TRIP
IRF LOA-EPS053 (28 10) TRIP
IRF LOA-EPS755 (28 15) TRIP
Event trigger #28

Materials needed for scenario:

- POP-1.3 marked up to step 4.53
- Graph Book

Note: None

Indian Point Unit 2
2003 NRC Initial License Examination
Simulator Scenario Turnover Information
Scenario 5

- The plant is at 15% power, 93 MWe gross, Xenon is increasing.
- Middle of Life, C_b is 992 PPM.
- EFPD = 340
- Control Bank D = 151 steps
- $T_{avg} = 548.5^{\circ}\text{F}$
- RCS Pressure = 2235 psig
- Pressurizer Level = 38%
- Risk Assessment = GREEN
- Daily Risk Factor = 0.94

The following equipment is out of service:

- None

Team instructions:

- In accordance with POP-1.3, continue from step 4.53 to start up at a rate of 200 MWe per hour

Op Test No.: 1 Scenario # 5 Event # 1 Page 5 of 18

Event Description: Increase Load

Time	Position	Applicant's Actions or Behavior
------	----------	---------------------------------

	CRS	Refers to POP 3.1
		Note: CRS may review previously performed steps in the POP to verify that they have been completed.
	RO	Withdraw Control Rods as necessary to MAINTAIN delta flux within the target band and Tave on program
	RO	DILUTE per SOP-3.2, Reactor Coolant System Boron Concentration Control, as necessary to maintain delta-Flux within the target band and Tave on program. Note: Actions for DILUTION are on pages 6 of this scenario guide
	RO	VERIFY T_{AVE} AND Pressurizer Level are maintained on program per Graph RCS-2, Pressurizer Level V.S. T_{AVE} .
	RO	MAINTAIN steam generator levels between 40 and 50 percent Narrow Range.
	RO	NULL manual setpoint on feedwater regulating valve control to facilitate rapid transfer from AUTOMATIC to MANUAL control.
	RO	INITIATE load increase using either of the following as directed by CRS: <ul style="list-style-type: none"> ○ Governor control ○ Load Limit control

Op Test No.: 1 Scenario # 5 Event # 1 Page 6 of 18

Event Description: Increase Load

Time	Position	Applicant's Actions or Behavior
------	----------	---------------------------------

	RO	Refers to SOP-3.2 for dilution
	RO	<p>DETERMINE RCS Boron concentration from reactor coolant sample analysis.</p> <ul style="list-style-type: none"> IF analysis following concentration adjustment is <u>NOT</u> yet available, ESTIMATE Boron concentration based on latest readings.
<p style="text-align: center;">NOTE</p> <p>Determinations should be based upon rod position, RCS Boron concentration, Xenon level variations, incremental Boron and rod worth, and operating experience.</p>		
	RO	<p>DETERMINE magnitude of decrease in Boron concentration necessary to accomplish desired reactivity change using one or more of the following references:</p> <ul style="list-style-type: none"> GRAPH CVCS-6, Boration - Dilution Tables GRAPH RV-2, Total Power Defect (PCM) as a Function of Power and Boron Concentration at MOL GRAPH RV-3, Differential Boron Worth (Hot Zero Power) at MOL GRAPH RV-4, Total Temperature Defect (PCM) as a Function of Temperature and Boron Concentration at MOL GRAPH RV-9, IP2 Cycle 15 Reactivity Equivalents POP 1.2, Reactor Startup WCR 1, Reactivity Summary
	RO	IF the change in RCS Boron concentration is anticipated to be greater than or equal to 25 ppm, OPERATE Pressurizer heaters to open spray valve.
	RO	ESTIMATE total volume of PW required for dilution from graphs

Op Test No.: 1 Scenario # 5 Event # 1 Page 7 of 18

Event Description: Increase Load

Time	Position	Applicant's Actions or Behavior
------	----------	---------------------------------

		or references listed in step 4.5.2.
	RO	PLACE the RCS Makeup Control switch to STOP.
	RO	SET Primary Water Integrator to amount determined in step 4.5.3.
	RO	PLACE the RCS Makeup Mode Selector switch to DILUTE.
	RO	PLACE the RCS Makeup Control switch to START.
	RO	MONITOR Nuclear Instrumentation, Rod position, and RCS temperature closely during any reactivity changes.
	RO	<p><u>WHEN</u> dilution operation has been completed, <u>PERFORM</u> the following:</p> <ul style="list-style-type: none"> ○ PLACE the RCS Makeup Control switch to STOP. ○ PLACE the Makeup Mode Selector switch to MANUAL. ○ ADJUST FCV-110A, Boric Acid Flow Control, dial setting to the new RCS Boron concentration per applicable CVCS Graph: ○ GRAPH CVCS-1A, Blended Makeup - (0-500) with 120 Gpm PW ○ GRAPH CVCS-1B, Blended Makeup - (0-2000) with 120 Gpm PW ○ GRAPH CVCS-1C, Blended Makeup with Various PW Flows

Op Test No.: 1 Scenario # 5 Event # 1 Page 8 of 18

Event Description: Increase Load

Time	Position	Applicant's Actions or Behavior
------	----------	---------------------------------

	RO	SELECT AUTO on RCS Makeup Mode Selector switch.
	RO	PLACE the RCS Makeup Control switch to START.
	RO	LOG amount of PW added to system for dilution in CCR Log Book.
<i>When reactor power has been changed by approximately 10%, or at the discretion of the lead evaluator, proceed to event 2.</i>		

Op Test No.: 1 Scenario # 5 Event # 2 Page 9 of 18

Event Description: PRZR PRESS CH1 FAILS HIGH

Time	Position	Applicant's Actions or Behavior
------	----------	---------------------------------

Booth Instructor: When directed by lead evaluator, click button to insert the following command:

**TRG!1, Actuates event trigger 1:**PT-455 PZR PRESS CH.1 fails high

XMT-RCS028A (1 0) 2255 60 2235

Indications received:

*Pressurizer Pressure Channel 1 indication increases to 2255 over 60 seconds**Spray valves modulate open**Actual Pressurizer Pressure decreases**Alarm SA 3-2 PRZR Low Pressure 2185 PSIG*

	RO	Diagnoses Pressurizer pressure control system malfunction
	CRS	Directs RO to perform immediate operator actions of AOI-28.0, Instrument Failures
	RO	<p><i>(NOTE: bulleted steps may be performed in any order)</i></p> <p>Performs Immediate Actions from memory.</p> <p>Verifies the following controls:</p> <ul style="list-style-type: none"> ◇ Turbine Load – Stable ◇ Rod Control – Stable ◇ PRZR Pressure Control – NOT STABLE <ul style="list-style-type: none"> Determines S/G control is not affected Places PRZR Pressure master controller or individual spray valve controllers in manual and closes spray valves ◇ PRZR Level Control – Stable ◇ MBFP Speed – Normal ◇ S/G Levels – Normal ◇ S/G Pressure Control – Normal <p>Announces Immediate Actions Complete</p>

Op Test No.: 1 Scenario # 5 Event # 2 Page 10 of 18

Event Description: PRZR PRESS CH1 FAILS HIGH

Time	Position	Applicant's Actions or Behavior
------	----------	---------------------------------

	CRS	Directs review of immediate Operator Actions using the procedure.
	BOP	Performs Alarm Response Procedures for annunciators in alarm
	RO	Diagnose PRZR Pressure Channel 1 instrument malfunction
	CRS	Transition to AOI-28.5 Pressurizer Pressure Channel Fails High
	RO	Determine that the failed channel is the controlling channel
	RO	Verifies Pressurizer Pressure control is in MANUAL
	RO	Manually controls Pressurizer Pressure at 2235 or within the band directed by the CRS
	BOP	Places P/455A Pressurizer Pressure Defeat Switch in rack B6 to Defeat 1&4
	RO	Return Pressurizer Pressure control to AUTO
	CRS	Determine that placing bistable trip switches to trip for affected channel will not cause a reactor trip.

Op Test No.: 1 Scenario # 5 Event # 2 Page 11 of 18

Event Description: PRZR PRESS CH1 FAILS HIGH

Time	Position	Applicant's Actions or Behavior
------	----------	---------------------------------

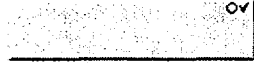
	BOP	Trips bistable trip switches in Red A-4 rack ◇ PC-455B Hi Press Trip (Alarm and proving lamp) ◇ PC-455A Lo Press Trip (Alarm and proving lamp) ◇ PC-455E SI (Alarm and proving lamp) ◇ PC-455C Unblock SI (No alarm, no light) ◇ TC-411A Overtemp Trip (Alarm and proving lamp)
	CRS	Refers to Technical Specification Tables 3.5-2 and 3.5-3
<i>Proceed to event 3 when bistables have been tripped, or at the discretion of the lead evaluator.</i>		

Op Test No.: 1 Scenario # 5 Event # 3 Page 12 of 18

Event Description: Loss of 480V Bus 6A

Time	Position	Applicant's Actions or Behavior
------	----------	---------------------------------

Booth Instructor: When directed by lead evaluator, insert the following command:

**TRG!2, Actuates event trigger 2:**480V Bus 6A Fault

IMF MAL-EPS007D (2 0) TRUE

Indications received:

*21 and 22 EDGs start. 22 EDG Fails to start**Multiple Alarms associated with deenergized 480V bus and breaker trips.**Deenergized equipment powered from bus 6A including the running charging pump*

	BOP	Diagnoses 480V Bus 6A de-energized
	CRS	Directs RO and BOP to perform immediate operator actions of AOI-27.1.13, Loss of a 480 V Bus
	RO	Check Charging Pumps Determine that no Charging Pumps are running Starts 21 or 22 Charging pumps
	BOP	Checks Service Water Pumps Determines that ESW header pressure is low Starts 24 SW Pump
	BOP	Checks RCS temperature > 200°F Checks CRDM fans – At Least three running (expect 4 running) Announces Immediate Actions Complete
	CRS	Directs review of immediate actions using the procedure

Op Test No.: 1 Scenario # 5 Event # 3 Page 13 of 18

Event Description: Loss of 480V Bus 6A

Time	Position	Applicant's Actions or Behavior
------	----------	---------------------------------

Booth instructor: Click button to swap inservice boric acid pumps, when Nuke Side NPO is dispatched.

22:00:00

Swaps BAT Pumps by activating trigger 30

	BOP	Diagnose 480 Volt Bus 6A De-energized
	BOP	Determine Bus 6A Lockout Status light is not lit
	TEAM	Place control switches for bus 6A loads in pullout and OPEN bus 6A MCC Feeder breakers
	BOP	Dispatch NPO to perform visual inspection of switchgear for Bus 6A equipment

Booth Instructor: NPO should report that Bus 6A has apparently suffered a catastrophic failure. Report that the back of Bus 6A switchgear is deformed and paint is blistered and smell of acrid odor.

	BOP	Determine that amber light for breaker 52/6A is lit
	BOP	Dispatch NPO to shutdown 23 EDG
	CRS	INITIATE Technical Specification Shutdown

Note: Proceed to event 4 when the team has determined that a shutdown is required, or at the lead evaluator's discretion.

Op Test No.:	<u>1</u>	Scenario #	<u>5</u>	Event #	<u>4, 5, 6</u>	Page	<u>14</u>	of	<u>18</u>
Event Description:		Attachment 1, Automatic Action Verification							
Time	Position	Applicant's Actions or Behavior							

Booth Instructor: When directed by lead evaluator, insert the following command:



TRG!3, Actuates event trigger 3:

Feedwater Header Leak in VC

IMF FLX-CFW050 (3 0) 25.000 900 0.000

Indications available:

Containment Sump level alarms on panel SB-1

Containment Humidity alarm on panel SM

21 SG Feed Flow decreases and 21 SG Level decreases

Auto reactor trip if no manual trip actuated.

Auto SI on High Containment Pressure and Steam Line Delta-P

Following Trip

Loss of Offsite Power occurs

Loss of All 480 V busses

	RO	Diagnoses 21 SG Level decreasing rapidly and containment conditions degrading
NOTE: The CRS may direct the RO to manually trip the reactor due to rapidly deteriorating plant transient.		
	CRS	Direct performance of immediate actions of E-0, Reactor Trip or Safety Injection
	RO	Verifies Reactor Tripped
	RO	Verifies Turbine Tripped
	BOP	Checks Status of 480V Busses Determines that no 480V Bus is energized Announces to team that transition to ECA-0.0 is required

Op Test No.: 1 Scenario # 5 Event # 4, 5, 6 Page 15 of 18

Event Description: Attachment 1, Automatic Action Verification

Time	Position	Applicant's Actions or Behavior
------	----------	---------------------------------

	CRS	Directs team to perform immediate actions of ECA-0.0, Loss of All AC Power
	RO	Verify Reactor Trip
	RO	Verify Turbine Trip Announce immediate actions complete
	CRS	Verify immediate actions using the procedure
	RO	Check if RCS is isolated <ul style="list-style-type: none"> ◇ Checks PORVS closed ◇ Checks letdown isolation valves closed ◇ Checks excess letdown isolation valve closed
Critical task		
Establish at least 400 gpm AFW flow to the SGs before SG dry-out occurs (WR level less than 14%)		
Critical Task	TEAM	Verify AFW Flow – Greater than 400 GPM <ul style="list-style-type: none"> ◇ Manually open PCV-1139 Steam Supply regulator Valve to start 22 AFW Pump ◇ Manually align 22 AFWP FCVs as necessary ◇ Adjust HCV-1118 Steam Supply Speed Control valve

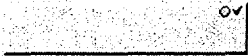
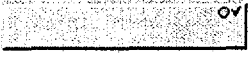
Op Test No.: 1 Scenario # 5 Event # 4, 5, 6 Page 16 of 18

Event Description: Attachment 1, Automatic Action Verification

Time	Position	Applicant's Actions or Behavior
------	----------	---------------------------------

	BOP	Try to restore power to any 480V bus ◇ Check EDGs running (22 not running, 21 EDG running) ◇ Attempt to close 21 EDG output breaker (will not close) ◇ Dispatch NPO to emergency start 22 EDG ◇ Locally trip running EDGs (Note, they will probably be auto tripped before this step is performed due to lack of SW cooling) ◇ Attempt to manually energize 480V bus using any available power supply per AOI-27.1.1 and AOI-27.1.13
	BOP/CRS	Determine that 480 Bus cannot be readily energized from CCR
Booth Instructor: NPO dispatched to start 22 EDG reports that both air start motors appear to be mechanically bound. 22 EDG will not start. NPO will contact work control for assistance. Booth Instructor: When asked, DO reports that 13.8 KV power is available from 13W92 Evaluator Note: When power is restored to any 480V bus, then recovery actions should continue starting with step 24 of ECA-0.0		
	RO	Place Equipment in Pullout: ◇ CS Pumps ◇ SI Pumps ◇ FCUs ◇ Motor Driven AFW Pumps ◇ Turning Gear Oil Pump ◇ Bearing Oil Pump ◇ Turbine Auxiliary Oil Pump ◇ CCW Pumps ◇ RHR Pumps
	CRS	Dispatch personnel to Locally Restore AC Power

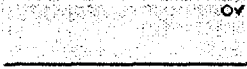
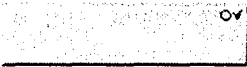
Op Test No.:	<u>1</u>	Scenario #	<u>5</u>	Event #	<u>4, 5, 6</u>	Page	<u>17</u>	of	<u>18</u>
Event Description:		Attachment 1, Automatic Action Verification							
Time	Position	Applicant's Actions or Behavior							

	CRS	Check 13.8KV feeder 13W92 ENERGIZED (yes)
	CRS/BOP	Attempt to restore power to busses per the following while continuing with step 8: ◇ AOI-27.0 Diagnosis and Response to Electrical Failure ◇ SOP-27.1.3 Operation of 13.8KV System ◇ AOI-27.1.1 Loss of Normal Station Power ◇ AOI-27.1.13 Loss of 480V Bus
Critical Task		
Isolate RCP Seal Injection before starting a Charging Pump.		
Critical Task	TEAM	Dispatch personnel to locally close valves to isolate RCP Seals and Place valve Switches to CLOSED position ◇ MOV-222 RCP seal return isolation valve outside containment ◇ MOV-250A-D, RCP seal injection isolation valves outside containment ◇ MOV-789, RCP thermal barrier CCW return isolation valve outside containment
Booth Operator: When NPO directed to Isolate RCP seals, click the button: 		
When NPO directed to open MCC breakers on Bus 5A, click this button: 		
	BOP	Place 52/SS5 and 52/EG1 in Pullout
	BOP	Energize Bus 5A from 13.8KV via 52/GT25
	BOP	Direct NPO to remove control power fuses for 52/5A and manually close breaker 52/5A

Op Test No.: 1 Scenario # 5 Event # 4, 5, 6 Page 18 of 18

Event Description: Attachment 1, Automatic Action Verification

Time	Position	Applicant's Actions or Behavior
------	----------	---------------------------------

Booth Instructor: When NPO dispatched, click to execute**Remove control power fuses breaker 52/5A****Mechanically locally close breaker 52/5A**

	BOP	Press 86/5A reset pushbutton and verify white light is on
	BOP	Close 52/SS5. Inform team that Bus 5A is energized
	CRS	Determine that ECA-0.0 Step 24 should be performed per step 6 CAUTION.
	RO	Manually control SG atmospheric Steam Dumps to stabilize SG Pressures
	BOP	Verify Service Water system operation
	BOP	Verify the following equipment is loaded onto bus 5A <ul style="list-style-type: none"> ◇ MCC 26A ◇ MCC 29A ◇ 21 Battery Charger ◇ 21 Static Inverter on alternate power

Evaluator Note: Team will be unable to close breaker for MCC 29A due to blackout relay not reset.**Booth Operator: If NPO dispatched to reset MCC29A, inform the CCR that MCC29A breaker will not close.**

	CRS	Select Recovery Procedure Determine transition to ECA-0.2 (expected)

Terminate scenario when transition from ECA-0.0 is announced.

Facility:	IP2	Scenario No.:	1	Op Test No.:	1
Examiners:	_____	Candidates:	_____	CRS	
	_____		_____	RO	
	_____		_____	PO	

Initial Conditions: 100% power MOL

21 Charging Pump OOS

21 CCW Pump OOS

Small SG Tube Leak < 5 GPD

Turnover: Reduce load to 900 MWe to remove 23 Condensate Pump from service within 60 minutes

Critical Tasks: Manual reactor trip prior to completion of E-0, step 1

Initiate Bleed and Feed Cooling so that the RCS depressurizes sufficiently to obtain SI flow

Event No.	Malf. No.	Event Type*	Event Description
1		R (RO) N (BOP) N (CRS)	Reduce power
2	CNH PCS8D	C (RO) C (CRS)	MFRV fails closed slowly in AUTO
3	XMT RCS20A	I (ALL)	Pressurizer level channel fails high
4	ATS7B	C (ALL)	Feedwater Pump trip requiring rapid load decrease to 700 MWe
5	ATS7A	M (ALL)	Feedwater pump trip. Reactor trip required.
6	BAT ESR.FAIL. RX.TRIP	C (RO)	Auto reactor trip failure. Manual trip required
7	MOC AFW1	C (BOP)	21 MDAFW fails to start
8	MOT AFW1	C (BOP)	21 MDAFW trips
9	ATS5C		TDAFW trips

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

Scenario Event Description
IP2 NRC Simulator Scenario 1

The team assumes the shift and initiates a power reduction IAW POP-3.1. The OTC will commence RCS boration and the BOP will slowly reduce generator load.

23 MFRV controller fails in automatic. The controller must be placed in manual IAW AOI 28.0 and/or AOI 21.1.1, and 23 SG level restored to the normal control band. The CRS will refer to Tech Specs.

Pressurizer level channel 460 (controlling channel) will fail high. The team will respond IAW AOI-28.0 and AOI-28.7. The OTC will operate charging pumps and pressurizer heaters manually while the BOP defeats the failed channel inputs and the CRS refers to Technical Specifications.

Subsequently, 22 MBFP will trip, requiring a plant runback to <745 MWe IAW AOI-21.1.1. 23 SG level must be controlled manually and normal boration will be performed for AFD control. If Rod Insertion Limits are exceeded, the OTC will commence Emergency Boration.

When the plant is stabilized, 21 MBFP will trip, requiring a reactor trip. The reactor must be tripped manually IAW AOI-21.1.1, because automatic reactor trip is not functional.

Subsequent AFW failures result in the requirement to transition to FR-H.1, and restore Heat Sink using Bleed and Feed.

EOP flow path: E-0 – ES-0.1 – FR-H.1

Indian Point Unit 2
2003 NRC Initial License Examination
Simulator Scenario Setup
Scenario 1

<u>21 Charging Pump OOS:</u>	LOA EPS10 RACKED OUT Place pump control switch in TPO
<u>21 CCW Pump OOS:</u>	LOA EPS13 RACKED OUT Place pump control switch in TPO
<u>AUTO reactor trip failure:</u>	Run Batch File ESR.FAIL.RX.TRIP
<u>21 ABFP fail to auto start:</u>	MOC AFW1 OPTION 4 AUTO CLOSE FAILURE
<u>23 ABFP trips upon starting:</u>	MOT AFW2A OPTION 2 AFW 23 SHAFT SEIZURE

Materials needed for scenario:

- POP-3.1
- Graph Book
- Tags for tagged equipment
- Reactivity Summary Sheet

Allow team to begin scenario brief approximately 30 minutes prior to entering simulator

Note: None

Scenario built from IC 3

Indian Point Unit 2
2003 NRC Initial License Examination
Simulator Scenario Turnover Information
Scenario 1

- The plant is at 100% power, steady state conditions exist.
- Middle of Life, C_b is 862 ppm.
- EFPD = 340
- Control Bank D = 214 steps
- T_{avg} = 559°F
- RCS Pressure = 2235 psig
- Pressurizer Level = 45%
- A small Steam Generator Tube Leak exists on 23 SG, less than 5 gallons per day.
- Risk Assessment = GREEN
- Daily Risk Factor = 0.94

The following equipment is out of service:

- 21 Charging Pump OOS for oil change. Return expected in approximately 6 hours.
- 21 Component Cooling Water Pump. Return to service in approximately 8 hours.

Team instructions:

- 23 Condensate Pump has high vibration.
- In accordance with POP-3.1, reduce generator load to 900 MWe at a rate of 100 MWe per hour and remove 23 Condensate Pump from service.

Op Test No.:	<u>1</u>	Scenario #	<u>1</u>	Event #	<u>1</u>	Page	<u>5</u>	of	<u>32</u>
Event Description:		Reduce Power							
Time	Position	Applicant's Actions or Behavior							

	CRS	Refers to POP 3.1
	CRS	<p><u>IF</u> reducing Reactor Power for a maintenance support function, the SM SHALL DETERMINE the desired Reactor Power level <u>OR</u> Turbine load (MWe) to maintain while repairs are made/troubleshooting is performed</p> <p>Evaluator Note: 900 MWe indicated on turnover</p>
	CRS	<p>REQUEST Test Group to determine if Pressurizer Level instrumentation must be re-calibrated.</p> <p>Evaluator cue: If asked, no re-calibration necessary</p>
	CRS	<p>VERIFY LCV-1129, Excess Condensate Return to CST, is closed, <u>AND</u> isolated locally per SOP 20.2, Condensate System Operation.</p>
	OTC	<p>BORATE per SOP 3.2, Reactor Coolant System Boron Concentration Control, as necessary to maintain control banks above insertion limits required by GRAPH RPC-6, Cycle 14 Core Operating Limits Report.</p>
	OTC	<p><u>IF</u> necessary, PLACE rod control in MANUAL to maintain rods above the Insertion Limit.</p>
	OTC	<p>MAINTAIN delta flux within the target band.</p>

Op Test No.:	<u>1</u>	Scenario #	<u>1</u>	Event #	<u>1</u>	Page	<u>6</u>	of	<u>32</u>
Event Description:		Reduce Power							
Time	Position	Applicant's Actions or Behavior							

	TEAM	<p>IF PICS is <u>NOT</u> operable, PERFORM the following after load changes greater than 10% per AOI 29.12, Loss of PICS Computer:</p> <ul style="list-style-type: none"> ○ Quadrant Power Tilt Calculation using DSR-4B, Quadrant Power Tilt Calculation Sheet (Technical Specification 3.10.10). ○ Log individual rod position indications using DSR-3, Rod Position Verification Log Sheet (Technical Specification 3.10.9).
	BOP	MONITOR condenser sextants for sodium increase.
	OTC	VERIFY T_{AVE} <u>AND</u> Pressurizer Level are maintained on program per Graph RCS-2, Pressurizer Level V.S. T_{AVE} .
	OTC	MAINTAIN steam generator levels between 40 and 50 percent Narrow Range.
	OTC	NULL manual setpoint on feedwater regulating valve control to facilitate rapid transfer from AUTOMATIC to MANUAL control.
	CRS	NOTIFY nuclear and conventional NPOs that load reduction is in progress.

Op Test No.: 1 Scenario # 1 Event # 1 Page 7 of 32

Event Description: Reduce Power

Time	Position	Applicant's Actions or Behavior
------	----------	---------------------------------

	CRS	<p>DIRECT NPOs to perform the following during load reduction:</p> <ul style="list-style-type: none"> ○ MONITOR Main Turbine Oil Temperatures ○ MONITOR Hydrogen Seal Oil Temperatures ○ MONITOR MBFP Oil Temperatures ○ BALANCE Heater Drain Tank Pump flows between the pump in Auto and Manual per SOP 19.1, Extraction Steam And Heater Drain Systems Operation. ○ <u>IF</u> SJAEs are in service, MAINTAIN Steam pressure per SOP 20.1, Condenser Air Removal System Operation, <u>AND</u> periodically CHECK SJAEs for backfiring. ○ <u>IF</u> FCV-1120, Flowpath A Controller Stop, is in MANUAL, ADJUST to maintain FCV-1113, Gland Steam Condenser Minimum Flow Control Valve, closed.
<p style="text-align: center;"><u>NOTE</u></p> <p><u>WHEN</u> erratic governor operation is observed, governor oil pressure may be raised above the controlling load limit to avoid adverse Main Turbine operation.</p>		
	BOP	<p>INITIATE load decrease using either of the following as directed by CRS:</p> <ul style="list-style-type: none"> ○ Governor control ○ Load Limit control
	OTC	Refers to SOP-3.2 for boration
	OTC	<p>DETERMINE RCS Boron concentration from reactor coolant sample analysis.</p> <ul style="list-style-type: none"> ○ <u>IF</u> analysis following concentration adjustment is <u>NOT</u> yet available, ESTIMATE Boron concentration based on latest readings.

Op Test No.:	<u>1</u>	Scenario #	<u>1</u>	Event #	<u>1</u>	Page	<u>8</u>	of	<u>32</u>
Event Description:		Reduce Power							
Time	Position	Applicant's Actions or Behavior							

NOTE

Determinations should be based upon rod position, RCS Boron concentration, Xenon level variations, incremental Boron and rod worth, and operating experience.

	OTC	<p>DETERMINE magnitude of increase in Boron concentration necessary to accomplish desired reactivity change using one or more of the following references:</p> <ul style="list-style-type: none"> ○ GRAPH CVCS-3A, Boration Nomograph for Hot RCS ○ GRAPH CVCS-3B, Boration Nomograph for Cold RCS ○ GRAPH CVCS-6, Boration - Dilution Tables ○ GRAPH RV-2, Total Power Defect (PCM) as a Function of Power and Boron Concentration at MOL ○ GRAPH RV-3, Differential Boron Worth (Hot Zero Power) at MOL ○ GRAPH RV-4, Total Temperature Defect (PCM) as a Function of Temperature and Boron Concentration at MOL ○ GRAPH RV-9, IP2 Cycle 15 Reactivity Equivalents ○ POP 1.2, Reactor Startup ○ WCR 1, Reactivity Summary
	OTC	IF the change in RCS Boron concentration is anticipated to be greater than or equal to 25 ppm, OPERATE Pressurizer heaters to open spray valve.
	OTC	ESTIMATE total volume of boron required for boration from boration graphs or references listed in step 4.5.2.
	OTC	PLACE the RCS Makeup Control switch to STOP.
	OTC	SET Boric Acid Integrator to amount determined in step 4.5.3.

Op Test No.:	<u>1</u>	Scenario #	<u>1</u>	Event #	<u>1</u>	Page	<u>9</u>	of	<u>32</u>
Event Description:		Reduce Power							
Time	Position	Applicant's Actions or Behavior							

	OTC	PLACE the RCS Makeup Mode Selector switch to BORATE.
	OTC	FCV-110A, Boric Acid Flow Control, may be left in AUTO or placed in MANUAL as directed by CRS.
	OTC	VERIFY boric acid transfer pumps are in AUTO.
	OTC	PLACE the RCS Makeup Control switch to START.
<p style="text-align: center;"><u>NOTE</u></p> <p>BATPs shifting to fast speed is verified by both counter operation and by the respective fast speed lights illuminating.</p>		
	OTC	VERIFY BATPs shift to fast speed.
	OTC	<u>IF</u> in manual, ADJUST FCV-110A, Boric Acid Flow Control, to obtain desired boric acid flow rate (may be greater than meter range).
	OTC	<p><u>IF</u> desired to maximize Boron flow, CLOSE the appropriate BATP recirculation valve.</p> <ul style="list-style-type: none"> ○ HCV-104 CVCS/Boric Acid Tank 22 BA Inlet ○ HCV-105 CVCS/Boric Acid Tank 21 BA Inlet <p>Note: Likely will NOT be desired</p>

Op Test No.: 1 Scenario # 1 Event # 1 Page 10 of 32

Event Description: Reduce Power

Time	Position	Applicant's Actions or Behavior
------	----------	---------------------------------

	OTC	MONITOR Nuclear Instrumentation, Rod position, and RCS temperature closely during any reactivity changes.
	OTC	<p><u>WHEN</u> boration operation has been completed, PERFORM the following:</p> <ul style="list-style-type: none"> ○ PLACE the RCS Makeup Control switch to STOP. ○ PLACE the Makeup Mode Selector switch to MANUAL. ○ ADJUST FCV-110A, Boric Acid Flow Control, dial setting to the new RCS Boron concentration per applicable CVCS Graph: ○ GRAPH CVCS-1A, Blended Makeup - (0-500) with 120 Gpm PW ○ GRAPH CVCS-1B, Blended Makeup - (0-2000) with 120 Gpm PW ○ GRAPH CVCS-1C, Blended Makeup with Various PW Flows
	OTC	VERIFY FCV-110A control switch in AUTO.
	OTC	PLACE the RCS Makeup Control switch to START.
	OTC	VERIFY approximately 30 gallons of blended makeup flows through blender.
	OTC	PLACE RCS Makeup Control switch to STOP.
	OTC	SELECT AUTO on RCS Makeup Mode Selector switch.

Op Test No.: 1 Scenario # 1 Event # 1 Page 11 of 32

Event Description: Reduce Power

Time	Position	Applicant's Actions or Behavior
------	----------	---------------------------------

	OTC	PLACE the RCS Makeup Control switch to START.
	CRS	<u>IF</u> Reactor is shutdown, REQUEST a sample for RCS Boron concentration within 30 minutes of completing the boration.
	OTC	LOG amount of boric acid added to system for boration in CCR Log.
<i>At Lead Evaluator's discretion, proceed to Event 2</i>		

Op Test No.:	<u>1</u>	Scenario #	<u>1</u>	Event #	<u>2</u>	Page	<u>12</u>	of	<u>32</u>
Event Description:		MFRV Fails Closed Slowly							
Time	Position	Applicant's Actions or Behavior							

Booth Instructor: When directed, insert the following command:
CNH PCS8D RAMP START 65 RAMP TIME 300 SEVERITY 25

Expected alarm:
 FBF 1-1, STM GENERATOR LEVEL CONTROL DEVIATION

	CRS	Refer to AOI 28.0, Instrument Failures, or 21.1.1, Loss of Feedwater
		Note: The following 2 steps are the actions of AOI-28.0
	OTC	VERIFY The Following Controls: <ul style="list-style-type: none"> ○ Turbine load - STABLE ○ Rod Control - STABLE ○ PRZR pressure control - NORMAL ○ PRZR level control - NORMAL ○ MBFP Speed - NORMAL ○ S/G levels – NORMAL (NO) ○ S/G pressure control - NORMAL
	OTC	Place 23 MFRV in MANUAL and restore SG level
	OTC	CHECK PRZR instrumentation - NORMAL: <ul style="list-style-type: none"> ○ PRZR pressures ○ PRZR levels

Op Test No.:	<u>1</u>	Scenario #	<u>1</u>	Event #	<u>2</u>	Page	<u>13</u>	of	<u>32</u>
Event Description:		MFRV Fails Closed Slowly							
Time	Position	Applicant's Actions or Behavior							

	OTC	<p>CHECK S/G instrumentation – NORMAL</p> <ul style="list-style-type: none"> ○ S/G levels (All 23 SG level indication will be low, but not instrument failure. Due to controller failure) ○ S/G pressures ○ S/G feedwater flow ○ S/G steam flows
	OTC	<p>CHECK RCS instrumentation:</p> <ul style="list-style-type: none"> ○ CHECK RCS loop temperatures: <ul style="list-style-type: none"> ○ Loop Tavg – NORMAL ○ Actual loop ΔT – NORMAL ○ CHECK Power Range Channels – NORMAL ○ CHECK RCS coolant loop flow channels – NORMAL
	CRS	CHECK Turbine first stage pressure – NORMAL
	CRS	CHECK Containment pressures – NORMAL
	CRS	<p>Return to procedure and step in effect.</p> <p>Note: CRS may have called I&C to determine failure. Otherwise, would refer to AOI-21.1.1, steps below</p>
		<p>Note: The following steps are the actions of AOI-21.1.1. The team may use either procedure to stabilize level prior to diagnosing the failure</p>
	CRS	<p><u>IF</u> Main Feed Regulator Valve(MFRV) has failed, GO TO Section 5.7</p>

Op Test No.: 1 Scenario # 1 Event # 2 Page 14 of 32

Event Description: MFRV Fails Closed Slowly

Time	Position	Applicant's Actions or Behavior
------	----------	---------------------------------

	OTC	TRANSFER failed MFRV to MANUAL and RESTORE normal level
	OTC	POSITION MBFP recirculation valve switch at the direction of the CRS <ul style="list-style-type: none"> ○ FCV-1115 21 MBFP Recirc Vlv ○ FCV-1116 22 MBFP Recirc Vlv
	CRS	IF SG Levels can be stabilized, GO TO step 5.13 to stabilize plant
	OTC	ADJUST TURBINE LOAD AS DIRECTED BY THE SM: <ul style="list-style-type: none"> ○ VERIFY that both PORV block valves (MOV-535 and MOV-536) are closed.
	OTC	VERIFY that the MBFP recirculation valve switches are in AUTO <ul style="list-style-type: none"> ○ FCV-1115 21 MBFP Recirc Vlv ○ FCV-1116 22 MBFP Recirc Vlv
	CRS	ESTABLISH plant conditions as directed by the SM Evaluator note: If requested by CRS, Shift Manager directs continuing plant shutdown once plant conditions are stable.

Op Test No.: 1 Scenario # 1 Event # 2 Page 15 of 32

Event Description: MFRV Fails Closed Slowly

Time	Position	Applicant's Actions or Behavior
------	----------	---------------------------------

When plant conditions are stable with 23 Feedwater Regulating valve in Manual and SG level within 5% of normal band, proceed to Event 3

Op Test No.:	<u>1</u>	Scenario #	<u>1</u>	Event #	<u>3</u>	Page	<u>16</u>	of	<u>32</u>
Event Description:		Pressurizer Level Channel Fails High							
Time	Position	Applicant's Actions or Behavior							

Booth Instructor: When directed, insert the following command:

XMT RCS20A SEVERITY 100 RAMP TIME 180

Expected alarms:

FBF 4-5, LOW CHARGING FLOW

SAF 1-3, PRZR HIGH LEVEL

SAF 2-3, PRZR HIGH LEVEL CHANNEL TRIP (After approximately 2 minutes)

	CRS	Refer to AOI-28.0, Instrument Failures
	OTC	VERIFY The Following Controls: <ul style="list-style-type: none"> ○ Turbine load - STABLE ○ Rod Control - STABLE ○ PRZR pressure control - NORMAL ○ PRZR level control – NORMAL (NO) ○ MBFP Speed - NORMAL ○ S/G levels – NORMAL ○ S/G pressure control – NORMAL
	OTC	Place Charging Pump Speed control in manual
	CRS	CHECK PRZR instrumentation – NORMAL <ul style="list-style-type: none"> ○ PRZR levels <ul style="list-style-type: none"> ○ GO to AOI 28.7 (Fails High), PRZR LEVEL CHANNEL FAILURE (LI-460)

Note: If requested to peer check procedure transition, concur with whatever transition the CRS recommends.

Op Test No.:	<u>1</u>	Scenario #	<u>1</u>	Event #	<u>3</u>	Page	<u>17</u> of <u>32</u>
Event Description:		Pressurizer Level Channel Fails High					
Time	Position	Applicant's Actions or Behavior					

	OTC	<p><u>IF</u> failed Channel is controlling Pressurizer level</p> <ul style="list-style-type: none"> TURN OFF any unnecessary Pressurizer back-up heaters (Note: Heaters may have been placed in "ON" previously for the RCS boration) PLACE charging pump speed control in MANUAL CONTROL Pressurizer level in normal band. (Refer to Graph, RCS-2, PRESSURIZER LEVEL vs. TAVE, in Graph Book).
	BOP	<p>In Foxboro rack B6, PLACE Pressurizer Level Defeat switch (L 460A) to DEFEAT #, for affected channel</p> <p>Alarms clear:</p> <p>SAF 1-3, PRZR HIGH LEVEL FBF 4-5, FBF 4-5, LOW CHARGING FLOW</p>
	OTC	RETURN charging pump speed control to AUTOMATIC
	OTC	<p>RETURN Pressurizer bulk heater control to AUTOMATIC <u>OR</u> MANUAL as directed by SOP 1.4, Pressurizer Pressure Control</p> <p>Note: May leave heaters on due to previous RCS boration</p>
	BOP	<p>PLACE Hi Level Trip Bistable Trip switch for affected channel in TRIP</p> <ul style="list-style-type: none"> 460, Rack A-12, WHITE
	CRS	VERIFY requirements of Technical Specification in Table 3.5-2 are met.

Op Test No.: 1 Scenario # 1 Event # 3 Page 18 of 32

Event Description: Pressurizer Level Channel Fails High

Time	Position	Applicant's Actions or Behavior
------	----------	---------------------------------

<i>When Channel is removed from service, Proceed to Event 4</i>		
--	--	--

Op Test No.:	<u>1</u>	Scenario #	<u>1</u>	Event #	<u>4</u>	Page	<u>19</u>	of	<u>32</u>
Event Description:		Feedwater Pump Trip Requiring Rapid Load Decrease to 700 MWe							
Time	Position	Applicant's Actions or Behavior							

Booth Instructor: When directed, insert the following command:
MAL ATS7B 22 MBFP trip

Indications available:

- Multiple alarms received, including:
 - FBF 3-8, 22 MBFPT TURBINE TRIP
 - SEF 3-8, TURBINE RUNBACK ACTUATED
- Control Rod insertion in AUTOMATIC
- AUTOMATIC Turbine Runback

	CRS	Refer to AOI-21.1.1, Loss of Feedwater
		Note: The following 3 steps are Continuous Actions
	CRS	<u>IF</u> Reactor Power is above 4 percent <u>AND</u> AFW pumps are the only source of feed to the steam generators, TRIP the reactor and GO TO E-0, Reactor Trip or Safety Injection.
	CRS	IF Reactor Power is at <u>OR</u> below 4 percent <u>AND</u> AFW pumps are the only source of feed to the steam generators, REDUCE Reactor Power to 3 percent, so all steam generator levels can be maintained above 9 percent level.
	CRS	<u>IF</u> level in any single Steam Generator goes below 9 percent on 2 of 3 indicators, TRIP the reactor and GO TO E-0, Reactor Trip or Safety Injection.

Op Test No.:	<u>1</u>	Scenario #	<u>1</u>	Event #	<u>4</u>	Page	<u>20</u>	of	<u>32</u>
Event Description:		Feedwater Pump Trip Requiring Rapid Load Decrease to 700 MWe							
Time	Position	Applicant's Actions or Behavior							

	CRS	IF one MBFP has tripped, GO TO Section 5.3
	TEAM	<p>IF Turbine Load greater than 745 MWe, VERIFY automatic turbine runback has reduce Turbine Load to approximately 745 MWe</p> <ul style="list-style-type: none"> IF NOT, REDUCE Turbine Load to approximately 745 MWe using Load Limits (preferred) or Governor
<p style="text-align: center;"><u>NOTE</u></p> <p>The recirculation valve should remain closed <u>UNTIL</u> load has been stabilized</p>		
	OTC	VERIFY the Recirculation Valve for tripped MBFP is closed
	OTC	<p>IF necessary, ADJUST turbine load to MATCH Steam flows to Feedwater flows and MAINTAIN Steam Generator levels on program</p> <p>Note: May also place FRV controllers in MANUAL per step 4.12 to control SG levels</p>
<p style="text-align: center;"><u>CAUTION</u></p> <p><u>DO NOT</u> exceed 5500 rpm or 98 percent Startup signal, whichever is reached first</p>		
	OTC	IF necessary, PLACE MBFP Master Speed controller in manual and INCREASE speed to match Feed Flow to Steam Flow
	OTC	VERIFY control rods are in AUTO

Op Test No.:	<u>1</u>	Scenario #	<u>1</u>	Event #	<u>4</u>	Page	<u>21</u>	of	<u>32</u>
Event Description: Feedwater Pump Trip Requiring Rapid Load Decrease to 700 MWe									
Time	Position	Applicant's Actions or Behavior							

	OTC	IF rods are <u>NOT</u> responding, manually DRIVE rods in to control temperature
	BOP	VERIFY that the standby condensate pump is running
	BOP	VERIFY that 21 and 23 AFW Pumps are running <ul style="list-style-type: none"> ○ 21 ABFP NOT running ○ 23 ABFP is tripped (Yellow light)
	BOP	VERIFY that the SGBD Isolation Valves are closed
	OTC	VERIFY that the turbine runback has terminated, as follows <ul style="list-style-type: none"> ○ Load Limit oil pressure stable ○ TURBINE RUNBACK ACTUATED alarm on Panel SEF(Window 3-8) extinguished
	OTC	IF the runback has <u>NOT</u> terminated, PLACE the Loss of MBFP Turbine Runback Control Switch in DEFEAT (Panel FAF).
	CRS	Determine Delta-I is out of the envelope and refer to Technical Specification 3.10.2.6

Note:

When SAF 3-9, APPROACHING ROD INSERTION LIMIT 12.5" alarm is received, team should refer to the Annunciator Response and place Rod Control in MANUAL

When plant is stable, or at Lead Evaluator's discretion, proceed to Event 5

Op Test No.:	<u>1</u>	Scenario #	<u>1</u>	Event #	<u>5, 6, 7, 8, 9</u>	Page	<u>22</u>	of	<u>32</u>
Event Description:		Feedwater Pump Trip. Reactor Trip Required. Auto Reactor Trip Failure. Manual Trip Required. TDAFW Trips; MDAFW Fails to Start; MDAFW Trips.							
Time	Position	Applicant's Actions or Behavior							

<p><i>Booth Instructor: When directed, insert the following command:</i> MAL ATS7A 21 MBFP Trip MOT AFW1A OPTION 2 SHAFT SEIZURE 21 ABFP</p>		
	CRS	May refer to AOI-21.1.1
	CRS	Direct entry to E-0, Reactor Trip or Safety Injection
<p>Critical Task: Initiate Manual Reactor Trip prior to completion of E-0, Step 1</p>		
CRITICAL TASK	OTC	<p>Verify reactor trip:</p> <ul style="list-style-type: none"> ○ Trip breakers open ○ Flux decreasing ○ Rod bottom lights lit ○ Rod position indicators all less than 7.5 inches <p>Manual Reactor Trip required. Automatic reactor trip failed</p>
	OTC	<p>Verify Turbine Trip</p> <ul style="list-style-type: none"> ○ All stop valves closed
	BOP	<p>Verify power to 480 Volt busses:</p> <ul style="list-style-type: none"> ○ At least one energized: <ul style="list-style-type: none"> ○ 2A and 3A ○ 5A ○ 6A ○ All Energized

Op Test No.:	<u>1</u>	Scenario #	<u>1</u>	Event #	<u>5, 6, 7, 8, 9</u>	Page	<u>23</u>	of	<u>32</u>
Event Description: Feedwater Pump Trip. Reactor Trip Required. Auto Reactor Trip Failure. Manual Trip Required. TDAFW Trips; MDAFW Fails to Start; MDAFW Trips.									
Time	Position	Applicant's Actions or Behavior							

	OTC/BOP	Check if SI is actuated: <ul style="list-style-type: none"> SI annunciator lit(NO) OR Any SI pumps running(NO)
	TEAM	Check if SI is required (NO)
	CRS	GO to ES-0.1 Reactor Trip Response
		Cue: Concur with CRS request for transition peer check
	OTC	Check RCS temperature stable at or trending to 547°F
	OTC	Check Generator Output breaker open
	BOP	Verify 480 volt busses energized by offsite power
	OTC	Check pressurizer level control: <ul style="list-style-type: none"> Level greater than 18% Charging and Letdown in service Any CCW pump running Level trending to 37%

Op Test No.:	<u>1</u>	Scenario #	<u>1</u>	Event #	<u>5, 6, 7, 8, 9</u>	Page	<u>24</u>	of	<u>32</u>
Event Description: Feedwater Pump Trip. Reactor Trip Required. Auto Reactor Trip Failure. Manual Trip Required. TDAFW Trips; MDAFW Fails to Start; MDAFW Trips.									
Time	Position	Applicant's Actions or Behavior							

	OTC	Check pressurizer pressure control: <ul style="list-style-type: none"> ○ Pressure greater than 1840 psig ○ Trending to 2235 psig
<i>Booth Instructor: When directed, insert the following command:</i> MAL ATS5C 22 ABFP trip		
	CRS	Determine Red Path exists on Heat Sink CSF status tree. Direct transition to FR-H.1, Loss of Heat Sink
Note: STA Surrogate will provide cue that Heat Sink CSF is RED.		
	OTC	Check if secondary heat sink is required: <ul style="list-style-type: none"> ○ RCS pressure greater than any non-faulted SG pressure ○ RCS temperature greater than 350°F
<p style="text-align: center;"><u>CAUTION</u></p> <ul style="list-style-type: none"> ○ If average of the 3 lowest wide range SG levels is less than 41% (54% Adverse containment) due to loss of secondary heat sink, RCPs should be tripped and steps 9 – 15 should be immediately initiated for bleed and feed ○ City Water for AFW pumps will be necessary if CST level decreases to less than 2 ft ○ Radiation levels and harsh environment conditions should be evaluated prior to performing local actions 		
	TEAM	Determine Bleed and Feed criteria is met
	OTC	Trip RCPs

Op Test No.:	<u>1</u>	Scenario #	<u>1</u>	Event #	<u>5, 6, 7, 8, 9</u>	Page	<u>25</u>	of	<u>32</u>
Event Description: Feedwater Pump Trip. Reactor Trip Required. Auto Reactor Trip Failure. Manual Trip Required. TDAFW Trips; MDAFW Fails to Start; MDAFW Trips.									
Time	Position	Applicant's Actions or Behavior							

Critical Task:

Initiate Bleed and Feed Cooling of the RCS so that the RCS depressurizes sufficiently to obtain SI flow

CRITICAL TASK	OTC/BOP	Actuate SI <ul style="list-style-type: none"> ○ Train A ○ Train B
	OTC/BOP	Verify RCS Feed path <ul style="list-style-type: none"> ○ Check All SI pumps running ○ 22 SI pump discharge isolation MOV-851A and MOV-851B open ○ Check proper emergency SI valve alignment for operating pumps: <ul style="list-style-type: none"> ○ SI pump cold leg injection valves open (856A, B, C, D) ○ RHR HX CCW outlet valves open (822A/B) ○ RHR HX Motor operated valves open (746/747) ○ Check feed path established
<p style="text-align: center;"><u>CAUTION</u></p> <ul style="list-style-type: none"> ○ If offsite power is lost after SI reset, then manual action may be required to restart safeguards equipment ○ Placing key switches to DEFEAT will prevent auto SI actuation 		

Op Test No.:	<u>1</u>	Scenario #	<u>1</u>	Event #	<u>5, 6, 7, 8, 9</u>	Page	<u>26</u>	of	<u>32</u>
Event Description: Feedwater Pump Trip. Reactor Trip Required. Auto Reactor Trip Failure. Manual Trip Required. TDAFW Trips; MDAFW Fails to Start; MDAFW Trips.									
Time	Position	Applicant's Actions or Behavior							

	OTC/BOP	<p>Reset SI</p> <ul style="list-style-type: none"> ○ Check all CCW pumps running (21 CCW pump in TPO as part of setup) ○ Place controls for main and bypass feedwater regulating valves to close ○ Verify automatic safeguards actuation key switches on panel SB-2 in DEFEAT position <ul style="list-style-type: none"> ○ Train A SIA-1 ○ Train B SIA-2 ○ One at a time, depress safety injection reset buttons <ul style="list-style-type: none"> ○ Train A ○ Train B ○ Verify Train A and B reset
	BOP	<p>Reset Containment isolation phase A and Phase B</p> <ul style="list-style-type: none"> ○ Place IVSW switches to open on SN panel (1410, 1413, 3518, 3519) ○ Place CNTMT RAD MON WCPS valves control switch to open on SN panel ○ Verify personnel and equipment hatch solenoid control switches to incident on SM panel ○ Place control switches for all remaining Phase A isolation valves to close on SN panel ○ One at a time, depress Phase A reset pushbuttons <ul style="list-style-type: none"> ○ CI Phase A Train A ○ CI Phase A Train B ○ Verify Train A and B reset

Op Test No.: 1 Scenario # 1 Event # 5, 6, 7, 8, 9 Page 27 of 32Event Description: Feedwater Pump Trip. Reactor Trip Required. Auto Reactor Trip Failure.
Manual Trip Required. TDAFW Trips; MDAFW Fails to Start; MDAFW Trips.

Time	Position	Applicant's Actions or Behavior
------	----------	---------------------------------

	BOP	Check Phase B actuated (NO)
	BOP	Establish Instrument Air to Containment <ul style="list-style-type: none"> ○ Open PCV-1228
CRITICAL TASK	OTC	Establish RCS Bleed Path <ul style="list-style-type: none"> ○ Verify power to PRZR PORV Block Valves available ○ Verify PRZR PORV Block Valves both open ○ Open both PORVs <ul style="list-style-type: none"> ○ Monitor PORV Nitrogen alarms
	OTC	Verify adequate bleed path <ul style="list-style-type: none"> ○ Both PORVs open ○ Both PORV block valves open
	OTC/BOP	Perform steps 1-9 of E-0, Reactor Trip or Safety Injection Note: Step 5 of E-0 directs use of Attachment 1, Automatic Action verification. The steps of this attachment are included beginning on page 28 of this scenario guide
<i>Terminate scenario when RCS Bleed and Feed is established and verified</i>		

Op Test No.: 1 Scenario # All Event # Attachment 1 Page 28 of 32

Event Description: E-0, Attachment 1, Automatic Action Verification

Time	Position	Applicant's Actions or Behavior
------	----------	---------------------------------

Note

This attachment must be terminated upon CRS transition to ECA-0.0, Loss of All AC Power.

	BOP	<p>Verify proper Charging system operation:</p> <ul style="list-style-type: none"> a. Start at least one charging pump in manual at maximum speed b. Align charging pump suction to the RWST <ul style="list-style-type: none"> • Open charging pump suction valve from RWST <ul style="list-style-type: none"> 1. LCV-112B • Close charging pump suction valve from VCT <ul style="list-style-type: none"> 1. LCV-112C • Place RCS Makeup Control switch to STOP
--	-----	---

Note

- **Notify CRS of any automatic actions that failed to occur during performance of this attachment**
- **Equipment found misaligned due to operator action should NOT be repositioned.**

	BOP	Check generator output breakers – OPEN
	BOP	<p>Check status of 480 volt busses:</p> <ul style="list-style-type: none"> a. All 480V busses – ENERGIZED BY OFF-SITE POWER b. Dispatch NPO to reset: <ul style="list-style-type: none"> ○ All lighting ○ MCC 24A ○ MCC 27A ○ MCC 29A c. Stop all Condensate Pumps

Op Test No.: 1 Scenario # All Event # Attachment 1 Page 29 of 32

Event Description: E-0, Attachment 1, Automatic Action Verification

Time	Position	Applicant's Actions or Behavior
------	----------	---------------------------------

	BOP	<p>Verify FW Isolation:</p> <ul style="list-style-type: none"> ○ Main Boiler Feed Pumps – TRIPPED ○ Main Boiler Feed Pump Discharge Valves – CLOSED ○ FW Regulating valves – CLOSED ○ FW Stop Valves – CLOSED ○ SG Blowdown Isolation Valves - CLOSED
	BOP	<p>Check if Main Steam Lines should be isolated:</p> <ul style="list-style-type: none"> a. Check for either: <ul style="list-style-type: none"> • High Steam Line flow with EITHER Tave less than 541 deg F OR Steam line pressure less than 525 psig. OR • Containment pressure – EVER GREATER THAN 24 psig b. Verify MSIVs - CLOSED
	BOP	<p>Verify proper Service Water System operation:</p> <ul style="list-style-type: none"> a. Three Service Water Pumps – Running on Essential Header b. Service Water valves from Diesel Generator - OPEN
	BOP	<p>Verify SI system pumps running:</p> <ul style="list-style-type: none"> a. Three SI pumps – RUNNING b. 22 SI pump discharge isolation MOV-851A AND MOV-851B – OPEN c. Two RHR pumps - RUNNING

Op Test No.: 1 Scenario # All Event # Attachment 1 Page 30 of 32

Event Description: E-0, Attachment 1, Automatic Action Verification

Time	Position	Applicant's Actions or Behavior
	BOP	Verify proper emergency SI System valve alignment: <ul style="list-style-type: none"> a. SI pump cold leg injection valves – OPEN <ul style="list-style-type: none"> ○ 856A ○ 856E ○ 856C ○ 856D b. RHR HX CCW outlet valves – OPEN <ul style="list-style-type: none"> ○ 822A ○ 822B c. RHR HX MOVs – OPEN <ul style="list-style-type: none"> ○ 746 ○ 747
	BOP	Verify Containment Fan Coolers – IN SERVICE: <ul style="list-style-type: none"> a. Five fan coolers - RUNNING b. Charcoal Filter valves - OPEN c. Fan normal discharge valves – CLOSED d. TCV-1104 and TCV-1105 – BOTH OPEN
	BOP	Verify AFW flow to all SGs
	BOP	Verify Containment Ventilation Isolation: <ul style="list-style-type: none"> a. Containment Purge Valves – CLOSED <ul style="list-style-type: none"> ○ FCV-1170 ○ FCV-1171 ○ FCV-1172 ○ FCV-1173 b. Containment Pressure Relief Valves - CLOSED <ul style="list-style-type: none"> ● PCV-1190 ● PCV-1191 ● PCV-1192

Op Test No.:	<u>1</u>	Scenario #	<u>All</u>	Event #	<u>Attachment 1</u>	Page	<u>31</u>	of	<u>32</u>
Event Description: E-0, Attachment 1, Automatic Action Verification									
Time	Position	Applicant's Actions or Behavior							

Note

Attachment 2 provides a list of Phase A valves

		Verify Containment Isolation Phase A
	BOP	<ul style="list-style-type: none"> a. Phase A – ACTUATED <ul style="list-style-type: none"> o Train A master relay CA1 (above rack E) o Train B master relay CA2 (above rack F) b. Phase A valves – CLOSED c. IVSW valves – OPEN <ul style="list-style-type: none"> o 1410 o 1413 o SOV-3518 o SOV-3519 d. WCP valves – OPEN: <ul style="list-style-type: none"> o PCV 1238 o PCV 1239 o PCV 1240 o PCV 1241 e. Place personnel and equipment hatch solenoid control switches to INCIDENT on SM panel f. Dispatch NPO to periodically check <ul style="list-style-type: none"> o IVSW Tank <ul style="list-style-type: none"> o Level – GREATER THAN 92% o Pressure – GREATER THAN 57 PSIG o WCP header pressures – GREATER THAN 52 PSIG
Evaluator note: The following step is intended for High Containment pressure condition. It will not be performed if conditions aren't met		

Op Test No.: 1 Scenario # All Event # Attachment 1 Page 32 of 32

Event Description: E-0, Attachment 1, Automatic Action Verification

Time	Position	Applicant's Actions or Behavior
------	----------	---------------------------------

	BOP	<p>Check if Containment Spray should be actuated:</p> <ul style="list-style-type: none"> a. Containment Pressure – EVER GREATER THAN 24 PSIG b. Verify spray pumps – RUNNING c. Verify spray pump discharge valves – OPEN <ul style="list-style-type: none"> o MOV-866A o MOV-866B o MOV-866C o MOV-866D d. Verify Containment Isolation Phase B valves – CLOSED e. STOP all RCPs f. Verify IVSW Isolation Valves – OPEN <ul style="list-style-type: none"> o 7864 o 7865 o 7866 o 7867
	BOP	Verify CCR Air Conditioner Train A and B – RUNNING IN INCIDENT MODE 2
	BOP	Notify CRS that Attachment 1 is complete