

Facility: Fermi 2 Scenario No. 1 Op-Test No:
2008-1

Examiners: M. Bielby Operators: _____
C. Moore _____
C. Zoya _____

Initial Conditions: IC-18, MOL, 75% Rx. Power

Turnover: The plant has been operating for 103 days. Reactor Power is currently 71% of Rated Thermal Power with Control Rods at the 98% Rod Line following rod pattern adjustment. General Service Water Pump #4 is out of service for motor replacement with an expected return to service in 2 days. The shift will raise Reactor Power to 75% with Recirculation flow, start the East Heater Feed Pump, and continue raising power. GOP 22.000.03, "Plant Operation 25% to 100% to 25%" (Rev 77) actions for power increase are complete through Step 4.2.17.

NOTE: The crew's Pre-job Briefing for the reactor power increase is to be conducted prior to entering the simulator. (Suggested time 30 minutes prior to beginning the scenario.)

Event No.	Malf. No.	Event Type*	Event Description
1.	N/A	R (ATC) R (SRO)	Increase reactor power with recirculation flow to $\geq 75\%$.
2.	N/A	N (BOP) N (SRO)	Start the Third HFP per SOP 23.107.
3.	N/A		Continue reactor power increase with recirculation flow.
4.	B31RF0018	C (ATC) C (SRO)	RRMG "B" Walkaway 58% to 70% speed. ATC trips the RRMG, and CRS enters TS 3.4.1.A.
5.	N/A		Restoration of operation outside the Exit Region. Crew raises speed of RRMG "A" to leave Exit Region.
6.	E51MF0009	I (BOP) I (SRO)	Spurious RCIC Initiation ATC trips / shuts down RCIC, when directed. CRS declares RCIC inoperable TS 3.5.3.A.
7.	R14MF0001 N20MF0023	M (All)	Loss of Div 2 Offsite Power / EDGs start / Loss of all Heater Feed Pumps, Reactor Feed Pumps, and Scram
8.	E41MF0009 E41MF0005	C (BOP) C (SRO)	HPCI Auto Start Failure / Isolation The crew will manually start HPCI to restore RPV Level, which later isolates.
* (N)ormal, (R)eactivity, (I)nstrument, (C)omponent, (M)ajor			

Facility: Fermi 2 Scenario No. 1 Op-Test No: 2008-1

Examiners: M. Bielby Operators: _____
C. Moore _____
C. Zoya _____

Initial Conditions: IC-18, MOL, 75% Rx. Power.

NOTE: Continued from page 1

Event No.	Malf. No.	Event Type*	Event Description
9.	N21MF0031 N21RF0019	C (BOP) C (SRO)	SBFW F001 Fails As Is / Loss of power BOP starts SBFW Pump A and identifies the injection valve failure. (Restored when overloads reset.)
10.	B31MF0066	M (All)	Recirc Loop A Rupture (LOCA) Multiple EOP entries and re-entry.
11.	EOPRF003 8	I (ATC) I (SRO)	Div 2 EECW Hi Drywell Pressure Lead Lifted. ATC determines EECW is not isolated, and isolates.
12.	N/A	M (ALL)	At TAF crew Emergency Depressurizes (BOP opens 5 SRVs, ADS preferred) (CT) Crew restores water level 173 – 214” with available High Pressure and Low Pressure ECCS Systems. (CT)
13.	N/A	M (ATC) M (SRO)	Crew sprays the Torus using SOP 23.205, “RHR System”, Encl A. (Hard Card) Crew sprays the Drywell using SOP 23.205, “RHR System”, Encl A. (Hard Card) (CT)
* (N)ormal, (R)eactivity, (I)nstrument, (C)omponent, (M)ajor			

ILO NRC Initial Exam Scenario 1 Narrative Summary

Initial conditions establish Reactor Power at 71%, necessary to best facilitate the RR Pump uncontrolled speed increase malfunction >10% (Malfunction 1). The CRS will be directing crew actions per the GOP, which produces a Normal activity for BOP to start a HFP, and a Reactivity maneuver for the RO to increase power (10-15%) with RR flow.

After a short brief the CRS will direct ATC to commence raising power with recirc flow. The ATC will raise power with recirc flow until he reaches the recirc speed oscillation region (49%-54%) for both recirc pumps. ATC will report conditions and obtain permission to split recirc speeds to raise each RR Pump through the speed oscillation region. He will then increase speed on each RR Pump until it is clear of the oscillation region.

When directed, BOP will start the East HFP per the GOP's direction.

After the East HFP is started reactor power will again be raised with recirc flow. When RRMG Set speed is $\geq 58\%$, the RR speed control malfunction will be automatically initiated. ATC will take immediate action to lock the scoop tube, if not already locked, and trip RRMG "B" due to a > 10% speed change. The CRS will direct crew response via AOP 20.138.03, Uncontrolled Recirc Flow Change.

This will result in single-loop operation and entry into AOP 20.138.01, Recirc Pump Trip and require CRS to comply with TS LCOs. Depending on where the crew is on the power to flow map, they will probably find themselves in the Exit Region. **NOTE:** The operating Recirc Pump Speed will be $\geq 58\%$ and it will be in the desired single loop speed range of 50 - 75%. With OPRMs operable they should monitor for instability and exit the region as soon as possible. The best way to accomplish this is to raise speed on the operating Recirc Pump until out of the Exit Region.

In response to a Loss of Heater Drains resulting from the transient, the CRS will also direct BOP to evaluate the effects on Feedwater Heating and determine Loss of Feedwater Heating AOP applicability.

A malfunction will result in spurious auto-initiation and injection by RCIC. It is expected that the BOP will trip RCIC under CRS direction. This establishes conditions which will later require manual re-start of RCIC, if selected for level-control post LOCA. CRS will evaluate and comply with TS LCOs, and should coordinate with support personnel to control/protect unaffected ECCS equipment.

An electrical fault on the 345kV distribution system will result in an interruption of Division 2 electrical power, a coincidental loss of feedwater, and Rx Scram (either manual or automatic). The Division 2 EDGs will re-energize the ESF Buses. The crew will enter AOPs 20.300.345kv, Loss of 345 Kv, and 20.000.21, Reactor Scram. After Scram Reports, the CRS will enter EOP 29.100.01, RPV Control, Sheet 1 (Level 3).

The loss of feedwater/scram will challenge RPV Level Control, which will be complicated by the LOCA, a loss of all Heater Feed Pumps and two Condenser Pumps, an auto start failure of HPCI, a loss of power to the Standby Feedwater discharge valve, and the earlier trip of RCIC.

Options available to restore RPV level include manual start of HPCI, re-starting RCIC, or opening the discharge valve and restoring Standby Feedwater (either manually or electrically after resetting overloads). If HPCI is manually started it will isolate after ~1 minute. When the only SBFW Pump (A) is started, the discharge valve will fail to open (N2103-F001). The valve will lose power shortly after receiving the open signal.

The only available high pressure injection sources available will be CRD A Pump, SLC A Pump, and RCIC, when re-started.

A Recirc leak will require the CRS to direct EOP actions to recover RPV level and protect the primary containment from overpressure. EOPs 29.100.01, RPV Control and Primary Containment Control, Sheets 1 & 2 will be entered on high drywell pressure. Most typically the ATC will be tasked with containment sprays, and BOP assigned to restore and maintain level.

When the CRS directs the ATC to, "Verify EECW is initiated, isolated from the drywell, and restore cooling to CRD", the ATC will discover the P4400-F606B failed to isolate. He will report and close the valve.

At ~100" RPV Water Level, the BOP will report that RPV Water Level cannot be maintained >TAF. This will prompt the CRS to brief the crew for Emergency Depressurization.

At TAF (0" core level), the crew will Emergency Depressurize (EOP C-2) (CT) in accordance with 29.100.01, RF/ED/SC, Sheet 3. BOP will be directed to open 5 SRVs, ADS preferred. The crew will then brief and develop a plan for water level recovery, while the plant is being monitored during depressurization.

When LP sources inject and water level is restored >TAF, the crew will coordinate removal of injection systems to maintain RPV Water Level 173 – 214". **(CT)**

When level is recovered and stabilized, ATC will spray the Torus and Drywell to control Primary Containment Pressure. **(CT)**

The scenario will be terminated when the plant is stabilized, and evaluation activities are complete.

Event Description: Overview***Initial Conditions:***

Reactor Power is 71% of RTP with control rods at the 98% Rod Line following a rod pattern adjustment. GSW Pump #4 is out of service for motor replacement. It is scheduled to be returned to service in 2 days. This shift will raise power to 75%, start the E. HFP, and continue to raise reactor power to 100% of RTP with Recirc Flow. GOP 22.000.03, "Plant Operation 25% to 100% to 25%" (Rev 77) actions for power increase are complete **up to** Step 4.2.17.

The objectives of this scenario are to:

1. Recognize, respond to, and take the required actions for an instrument / equipment failures requiring the use of operator and Tech Spec actions.
2. Operate RHR in all modes for Primary Containment Control.
3. Recognize and respond to an Uncontrolled Recirc Flow Change.
4. Recognize and respond to a Recirc Pump Trip.
5. Recognize and respond to a Loss of 345kV Power.
6. Initiate HPCI Manually after failure to Auto Start.
7. Recover RCIC from a Manual Trip and manually start RCIC.
8. Execute steps in Primary Containment Control and operate the RHR System to control Drywell and Torus Temperature and Pressure.
9. Execute the steps of RPV Control for level (L) and pressure (P).
10. Direct and supervise the Shift team during Normal, Abnormal, and Emergency operations.

The crew will be required to respond to the following order of events:

- Recirc Motor Generator "B" Walkaway (TS 3.4.1)
- Spurious RCIC Initiation (TS 3.5.3.A)
- Loss of 345 KV Offsite Power
- HPCI Auto Start Failure
- Failure of N2103-F001, SBFW Disch To RPV Iso Valve
- LOCA – Recirc Loop A Rupture
- Failure of Div 2 EECW Hi Drywell Pressure Isolation.

Event Description: Increase Reactor Power With Recirculation Flow

Time	Position	Applicant's Actions or Behavior
0 min	SRO	<ul style="list-style-type: none">• Short brief on raising power to 75%.<ul style="list-style-type: none">○ Hi-Com announcement commenced raising reactor power.• Directs ATC to commence raising power with recirc flow.• Reviews SR 3.4.1.1• Directs BOP to maintain Turbine Flow Limiter 5% > Reactor Power.• Directs BOP to have TB Rounds to monitor Condensate Filter Demineralizer flows > 2000 gpm.
	ATC	<ul style="list-style-type: none">• Crew Update, "Raising reactor power with recirc flow."• Raises reactor power IAW SOP 23.138.01, "Reactor Recirc System", Section 6.1, by adjusting North and South RR MG Set speeds using B31-R621A and B, N and S RR MG Set Speed Controllers. [Speed will be incrementally increased on N and S RR Pumps to achieve an increase of ≤ 49% speed.]• Contacts RB Rounds to monitor and adjust RR Pump Lube Oil Temperatures. <div>ROLE PLAY: RB Rounds reports N and S RRMG Lube Oil Temperatures have been adjusted to 120°F and bearing oil pressures are ~ 35 psig.</div> <ul style="list-style-type: none">• At 49% speed announces Crew Update, "Splitting Recirc pump speeds to traverse the recirc pump speed oscillation region." (Reactor power is ~72% and core flow is < 70%.)• Steadily raises RRMG "A" speed to traverse the speed oscillation region, until speed is ≥ 54%.• Steadily raises RRMG "B" speed to traverse the speed oscillation region, until speed is ≥ 54%. <p>NOTE: At this time reactor power will be ≥ 75%.</p>
	BOP	<ul style="list-style-type: none">• Maintains Turbine Flow Limiter 5% > Reactor Power.<ul style="list-style-type: none">○ If necessary, raises Turbine Speed Load Demand so ≥ 100 MWe greater than actual.• Directs TB Rounds to monitor Condensate Filter Demineralizer flows > 2000 gpm.

Event Description: Third Heater Feed Pump Start-up

Time	Position	Applicant's Actions or Behavior
+20 min	SRO	<ul style="list-style-type: none"> • Directs BOP to start the E. Heater Feed Pump (HFP) IAW GOP 22.000.03, "Power Operation 25% to 100% to 25%". • Directs BOP to co-ordinate his actions with ATC. • Directs ATC to monitor RPV Water Level during the evolution.
	BOP	<ul style="list-style-type: none"> ○ Makes Hi-com announcement, "Starting the East Heater Feed Pump." • Crew Update, "Starting the East Heater Feed Pump." • Coordinates with ATC to monitor RPV water level during evolution. • Starts the Third HFP IAW GOP 22.000.03, "Power Operation 25% To 100% To 25%", step 4.2.18.2: <ol style="list-style-type: none"> 1. Notifies TB Rounds of E. HFP start and requests walkdown. <div style="border: 1px solid black; padding: 2px; margin: 5px 0;">ROLE PLAY: TB Rounds reports E. HFP is ready for a start.</div> 2. Starts East Heater Feed Pump and monitors RPV water level. <div style="border: 1px solid black; padding: 2px; margin: 5px 0;">ROLE PLAY: TB Rounds reports good start on the E. HFP.</div> 3. Places East HFP Aux Lube Oil Pump CMC switch in OFF/RESET for Heater Feed Pump started. 4. Places East HFP Aux Lube Oil Pump CMC switch in AUTO for Heater Feed Pump started. 5. May verify N20-F404, Cond Min Flow Ctrl Valve, throttles to maintain Condensate flow rate at least 9000 gpm. 6. May direct TB Rounds to adjust TBCCW as required to maintain E HFP lube oil temperature 90°F – 120°F. <div style="border: 1px solid black; padding: 2px; margin: 5px 0;">ROLE PLAY: TB Rounds reports will monitor and adjust E. HFP oil temperature as necessary.</div> ○ May direct RB Rounds to check RPS Alt EPA Breakers are not tripped. <div style="border: 1px solid black; padding: 2px; margin: 5px 0;">ROLE PLAY: RB Rounds reports RPS Alternate EPA Breakers are not tripped.</div>

Event Description: Continued Reactor Power Increase With Recirculation Flow

Time	Position	Applicant's Actions or Behavior
+30 min	SRO	<ul style="list-style-type: none">• Directs ATC to continue raising power to 95% with recirc flow.
	ATC	<p>NOTE: When recirc pump B speed is $\geq 58\%$, the recirc runaway malfunction will occur.</p> <ul style="list-style-type: none">• Raises reactor power IAW SOP 23.138.01, "Reactor Recirc System", Section 6.1, by adjusting North and South RR MG Set speeds using B31-R621A and B, N and S RR MG Set Speed Controllers. [Speed will be incrementally increased on N and S RR Pumps.]○ Contacts RB Rounds to monitor and adjust RR Pump Lube Oil Temperatures. <div><p>ROLE PLAY: RB Rounds reports N and S RRMG Lube Oil Temperatures have been adjusted to 120°F and bearing oil pressures are ~ 35 psig.</p></div>
	BOP	<ul style="list-style-type: none">• Maintains Turbine Flow Limiter $5\% >$ Reactor Power.○ If necessary, raises Turbine Speed Load Demand so ≥ 100 MWe greater than actual.• Directs TB Rounds to monitor Condensate Filter Demineralizer flows > 2000 gpm.

Event Description: RRMG B Walkaway (> 10%)

Time	Position	Applicant's Actions or Behavior
+35 min	SRO	<ul style="list-style-type: none">Announces entry into AOP 20.138.03, "Uncontrolled Recirculation Flow Change" and AOP 20.138.01 "Recirculation Pump Trip". (Crew Update)Hi-Com announcements of events.Conducts AOP briefs.Directs ATC to perform 20.138.01, Condition C Actions.Directs BOP to verify feedwater heating changes are due to the power change IAW ARP 5D85, "Loss of Heater Drains".Notifies Reactor Engineer (RE) of the unplanned power change and requests his assistance. <div>ROLE PLAY: RE states he will come to the control room as soon as possible. Until he gets there, increase monitoring for thermal-hydraulic instabilities.</div> <ul style="list-style-type: none">Notifies RP and Chemistry of power change >15%. (Condition E)Reviews TS 3.4.1, requirements for SLO. (4 hrs for adjustment of RPS setpoints and Thermal Limits for SLO) (2 hrs to declare non-operating loop inop.)Notifies Work Control personnel of RRMG "B" problem, requests a Condition Assessment Resolution Document (CARD) be written, protected system signs be posted for RRMG "A", and review of Plan of the Day for activities that might affect current plant conditions.
	BOP	<ul style="list-style-type: none">Responds to annunciator 5D85, LOSS OF HEATER DRAINSReports loss of Heater Drains due to Recirc Pump Trip.Reviews ARP 5D85.Reviews AOP 20.107.02, "Loss of Feedwater Heating", Enclosure A.Reports Feedwater temperature change is consistent with power change.Peer checks closure of B3105-F031B.Peer checks re-opening of B3105-F031B.

Event Description: RRMG B Walkaway (> 10%)

Time	Position	Applicant's Actions or Behavior
	ATC	<div style="border: 1px solid black; padding: 5px;">Malf – B31RF0018 – RRMG “B” Walkaway</div> <ul style="list-style-type: none"> • Identifies RRMG “B” walkaway and locks the scoop tube, if not already locked. • Expected annunciator 3D136, RECIRC SYS B FLUID DRIVE SCOOP TUBE LOCK. • Verifies that South RR MG Set Scoop Tube is locked. • Determines RRMG B speed increased by $\geq 10\%$. • Reports information to CRS AND announces, “Tripping RRMG B”. • Trips RRMG “B”. (Immediate Action IB.1 of AOP 20.138.03, “Uncontrolled Recirc Flow Change”.) • Monitors reactor power and flow conditions, on the power/flow map. <ul style="list-style-type: none"> ○ May direct RB Rounds to investigate the cause for RRMG B walkaway, informs him of the trip, and to adjust lube oil temperature. <div style="border: 1px solid black; padding: 5px; margin-top: 10px;">ROLE PLAY: RB Rounds reports cannot determine reason for RRMG B speed change and lube oil has been adjusted to maintain 120°F.</div> <ul style="list-style-type: none"> • When directed, performs AOP 20.138.01, Condition C Actions: <ol style="list-style-type: none"> 1. Verifies operating RR MG Set speed $\leq 75\%$. 2. Verifies Reactor Power $< 67.2\%$. 3. Verifies 3D129, RECIRC A and B FLOW LIMITER 2/3 DEFEATED, alarmed. 4. Places Recirc A and B Flow Limiter 2/3 Defeat Switch in DEFEAT. 5. Closes B3105-F031B for tripped RR Pump. (Requests a peer check.) 6. After 5 minutes fully opens B3105-F031B. (Requests a peer check.) 7. Maintains operating RR MG Set speed 50-75%.

Op-Test No.: 2008-1
19

Scenario No.: 1

Event No.: 5

Page 7 of

Event Description: Restoration of operation outside the Exit Region.

Time	Position	Applicant's Actions or Behavior
+45 min	SRO	NOTE: the crew will find the plant is operating in the Exit Region of the Power/Flow Map. <ul style="list-style-type: none">• When informed in the Exit Region of the Power/Flow Map, He directs actions per 20.138.01, Condition D, to raise speed on the operating Recirc Pump to exit the restricted area. (Not to exceed 67.2% power or 75% Recirc Pump Speed)○ May also direct control rod insertion, from the Cram Array sheets.• When clear of the Exit Region, directs operator to monitor for thermal-hydraulic instabilities.
	ATC	<ul style="list-style-type: none">• When directed, raises RRMG "A" speed to operate outside the Exit Region.○ May also insert control rods, from the Cram Array sheets.• Monitors for thermal-hydraulic instabilities.
	BOP	<ul style="list-style-type: none">• Verifies operation on the power to flow map.

Event Description: RCIC Spurious Initiation

Time	Position	Applicant's Actions or Behavior
+50 min	BOP	<div style="border: 1px solid black; padding: 2px;">Malf – E51MF0009 – Spurious RCIC Initiation</div> <ul style="list-style-type: none"> • Observes Alarm 1D24, RCIC SYSTEM ACTUATED. • Announces alarm for CRS. • Observes RCIC starts and commences to inject to the RPV. • Verifies no valid actuation Level 2 signal by checking: <ol style="list-style-type: none"> 1. Wide Range Level Indicators B21-R604A/B and/or 2. Post Accident Recorders B21-R623A/B. • Reports information to CRS. <p>NOTE: IF directed to shutdown RCIC, the candidate will use SOP 23.206. IF the CRS directs tripping RCIC, the candidate will perform Step 3 only.</p> <ul style="list-style-type: none"> • Manually shuts down RCIC by performing actions per SOP 23.206, "RCIC System", Section 8.1: <ol style="list-style-type: none"> 1. Places E51-K615, RCIC Discharge Flow Controller, in MANUAL. 2. Using E51-K615, RCIC Discharge Flow Controller, lowers turbine speed until indicating approximately 3000 rpm. 3. Trips RCIC turbine as follows: <ol style="list-style-type: none"> a. Places RCIC Turbine Trip pushbutton collar in ARMED. <ul style="list-style-type: none"> • Verifies Annunciator 1D90, RCIC TURBINE TRIP PUSHBUTTON ARMED, alarms. b. Depresses RCIC Turbine Trip pushbutton, and verifies: <ul style="list-style-type: none"> • Annunciator 1D94, RCIC TURBINE TRIPPED, alarms. • IF open, E5150-F059, RCIC Turbine Trip Throttle Vlv, closes. • RCIC Turbine speed is decreasing or is at zero. • RCIC Turbine Trip Solenoid ENERGIZED white light is ON. • IF open, E5150-F013, RCIC Disch to FW Inbd Iso Valve, closes. • IF open, E5150-F019, RCIC Min Flow Vlv, closes.

Event Description: RCIC Spurious Initiation

Time	Position	Applicant's Actions or Behavior
	BOP (cont'd)	<ul style="list-style-type: none"> Reviews ARPs 1D24, "RCIC System Actuated" and 1D94, "RCIC Turbine Tripped". Discusses applicable Tech Specs listed in the ARPs with CRS. Contacts RB Rounds for RCIC walkdown. <ul style="list-style-type: none"> May direct an operator to testability to investigate. <div style="border: 1px solid black; padding: 5px; margin-top: 10px;"> ROLE PLAY: If directed to testability, report there are no indications for why RCIC started. </div>
	SRO	<ul style="list-style-type: none"> Acknowledges 1D24, RCIC SYSTEM ACTUATED alarm report. When BOP reports RCIC started on an invalid actuation signal, then directs BOP to trip RCIC. Announces the event over the Hi-Com. Reviews TS 3.5.3, RCIC System, Condition A. Declares RCIC Inop, immediately verifies HPCI operable, and enters a 14 day LCO. Conducts a crew brief. Notifies Work Control personnel of RCIC problem, requests a CARD be written, protected system signs be posted for HPCI, and a review of POD for activities that might affect current plant conditions. <ul style="list-style-type: none"> May review reportability. (General Regulatory Reporting Requirements List)
	ATC	<ul style="list-style-type: none"> Monitors RPV water level, power, pressure, steam flow and feed flow. Reports power, level, and pressure are stable.

Event Description: Loss of 345 KV, loss of Heater Feed and Reactor Feed Pumps, and Reactor Scram.

Time	Position	Applicant's Actions or Behavior
+60 min	ATC	<div style="border: 1px solid black; padding: 5px; margin-bottom: 10px;"> Malf – R14MF0001 – Loss of 345 KV Offsite Power Malf – N20MF0023 – C. HFP Trip </div> <ul style="list-style-type: none"> • Places Mode Switch in SHUTDOWN. • Verifies all rods in. • Verifies power decreasing. • Announces Scram Report. • Performs a walkdown of the electrical panels with Hard Card from H11-P811. • Reports, “Loss 345 KV Offsite Power, Div 2 EDGs have started and are loaded.” • Continues walkdown of back panels. • Directs an operator to walkdown and investigate loss of 345 KV. <div style="border: 1px solid black; padding: 5px; margin-bottom: 10px;"> ROLE PLAY: Outside Rounds reports nothing abnormal on 345 KV Mat. </div> <ul style="list-style-type: none"> • Reports results of electrical walkdown to CRS. • Performs actions as directed by the CRS IAW AOP 20.300.345KV, “Loss of 345 KV” actions: <ol style="list-style-type: none"> 1. Verifies N & S RR MG Emergency L. O. Pumps running. (Conditions B & C) 2. Closes CW Pump #1, 2, & 3 Discharge Iso Valves (N7100-F601, F602, & F603). (Condition E) 3. Places CW Pump #1, 2, & 3 CMC Switches in OFF/Reset. 4. Verifies EDG 13 Output Breaker closed (EC-3) and verifies closed 72E Pos 2A, 72E Pos 5B, and 72EC Pos 2C (Condition G). 5. Verifies EDG 14 Output Breaker closed (ED-3) and verifies closed 72ED Pos 2D and 72F Pos 3A (Condition I). ○ May cross-tie V and W buses for SBFW restoration, when directed. (Condition L)

Event Description: Loss of 345 KV, loss of Heater Feed and Reactor Feed Pumps, and Reactor Scram.

Time	Position	Applicant's Actions or Behavior
	SRO	<ul style="list-style-type: none"> • Directs ATC to place the Mode Switch in SHUTDOWN. • Announces events over Hi-Com. • Requests Scram Reports. • Directs ATC to electrical panels for walkdown. • Announces EOP entry into 29.100.01, "RPV Control", Sheet 1, Level 3. (Crew Update) • Announces entry into "Loss of 345KV" AOP. (Crew Update) • Directs BOP to confirm isolations and actuations for level as they occur. • Directs BOP to restore and maintain level 173-214 inches. • Directs BOP to control pressure 800-1050 psig. • Consults with ATC to determine extent of equipment loss and which AOP(s) to enter.
	BOP	<ul style="list-style-type: none"> • Announces scram report. • Initially reports, "Loss 345 KV Offsite Power, Div 2 EDGs have started and are loaded." • Assesses systems available for injection and uses any available systems.

Event Description: HPCI Auto Start Failure / Isolation

Time	Position	Applicant's Actions or Behavior
+40 min	SRO	<div style="border: 1px solid black; padding: 5px;"> <p>Malf – E41MF0009 – HPCI System Auto Start Failure Malf – E41MF0005 – HPCI Isolation</p> </div> <ul style="list-style-type: none"> • Directs BOP to restore level 173 – 214 inches per 29.100.01, “RPV Control”, Sheet 1, using Table 1 Injection Systems (HPCI, RCIC, SBFW, CRD, SLC). ○ May direct start of HPCI.
	BOP	<ul style="list-style-type: none"> • Reports loss of Reactor Feed Pumps. • Reports failure of HPCI to auto-start. • Manually starts HPCI, IAW 23.202, “HPCI System”, Enclosure C (Hard Card): <ol style="list-style-type: none"> 1. Places E4101-C003, HPCI Baro Cndr Vacuum Pump, in RUN, and verifies pump starts. 2. Opens E4150-F003, HPCI Stm Sply Otbd Iso Vlv. 3. Opens E4150-F059, HPCI Lube Oil Clg Wtr Sply Vlv. 4. Initiates a start of HPCI System by performing the next two steps simultaneously: <ol style="list-style-type: none"> a. Places E4101-C005, HPCI Turbine Aux Oil Pump, in RUN, and verifies pump starts. b. Opens E4150-F001, HPCI Turb Stm Supply Iso Valve. 5. Opens E4150-F006, HPCI Pmp Inbd Disch Iso Valve. 6. Adjusts flow as necessary on E41-K615, HPCI Pump Flow Controller. <p>NOTE: Shortly after HPCI is started and level begins to increase it will isolate.</p> <ul style="list-style-type: none"> • Reports HPCI Isolation.

Event Description: SBFW F001 Fails As Is / Loss of power

Time	Position	Applicant's Actions or Behavior
+45 min	SRO	<div style="border: 1px solid black; padding: 5px;"> Malf – N21MF0031 – SBFW F001 Fails As Is Malf – N21RF0019 – N2103-F001 Breaker </div> <ul style="list-style-type: none"> ○ May direct BOP send an operator to investigate loss of power to N2103-F001.
	BOP	<ul style="list-style-type: none"> • Starts SBFW Pump “A” (From memory per ODE-10) <ol style="list-style-type: none"> 1. Starts N2103-C003A (B), West (East) Pump A (B) Aux Lube Oil Pump, if available. 2. Starts N2103-C001 (2), West (East) Standby Feedwater Pump A (B). 3. N2103-F001, SBFW Disch To RPV Iso Valve, does not automatically open and subsequently loses power. • Observes and reports N2103-F001 failure (SBFW Discharge Valve). • Directs TB Rounds or other operator to investigate the loss of power to N2103-F001, at MCC 2PC-1 Pos 5A. <div style="border: 1px solid black; padding: 5px; margin-top: 10px;"> ROLE PLAY: TB Rounds reports that he is in the BOP Switchgear Room and will investigate right away. Moments later TB Rounds reports he’s at the MCC and can attempt to reset the thermal overloads, if desired. When BOP directs the reset, TB Rounds resets the thermal overloads. (Power to the valve is restored and valve opens.) </div> <div style="border: 1px solid black; padding: 5px; margin-top: 10px;"> NOTE: Booth Operator coordinates Role Play with restoration. Ensure SBFW Pumps are OFF. (CLEAR N21MF0031 & N21RF0019) </div> <ul style="list-style-type: none"> • Observes N2103-F001 opening and reports the same to CRS. • Opens N2103-F002, SBFW 6” Discharge Flow Control Valve.

Event Description: Recirc Loop A Rupture

Time	Position	Applicant's Actions or Behavior
+50 min	SRO	<ul style="list-style-type: none"> • Directs BOP to maintain level band (173-214") • Directs BOP to maintain pressure band to 500 -1000 psig. • Announces EOP entry on high Drywell Pressure, Drywell Temperature, Torus Pressure, Torus Level, and Torus Temperature. (Crew Updates) • Directs ATC/BOP to start second CRD Pump IAW 29.ESP.04. • Directs ATC/BOP to inject SLC. • Directs BOP to start RCIC if not previously performed. • When told cannot maintain level gives BOP new level band to 0-214". • Directs BOP to Inhibit ADS, when RPV Level is 32 inches. • Directs ATC to bypass and restore Drywell pneumatics. • Directs ATC to cross-tie V and W Buses IAW 20.300.345kv, section L.
	ATC	<ul style="list-style-type: none"> • Bypasses and restores Drywell pneumatics if necessary. • When directed, starts second CRD Pump IAW 29.ESP.04, "RPV Injection Using CRD Pumps". <ol style="list-style-type: none"> 1. Place C11-R600, CRD Flow Controller, in MANUAL. 2. If operation of the second pump is necessary, start standby Control Rod Drive Pump. 3. Throttle open Flow Control Valve using C11-R600, CRD Flow Controller. 4. Open C1152-F003, CRD Drive/Clg Water PCV, to maximize cooling water flow. • When directed, injects SLC and reports completion. • Verifies SLC Storage Tank level is decreasing on C41-R601, SLC Storage Tank Level Ind. • Cross-ties V and W buses IAW 20.300.345kv, section L: <ol style="list-style-type: none"> 1. Place SBFW Pump B in OFF/RESET. 2. Place Bus 65W Pos W5 in OPEN. 3. Place Bus 64V Pos V3 in CLOSE.

Op-Test No.: 2008-1
of 19

Scenario No.: 1

Event No.: 10

Page 15

Event Description: Recirc Loop A Rupture

Time	Position	Applicant's Actions or Behavior
	BOP	<ul style="list-style-type: none">• Reports Level 2. <p>NOTE: RCIC has a spurious initiation signal locked in.</p> <ul style="list-style-type: none">• Resets the RCIC Turbine Trip to inject, IAW SOP 23.206, "RCIC System", Section 7.1, as follows:<ol style="list-style-type: none">1. Re-starts RCIC by performing the following:<ol style="list-style-type: none">a. Places RCIC Turbine Trip pushbutton collar in DISARMED.b. Closes and re-opens E5150-F059, RCIC Trip Throttle Valve.2. Monitors system operation and verifies flow path.3. Reports RCIC is injecting at 650 gpm.• Reports cannot maintain level.• When power is restored, starts second SBFW Pump B and maximizes injection with both pumps.• When Level 1 is reached, gives Crew Update, "Level 1, ADS is/is not timing down, and MSIVs are closed.• When directed, if not previously inhibited, inhibits ADS.

Event Description: Div 2 EECW isolation to the Drywell / Restoration of Cooling to CRD

Time	Position	Applicant's Actions or Behavior
+60 min	SRO	<div style="border: 1px solid black; padding: 5px; margin-bottom: 10px;"> Malf – EOPRF0038 – Div 2 EECW Hi Drywell Pressure Lead Lifted </div> <ul style="list-style-type: none"> • Directs ATC to verify EECW initiated, isolated to the Drywell, and restore cooling to CRD. ○ IF necessary, may direct closure of P4400-F606B.
	ATC	<ul style="list-style-type: none"> • Verifies Div 1 (2) EECW initiated and isolated to the Drywell by checking the indications of the following equipment: <ol style="list-style-type: none"> 1. The white Emergency Mode Light is ON for Div 1 (2). 2. EECW Pump A (B) is running. 3. EESW Pump A (B) is running. 4. P4400-F603A (B), Div 1 (2) EECW Supply Iso Vlv is closed. 5. P4400-F601A (B), Div 1 (2) EECW Return Iso Vlv is closed. 6. P4400-F602A (B), Div 1 (2) EECW Makeup Tnk Iso Vlv is open. 7. P4400-F605A (B), Div 1 (2) EECW To SE (NW) Sump Hx Iso Vlv is closed. 8. P4400-F608, Div 2 EECW To DW Sump Hx Iso Vlv is closed. 9. P4400-F604, Div 2 EECW To CRD Sply Iso Vlv is closed. 10. P4400-F614, Div 1 EECW To Penet Clr's Iso Vlv is closed. 11. P4400-F613, Div 1 EECW To Batt Rm's A/C Iso Vlv is closed. 12. P4400-F606A (B), Div 1 (2) EECW DW Otbd Supply Vlv is closed. • Reports D2 EECW not isolated to the Drywell. (P4400-F606B is open) • Isolates D2 EECW to the Drywell by closing P4400-F606B. • Restores cooling to CRD pumps as follows: <ol style="list-style-type: none"> 1. High DW Pressure is present, places Div 2 EECW Manual Override keylock switch to OVERRIDE. 2. Depresses RESET pushbutton for Div 2 EECW Isolation Valves. 3. Opens P4400-F604, Div 2 EECW To CRD Supply Iso Valve.

Op-Test No.: 2008-1
of 19

Scenario No.: 1

Event No.: 12

Page 17

Event Description: Emergency Depressurization and water level restoration

Time	Position	Applicant's Actions or Behavior
	SRO	<ul style="list-style-type: none"> Conducts an EOP brief in preparation for ED. Directs BOP to open 5 SRVs, ADS preferred [EOP 29.000.01, RF/ED/SC Sheet 3 (Emergency Depressurization EOP C-2)]. When RPV Level is between 0" and -25" on core level indication. Briefs crew on water level restoration and control.
CRITICAL TASK	BOP	<ul style="list-style-type: none"> When directed opens 5 SRVs, ADS preferred, when RPV Level is between 0" and -25" on core level indication. (CT) Maximizes injection with high and low pressure injection systems to restore reactor water level to 173-214". (CT) Crew Update, "Water level is turning." Crew Update, "Water level above top of active fuel."
CRITICAL TASK		<p>NOTE: No water level systems should be throttled or shut down until RPV Water Level is above TAF. (0</p>

inches on core
level)

- Shuts down and throttles injection systems when water level is > 0" to control water level 173-214".

NOTE: Normally Div 1 RHR is shut down first, if not the selected loop for injection, to be used for containment cooling and sprays.

Event Description: Recirc Loop A Rupture / Containment Sprays

Time	Position	Applicant's Actions or Behavior
+65 min	SRO	<ul style="list-style-type: none"> • Assigns ATC containment pressure control. • Directs ATC to Place Div 1 RHR in Torus Cooling and Torus Spray. • After report from ATC, directs ATC to stop spraying the Torus before Torus Pressure is 0 psig. (EOP Override) • Directs ATC to shutdown Drywell Cooling Fans. • Directs ATC to spray the Drywell. • After report from ATC, directs to stop spraying the Drywell before Drywell Pressure is 0 psig. (EOP Override)
	ATC	<ul style="list-style-type: none"> • Places D1 RHR in Torus Cooling/Torus Spray Mode IAW SOP 23.205, "RHR System", Enclosure A (Hard Card) <ol style="list-style-type: none"> 1. If High Drywell Pressure or RPV Level 1 actuation exist, place the Containment Spray Mode Select switch in MANUAL. 2. If RPV level is below Level 0, place selected division Containment Spray 2/3 Core Height Override keylock switch in MANUAL OVERRIDE. 3. If initiating Torus Cooling Mode, perform the following: <ol style="list-style-type: none"> a. Unlocks and opens E1150-F028A (B), Div 1 (2) RHR Torus Iso Vlv. b. Starts one RHR Pump. c. Throttles E1150-F024A (B), Div 1 (2) RHR Torus Clg Iso, to desired flow. d. When flow is > 3000 gpm, verifies E1150-F007A (B), Div 1 (2) RHR Pmps Min Flow Vlv, closes. e. Starts RHR Service Water System. (RHRSW Flow may be delayed until after Torus Spray is established.) f. To increase cooldown rate, throttles closed E1150-F048A (B), Div 1 (2) RHR Hx Bypass Vlv.

Event Description: Recirc Loop A Rupture / Containment Sprays

Time	Position	Applicant's Actions or Behavior
CRITICAL TASK	ATC	<p>4. If initiating Torus Spray Mode, perform the following:</p> <ol style="list-style-type: none"> Verifies RHR is in LPCI or Torus Cooling Mode. (RHRSW Flow may be delayed until after Torus Spray is established.) Verifies open or unlocks and opens E1150-F028A (B), Div 1 (2) RHR Torus Iso Vlv. Opens E1150-F027A (B), Div 1 (2) RHR Torus Spray Iso. Vlv. Verifies RHR flow increases by approximately 500 gpm. <ul style="list-style-type: none"> Shuts down Drywell Cooling Fans. Places D1 RHR in Drywell Spray Mode IAW IAW SOP 23.205, "RHR System", Enclosure A (Hard Card) (CT) <p>5. If initiating Drywell Spray Mode, perform the following:</p> <ol style="list-style-type: none"> Opens E1150-F021A (B), Div 1 (2) RHR DW Spray Inbd Iso Vlv. Starts or verifies started RHR Pump A or C (B or D). Unlocks and throttles open E1150-F016A (B), Div 1 (2) RHR DW Spray Otbd Iso Vlv, and ensures that RHR flow does not exceed 14,000 gpm per RHR Pump. <p>6. Performs or verifies complete the following sections of SOP 23.205 as applicable:</p> <ul style="list-style-type: none"> Torus Cooling Mode, Emergency Operation Torus Spray Mode Drywell Spray Mode <p>7. Verifies complete RHRSW Manual Operation, Enclosure B of 23.208, "RHRSW System".</p>

Scenario # 1

Lesson "Scenario #1.lsn" Malfunction List:

Label	Description	Target	Delay	Ramp	Step
H P807 A008_3	GSW #4 OFF Light	0	0	0	1
P807 A008_1	GSW #4 OFF/RESET Switch	1	0	0	1
PCLLP805 B246K1	Gain on Input	80	0	0	1
C97MF0786	05D001 TBCCW Pumps Recirc Valve Open	0	0	0	1
B31RF0018	RRMG B Scoop Tube Hand Crank cd='BBBDB3101C001B_MZMLNA GT 959'	58	0	7	2
E51MF0009	RCIC Spurious Initiation	ACTIVE	0	0	3
R14MF0001	Loss of Div 2 Offsite Power	ACTIVE	0	0	4
N20MF0023	Heater Feed Pump C Trip	ACTIVE	0	0	4
E41MF0009	HPCI Auto Start Failure	ACTIVE	0	0	4
N21MF0031*	SBFW N2103-F001 Fail As-Is	0	0	0	4
EOPRF0038	RBCCW High Drywell Isolation Defeat	DEFEAT	0	0	4
N21RF0019*	MOV N2103-F001 Breaker cd='P601 A290 2 OR P601 A291 2 EQ 1'	OPEN	8	0	4
E41MF0005	HPCI Spurious Isolation cd='H P602 A131 2 EQ 1'	ACTIVE	45	0	4
B31MF0006	Recirc Loop A Rupture	1	0	300	5

* Delete to reset thermal overload trip (simulated) of N21-F001 breaker.

Step 1 = Setup

Step 2 = Recirc Runaway

Step 3 = RCIC Initiation

Step 4 = Loss of Power (w/ HPCI & SBFW Failures)

Step 5 = LOCA

Simulator Instructions:

1. Initialize simulator to **IC-45**, and place in **RUN**.
2. Open and Execute Lesson **Scenario #1.lsn**.
3. **Trigger Step 1, Setup**
4. **Place an RT dot near GSW Pump #4 CMC switch.**
5. Bring crew into simulator and begin scenario when ready.

Facility: Fermi 2 **Scenario No.** 2 **Op-Test No:** 2008-1

Examiners: M. Bielby **Operators:** _____
C. Moore _____
C. Zoya _____

Initial Conditions: IC-20, MOL, 100% Rx. Power

Turnover: The plant has been operating for 23 days. Reactor Power is 100% of Rated Thermal Power. The South TBCCW Pump is out of service for motor replacement. It is scheduled to be restored tomorrow. Plans are to shift from Division 1 CCHVAC to Division 2 to collect routine vibration data on Division 2 CCHVAC equipment.

NOTE: The Pre-job Briefing for the CCHVAC shift is to be conducted prior to entering the simulator. (Suggested time 30 minutes prior to beginning the scenario.)

Event No.	Malf. No.	Event Type*	Event Description
1.	N/A	N (BOP) N (SRO)	Crew shifts from Division 1 CCHVAC to Division 2 CCHVAC
2.	C11MF0381	C (ATC) C (SRO)	Control Rod 22-31 Drifts OUT CRS enters AOP 20.106.07, "Control Rod Drift". Rod declared inop, (TS 3.1.3.C)
3.	C97MF1087 MF EBAORL _TCTVSP 1		Seismic System Event / MDCT Fan B Trip When MDCT Fan B is started, it trips. (TS 3.7.2.B)
4.	N61MF0003 PO P603_ A317_1	M (ALL) C (ATC) C (SRO) R (ATC)	East Condenser Air Leak / Manual Recirc Runback Failure Rapid Power Reduction with failure of Manual Runback pushbutton. ATC takes individual manual control
5.		M (ALL)	Reactor Scram / AOP / EOP Entry AOP override action Mode Switch in SHUTDOWN Condenser press ≤ 2.5 psia.
* (N)ormal, (R)eactivity, (I)nstrument, (C)omponent, (M)ajor			

Facility: Fermi 2 Scenario No. 2 Op-Test No: 2008-1

Examiners: M. Bielby Operators: _____
C. Moore _____
C. Zoya _____

Initial Conditions: IC-20, MOL, 100% Rx. Power.

NOTE: Continued from page 1.

Event No.	Malf. No.	Event Type*	Event Description
6.	C97MF1087 B21MF0059 B21MF0060 B21MF0073	M (ALL)	Aftershock Seismic Event / Loss of all level indication. CRS enters EOPs RPV Flooding and Primary Containment Control.
7.	B21MF0037	C (BOP) C (SRO)	RPV Flooding / SRV "R" Failure BOP opens 5 ADS SRVs. BOP will select and open another SRV. (CT)
8.	N/A	ALL	The crew floods to the Main Steam Lines (CT)

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

ILO NRC Initial Exam Scenario 2 Narrative Summary

Initial conditions establish Reactor Power at 100%, with a plan to shift the operating divisions of CCHVAC to support maintenance. The crew will have briefed this activity prior to entering the simulator. The CCHVAC shift in accordance with SOP 23.413, Control Center HVAC is a Normal activity for BOP.

A Control Rod Drift (Out of the core), which will raise reactor power to ~ 102%. This event will be identified and responded to by the ATC (ARP 3D80, CONTROL ROD DRIFT). Subsequent actions will be directed by the CRS from AOP 20.106.07, Control Rod Drift after restoring power to $\leq 100\%$. The CRS will review and take actions per TS.

A Seismic Event will occur, and be followed by a subsequent aftershock. The CRS will initially direct BOP response actions per the “Acts of Nature” AOP 20.000.01, Act of Nature, Earthquake. When the BOP starts the MDCT Fans, per the AOP, MDCT Fan B will trip. The CRS will review and take actions per TS.

A resultant condenser vacuum leak will be identified by lowering Main Condenser vacuum, at which time the CRS will direct actions per AOP 20.125.01, Loss of Condenser Vacuum. The CRS will direct ATC to lower power via Rapid Power Reduction (SOP 23.623, Reactor Manual Control System, Section 9.7). The Manual Runback pushbutton, on P603, malfunctions and ATC must take individual manual control of both Recirc Controllers to accomplish the Recirc Runback. BOP attempts to restore vacuum by operation of various Off-Gas System components and controls under CRS direction.

Continually lowering Main Condenser vacuum is expected to result in a manual scram (≤ 2.5 psia), prior to a main turbine trip. The Mode Switch will be taken to Shutdown and all rods will insert. After Scram Reports, the CRS will enter EOP 29.100.01, RPV Control, Sheet 1 (Level 3) and AOP 20.000.21, Reactor Scram. The crew controls RPV Water Level 173 – 214”.

A second seismic event (aftershock) results in failure of both Div 1 and 2 RPV Level instrumentation reference legs and Floodup Level indication. This causes a loss of all RPV level indication. The BOP will determine that, **RPV Level CANNOT be determined**. **NOTE:** Main Turbine, RFPs, HPCI, RCIC, and SBFW will all have Level 8 trips.

The CRS enters (EOP C-4) EOP 29.100.01, RF/ED/SC, Sheet 3 (RPV Flooding). Flooding will be complicated during the depressurization phase when one of the preferred SRVs (“R”) fails to open. BOP is expected to identify this failure and take action to open an alternate valve.

The CRS will direct defeat 29.ESP.19 or BOP to depress and hold N2103-F001 pushbutton, to defeat the SBFW L8. The CRS will direct Low Pressure ECCS Systems to be started in preparation for injection, when reactor pressure decreases to within their injection capability.

The scenario will be terminated after RPV Flooding conditions are established.

Event Description: Overview

Initial Conditions:

The plant has been operating for 23 days. Reactor Power is 100% of Rated Thermal Power. The South TBCCW Pump is out of service for motor replacement. It is scheduled to be restored tomorrow. Plans are to shift from Division 1 CCHVAC to Division 2 to collect Performance Engineering routine vibration data on Division 2 CCHVAC equipment.

The objectives of this scenario are to:

1. Recognize, respond to, and take the required actions for an instrument / equipment failures requiring the use of operator and Tech Spec actions.
2. Recognize and respond to a Control Rod Failure to Latch (Rod Drift).
3. Recognize and respond to an Earthquake.
4. Recognize and respond to a Loss of Condenser Vacuum.
5. Execute steps of RPV Control to control Reactor Water Level (L) and Pressure (P).
6. May require the execution of steps in Primary Containment Control and operation of the RHR System to control Drywell and Torus temperature and pressure.
7. Execute steps of Reactor Pressure Vessel Flooding (RF).
8. Direct and Supervise the Shift team during Normal, Abnormal, and Emergency Operations.

The crew will be required to respond to the following order of events:

- Control Rod Drift (22-31) - (Tech Spec 3.1.3.C)
- Earthquake
- Trip of RHRSW MDCT Fan B – (Tech Spec 3.7.2.B)
- East Condenser Air Leak
- Failure of Manual Runback (pushbutton)
- Reactor Scram
- Loss of ALL RPV Level Instruments – RPV Flooding
- Failure of SRV “R” to OPEN

Event Description: CCHVAC Shift

Time	Position	Applicant's Actions or Behavior
	SRO	<ul style="list-style-type: none"> Directs BOP to shift CCHVAC from Div 1 to Div 2 for ISI vibration data collection.
0 min	BOP	<ul style="list-style-type: none"> Shifts CCHVAC from Div 1 to Div 2 using SOP 23.413, "Control Center HVAC", Section 6.1 <ol style="list-style-type: none"> Directs operators to perform an operational check of Div 2 CCHVAC radiation monitors. (checked and independently verified) <div data-bbox="519 661 1414 739" style="border: 1px solid black; padding: 5px;"> ROLE PLAY: Report CCHVAC rad monitors have been verified by Reece/Kuttig. </div> Documents performance in the Unit Log. Contacts RB Rounds to verify Div 2 CCHVAC ready for starting. <div data-bbox="519 850 1414 928" style="border: 1px solid black; padding: 5px;"> ROLE PLAY: RB Rounds reports Div 2 CCHVAC is ready for a start. </div> Verifies the following switches: <ul style="list-style-type: none"> Div 2 Mode Select Switch in NORMAL. Emergency Air Intake Selector Switch in AUTO. Verifies Div 2 CCHVAC equipment CMC Switches are in AUTO. Places the Div 2 Mode Select Switch in ALL AUTO and verifies: <ul style="list-style-type: none"> CCHVAC Supply Fan, starts CCHVAC Chilled Water Pump starts. Places the Div 1 Mode Select Switch in ALL STOP. Verifies the following Div 2 equipment starts: <ul style="list-style-type: none"> CCHVAC Return Air Fan starts. (After supply fan establishes flow.) CCHVAC Chiller starts (after ~40 sec) and remains running. <div data-bbox="519 1501 1414 1541" style="border: 1px solid black; padding: 5px;"> ROLE PLAY: RB Rounds reports good start on Div 2 CCHVAC. </div> <p>NOTE: Examiner may elect to move on after candidate starts next step. No physical actions are required by the candidate.</p> Verifies Damper alignment. (SOP 23.413, Enclosure A)

Event Description: Control Rod 22-31 Drifts into the Core.

Time	Position	Applicant's Actions or Behavior
+10 min	ATC	<div style="border: 1px solid black; padding: 5px; margin-bottom: 10px;"> Malf - C11MF0381 – Control Rod 22-31 Drifts Out </div> <ul style="list-style-type: none"> • Responds to Annunciator 3D80, CONTROL ROD DRIFT. • Places Rod Select Power ON. • Determines that Control Rod 22-31, is drifting out of the core. • Reports rod 22-31 drifting out of the core. • Reviews ARP 3D80. • Reports reactor power 102%. ○ When directed lowers power to 100%, with recirc flow. • Directs RB Rounds to HCU 22-31, to standby for isolation. <div style="border: 1px solid black; padding: 5px; margin-bottom: 10px;"> ROLE PLAY: RB Rounds reports standing by at HCU 22-31. </div> <ul style="list-style-type: none"> • When directed, performs AOP 20.106.07, "Control Rod Drift" Condition B: <ol style="list-style-type: none"> 1. Fully Inserts Rod 22-31 holding Rod Out Notch Override Switch in EMER ROD IN. 2. Directs RB Rounds to disarm the control rod by: <ul style="list-style-type: none"> • Closing C11-F103 at HCU 22-31. • Closing C11-F105 at HCU 22-31. <div style="border: 1px solid black; padding: 5px; margin-bottom: 10px;"> NOTE: Booth Operator clear/delete the Malfunction just before the RB Rounds report. ROLE PLAY: When directed and complete, RB Rounds reports C11-F103 and F105 are closed for HCU 22-31. </div> <ul style="list-style-type: none"> • Reviews and discusses ARP Tech Specs with CRS. • Resets Rod Drift.
	SRO	<ul style="list-style-type: none"> • Announces entry into AOP 20.106.07, "Control Rod Drift". • Conducts AOP Brief. ○ When receives report from ATC that reactor power is 102%, directs ATC to lower power to 100% with recirc flow. • Directs ATC to perform AOP 20.106.07, Condition B. • Complies with TS 3.1.3 C, Control Rod Operability by: <ol style="list-style-type: none"> 1. Fully inserting Control Rod 22-31 within 3 hours. 2. Disarming Control Rod 22-31 within 4 hours. • Notifies the Reactor Engineer (RE) that rod 22-31 drifted into the core, was fully inserted, and disarmed.

Op-Test No.: 2008-1 Scenario No.: 2 Event No.: 2 Page 4 of 15

Event Description: Control Rod 22-31 Drifts out of the Core.

Time	Position	Applicant's Actions or Behavior
		<p>ROLE PLAY: IF the RE is consulted about the decision to insert rod 22-31, state that it is acceptable to fully insert the rod. Do not raise power until further research is done.</p> <p>May notify Tagging Center that Control Rod 22-31 is inoperable and needs an STR (Tagging Record) to reflect isolation.</p> <ul style="list-style-type: none">• Exits the AOP.

Event Description: Seismic Event / MDCT Fan B Trip

Time	Position	Applicant's Actions or Behavior
+25 min	BOP	<p>NOTE: The Booth Operator will play the Earthquake Sound, if available.</p> <p>Malf - C97MF1087 – 06D69 Seismic System Event / Trouble Alarm</p> <ul style="list-style-type: none"> • Responds to Annunciator 6D69, SEISMIC SYSTEM / EVENT TROUBLE. • Reviews ARP 6D69. • Directs an operator to the Seismic Monitor Panel in the Relay Room (H11-P831) to evaluate printout IAW 23.612, "Seismic Monitoring". <p>ROLE PLAY: Report the Seismic Monitor red ERROR LED is OFF and the printout indicates 0.03G vertical and 0.05G horizontal.</p> <ul style="list-style-type: none"> ○ Reviews and discusses ARP TRM list with CRS. • When directed, performs AOP 20.000.01, Condition AC: <ol style="list-style-type: none"> 1. Directs all operators to inspect plant for structural damage and leaks. 2. Directs RB Rounds to reset the following: <ul style="list-style-type: none"> • Div 1 CCHVAC Purge Compressor (SOP 23.413). • Div 2 CCHVAC Purge Compressor (SOP 23.413). <p>ROLE PLAY: After approximately 3 minutes, RB Rounds reports CCHVAC Purge Compressors have been reset.</p> <ol style="list-style-type: none"> 3. Starts all RHRSW MDCT Fans and checks for proper running indication IAW 23.208, "RHR Complex Service Water Systems", Section 5.11 as follows: <ul style="list-style-type: none"> • Contacts Outside Rounds to inform him MDCT Fans will be started and to have him check the fans ready for a start. <p>ROLE PLAY: Outside Rounds reports he is in the RHR Complex and has completed his rounds on the equipment. It is ready to be started.</p>

Event Description: Seismic Event / MDCT Fan B Trip

Time	Position	Applicant's Actions or Behavior
	BOP	<ul style="list-style-type: none"> Depresses and holds vibration reset for the MDCT fan. Within 5 seconds, starts the MDCT fan in LOW-SPEED. After MDCT Fan has started, releases the reset pushbutton. <div style="border: 1px solid black; padding: 5px; margin: 10px 0;"> Malf – EBAORL_TCTVSP – MDCT Fan B Trip </div> <ol style="list-style-type: none"> RHRSW MDCT Fan B trips when started. <ul style="list-style-type: none"> Reports trip to CRS Contacts Outside Rounds to investigate fan trip. <div style="border: 1px solid black; padding: 5px; margin: 10px 0;"> ROLE PLAY: Outside Rounds reports after several minutes that MDCT Fan B breaker relay indicates overload. If asked about brake status, report that the brake is disengaged. </div>
	SRO	<ul style="list-style-type: none"> Announces entry into AOP 20.000.01, “Acts of Nature”. (Earthquake) (Crew Update) Conducts AOP Brief. Makes Hi-Com announcement. Directs BOP to perform AOP 20.000.01, Condition AC (selected steps). Directs ATC to perform AOP 20.000.01, Condition AA. Reviews TRM section TR 3.3.7.2, Seismic Monitoring Instrumentation. (3.3.7.2.A – 30 days) Performs AOP 20.000.01, Condition AC (selected steps) <ol style="list-style-type: none"> Contacts Tagging Center to initiate a CARD to remove plates from Passive Seismic Detectors for data evaluation. Contacts the University of Michigan Seismic Observatory and Davis Besse. <div style="border: 1px solid black; padding: 5px; margin: 10px 0;"> ROLE PLAY: U of M and Davis Bessie report after evaluating their seismic activity data, the results are 0.03G vertical and 0.05G horizontal. </div> <ul style="list-style-type: none"> Acknowledge report of MDCT Fan trip. Reviews TS 3.7.2.B, Ultimate Heat Sink (UHS) – (72 hr LCO)

Op-Test No.: 2008-1 Scenario No.: 2 Event No.: 3 Page 7 of 15

Event Description: Seismic Event / MDCT Fan B Trip

Time	Position	Applicant's Actions or Behavior
	ATC	<ul style="list-style-type: none">Monitors plant parameters IAW 20.000.01 (Earthquake) Condition AA.<ol style="list-style-type: none">Reactor Vessel Level.Reactor Vessel Pressure.Reactor Power.Drywell Pressure.Torus Water Level.Drywell Unidentified Leakage.Process Radiation Monitors.Reports Power, Pressure, and Level are stable.

Event Description: East Condenser Air Leak / Manual Recirc Runback Failure

Time	Position	Applicant's Actions or Behavior
+40 min	BOP	<div style="border: 1px solid black; padding: 5px; margin-bottom: 10px;"> Malf - N61MF0003 – E. Condenser Air Leak </div> <ul style="list-style-type: none"> • Responds to Annunciators: <ol style="list-style-type: none"> 1. 6D19, OFFGAS DIFFERENTIAL PRESSURE HIGH. 2. 6D39, OFFGAS CHARCOAL UNITS FLOW HIGH. 3. 6D45, OFFGAS SOUTH VALVE F406B CLOSED. 4. 6D46, OFFGAS DELAY PIPE PRESSURE HIGH. 5. 16D29 HWC SYSTEM SHUTDOWN • Observes Delay Pipe pressure high and Charcoal Units flow high. • Reviews ARPs for the alarm windows. • Reports lowering condenser vacuum. • Performs AOP 20.125.01 Condition A Actions: <ol style="list-style-type: none"> 1. Starts additional SJAEs IAW 23.125, "Condenser Vacuum System" Section 5.2, as follows: <ol style="list-style-type: none"> a. Opens N6200-F605 (606, 607, 608) SJAE Disch to 18" Manifold Valve. b. Opens N6200-F601 (602, 602, 603) SJAE Main Steam Supply Valve. • Performs AOP 20.125.01 Condition F Actions: <ol style="list-style-type: none"> 1. Contacts TB Rounds to prime the North Off-Gas Ring Water Pump. <div style="border: 1px solid black; padding: 5px; margin-top: 10px;"> ROLE PLAY: After 2 minutes, TB Rounds reports the North Off-Gas Ring Water Pump is primed. </div>

Event Description: East Condenser Air Leak / Manual Recirc Runback Failure

Time	Position	Applicant's Actions or Behavior
		<p>2. Starts an additional Off-Gas Ring Water Pump IAW SOP 23.712, "Off- Gas System" Section 6.5.</p> <ul style="list-style-type: none"> • Verifies N6200-F665, North Off-Gas Ring Water Pump Cooling Water Valve at 10% open. • Starts the North Off-Gas Ring Water Pump. • Verifies the N6200-F663, N. Absolute Filter Inlet Valve, N6200-F667, N. Buffer Tank Outlet Valve and P4300-F606, TBCCW To North Off-Gas Ring Water Cooler Inlet Valve open. <div> ROLE PLAY: TB Rounds reports good start on the North Off-Gas Ring Water Pump. </div>
	SRO	<ul style="list-style-type: none"> • Announces event over the Hi-Com. • Announces entry into AOP 20.125.01, "Loss of Condenser Vacuum". • Conducts AOP Brief. • Directs BOP to perform AOP 20.125.01, Condition A and F to start additional SJAEs and the North Off-Gas Ring Water Pump. • Directs ATC to perform AOP 20.125.01, Condition C for Rapid Power Reduction and H to monitor potential causes. • Conducts a Pre-Scram Brief.

Event Description: East Condenser Air Leak / Manual Recirc Runback Failure

Time	Position	Applicant's Actions or Behavior
	ATC	<ul style="list-style-type: none"> Performs AOP 20.125.01, Condition C Actions: <ol style="list-style-type: none"> Contacts the CSS to notify of load reduction. Performs a rapid power reduction IAW 23.623, "Reactor Manual Control System", Section 9.6, by depressing the Reactor Recirculation RECIRC MANUAL RUNBACK pushbutton. <div style="border: 1px solid black; padding: 2px; margin: 10px 0;"> PO – P603_A317_1 – Manual Runback Pushbutton OFF </div> <ul style="list-style-type: none"> <ul style="list-style-type: none"> Notifies crew commencing rapid power reduction. (Crew Update) Determines Manual Runback failure. Notifies crew commencing manual speed reduction. (Crew Update) Takes individual manual control to reduce recirc speeds to 55-60% core flow. Performs AOP 20.125.01, Condition H Actions to verify status of: <ol style="list-style-type: none"> Condenser vacuum breakers. Proper Feedwater Heater levels. Condenser Pump seal water flow, etc. Monitors Main Condenser Vacuum for 2.5 psia indication. Notifies crew Condenser Vacuum is 2.5 psia. (Crew Update) Places Mode Switch in SHUTDOWN when condenser vacuum indicates 2.5 psia or when directed.

Op-Test No.: 2008-1 Scenario No.: 2 Event No.: 5 Page 11 of 15

Event Description: Reactor Scram

Time	Position	Applicant's Actions or Behavior
+55 min	ATC	<ul style="list-style-type: none"> • Gives Scram Report to CRS. • Performs AOP 20.000.21, "Reactor Scram" actions: (Should perform all or most of the following) <ol style="list-style-type: none"> 1. Verifies all rods in. (Rod Worth Minimizer) 2. Verifies power decreasing. 3. Verifies SDV Vent and Drain Valves closed. 4. Verifies Post Scram Feedwater Logic and Post Scram Water Level Setdown sealed in. 5. Inserts IRMs and SRMs to monitor reactor power. 6. Directs RB Rounds to verify Scram Discharge Volume integrity. 7. Stops all Heater Drain Pumps.
	SRO	<ul style="list-style-type: none"> • Enters 29.100.01 Sheet 1, "RPV Control" (Level 3). • Requests Scram Reports. • Directs BOP to Confirm Isolations and actuations for level as they occur. • Assigns BOP RPV Level Band (173-214 inches) and pressure band (750-1050 psig). • Directs ATC to perform AOP 20.000.21, "Reactor Scram".
	BOP	<ul style="list-style-type: none"> • Gives Scram Report. • Monitors and controls RPV Level 173-214 inches. • Monitors and controls RPV Pressure 700-1050 psig.

Event Description: Loss of Level Indication / RPV Flooding

Time	Position	Applicant's Actions or Behavior
+60 min	ATC	<p>NOTE: Booth Operator will play the Earthquake Sound, if available.</p> <p>Malf - C97MF1087 - Seismic Event / Trouble Alarm (6D69) B21MF0059 - Rx Nozzle 12A Sensing Line Rupture B21MF0060 - Rx Nozzle 12B Sensing Line Rupture B21MF0073 - RPV Level Floodup Fails Hi B21MF0037- SRV "R" Fails Closed</p> <p>ROLE PLAY: If requested, .06g vertical and .05g horizontal.</p> <ul style="list-style-type: none"> • Determines all Narrow Range Level Indication (C32R606A-D) is lost. • Determines Flood Up (B21R605) indication is lost. • When directed, bypass and restores drywell pneumatics. • When directed, injects with Condensate and Feedwater through the SULCV, restarting Heater Feed Pumps IF required. • When directed, injects with both SBFW Pumps by continuously depressing the F001 valve open pushbutton. (May not be directed) ○ Orders 29.ESP.19, SBFW Level 8 Defeat. (May not perform due to other priorities) <p>NOTE: Booth Operator will activate EOPRF0047 (DEFEAT)</p> <p>ROLE PLAY: After 5 min report 29.ESP.19 defeats are installed.</p> <ul style="list-style-type: none"> • IF High Drywell pressure signal is received: <ol style="list-style-type: none"> 1. Verifies initiation of EECW and isolation to the Drywell by verifying the following: <ol style="list-style-type: none"> a. The white Emergency Mode Light is ON for Div 1 (2). b. EECW Pump A (B) is running. c. EESW Pump A (B) is running. d. P4400-F603A (B), Div 1 (2) EECW Supply Iso Vlv is closed. e. P4400-F601A (B), Div 1 (2) EECW Return Iso Vlv is closed.

Event Description: Loss of Level Indication / RPV Flooding

Time	Position	Applicant's Actions or Behavior
	ATC	<p>f. P4400-F602A (B), Div 1 (2) EECW Makeup Tnk Iso Vlv is open.</p> <p>g. P4400-F605A (B), Div 1 (2) EECW To SE (NW) Sump Hx Iso Vlv is closed.</p> <p>h. P4400-F606A (B), Div 1 (2) EECW DW Otbd Supply Vlv is closed.</p> <p>i. P4400-F608, Div 2 EECW To DW Sump Hx Iso Vlv is closed.</p> <p>j. P4400-F604, Div 2 EECW To CRD Sply Iso Vlv is closed.</p> <p>k. P4400-F614, Div 1 EECW To Penet Clr's Iso Vlv is closed.</p> <p>l. P4400-F613, Div 1 EECW To Batt Rm's A/C Iso Vlv is closed.</p> <p>2. Restores Cooling to CRD by performing the following:</p> <p>a. High DW Pressure is present, places Div 2 EECW Manual Override keylock switch to OVERRIDE.</p> <p>b. Depresses RESET pushbutton for Div 2 EECW Isolation Valves.</p> <p>c. Opens P4400-F604, Div 2 EECW To CRD Supply Iso Valve.</p>
	SRO	<ul style="list-style-type: none"> • Announces entry into EOP 29.100.01 Sheet 3, "RPV Flooding". • Directs BOP to open 5 SRVs, ADS preferred. • Directs ATC to bypass and restore drywell pneumatics. • Directs BOP to Close MSIVs and Steam Line Drains. (Could be closed on loss of vacuum). • Directs BOP to isolate HPCI and RCIC Steam Lines. (HPCI previously isolated). • Directs starting LP ECCS Systems in preparation for when pressure is low enough for injection. • Directs shutting down injection systems, when flooded to Main Steam Lines, while maintaining SRVs open and RPV Pressure as low as practical.

Event Description: Loss of Level Indication / RPV Flooding

Time	Position	Applicant's Actions or Behavior
CRITICAL TASK	BOP	<ul style="list-style-type: none">• Responds to Seismic System/Event Trouble alarm. (6D69)• Directs an operator to investigate in the Relay Room.• Determines all Wide Range level instrumentation is lost.• Reports RPV Level cannot be determined.
CRITICAL TASK		<ul style="list-style-type: none">• When directed, opens 5 ADS Valves.• Determines SRV "R" does not open.• Opens an additional SRV.
CRITICAL TASK		<ul style="list-style-type: none">• Reports 5 SRVs are open and SRV R did not open.• When directed, closes MSIVs and Main Steam Line Drains. (Could be closed on loss of vacuum).• When directed, closes RCIC and HPCI Steam Line isolation valves. (HPCI previously isolated).
		NOTE: Core Spray and RHR may automatically align on High Drywell Pressure.
		<ul style="list-style-type: none">• Starts LP ECCS (CS and RHR) Systems before pressure is low enough for injection as follows:<ol style="list-style-type: none">1. CS is started and aligned for injection IAW SOP 23.203, "Core Spray System", Enclosure A. (Hard Card)<ol style="list-style-type: none">a. Starts Core Spray Pump A and C (B and D).b. When Reactor Pressure drops below 461 psig, opens E2150-F005A (B), CSS Loop A (B) Inboard Isolation Valve.c. Verifies E2150-F031A (B), Div 1 (2) CS Pmps Min Flow Vlv, closes.

Event Description: Loss of Level Indication / RPV Flooding

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

Event Description: Loss of Level Indication / RPV Flooding

<p>CRITICAL TASK</p>	<p>BOP</p>	<p>2. RHR/LPCI is started and aligned for injection IAW 23.205, "RHR System", Enclosure B. (Hard Card)</p> <ul style="list-style-type: none"> a. Starts RHR Pumps A and C (B and D) b. Closes B3105-F031A(B), N(S) RR Pump Discharge Vlv, for loop where injection is desired. c. When Reactor Pressure decreases below 461 psig, opens E1150-F015A(B), Div 1(2) LPCI Inbd Iso Vlv. d. When RHR Loop A(B) Flow Indicator, E11-R603A(B) is >3000 gpm, verifies E1150-F007A(B), Div 1(2) RHR Pmps Min Flow Vlv, closes. e. Determines that Reactor vessel is flooded to the Main Steam Lines. f. Establishes RPV pressure as low as practical to maintain SRVs open, by stopping and starting injection systems as necessary.
--------------------------	------------	--

Scenario # 2

Lesson “Scenario #2.lsn” Malfunction List:

Label	Description	Target	Delay	Ramp	Step
H_P805_B058_3	South TBCCW Pump OFF Light	0	0	0	1
C11MF0381	Control Rod 22-31 Drift	ACTIVE	0	0	2
C97MF1087*	06D69 Seismic System Event/Trouble Alarm	1	0	0	3
EBAORL_TCTVSP	MDCT Fan Trip	1	0	0	4
N61MF0003	East Condenser Vacuum Leak	2.5	0	3	5
P603_A317_1	Manual Recirc Runback Pushbutton	0	0	0	5
B21MF0037	Main Steam SRV Failure B21-F013R	0	0	0	6
C97MF1087*	06D69 Seismic System Event/Trouble Alarm	1	0	0	6
B21MF0059	Reactor Nozzle 12A Sensing Line Rupture	ACTIVE	30	0	6
B21MF0060	Reactor Nozzle 12B Sensing Line Rupture	ACTIVE	60	0	6
B21MF0073	RPV Lvl Xmtr Fail As-Is Floodup Div 2 B21-N027	570	75	0	6

* Deletes automatically after 60 seconds.

Step 1 = Setup

Step 2 = CR 22-31 Drift Out

Step 3 = Seismic Event

Step 4 = MDCT Fan Trip

Step 5 = Loss of Vacuum

Step 6 = Loss of Level Indication

Simulator Instructions:

1. Initialize simulator to **IC-20**, and place in **RUN**.
2. Open and Execute Lesson **Scenario #2.lsn**.
3. **Trigger Step 1, Setup.**
4. **Place an RT dot near the South TBCCW Pump CMC switch.**
5. Bring crew into simulator and begin scenario when ready.
6. Trigger other steps as cued by examiner.

Facility: Fermi 2 Scenario No. 3 Op-Test No: 2008-1

Examiners: M. Bielby
C. Moore
B. Pillaggi

Operators: _____

Initial Conditions: IC-19, EOL, 100% Rx. Power

Turnover:

The plant has been operating for 403 days. Reactor Power is currently 100% of RTP with Control Rods at the 100% Rod Line following rod pattern adjustment. The N. Turbine Lube Oil Vapor Extractor is out of service for motor replacement. APRM #1 has failed downscale and is bypassed. I&C is working on the APRM failure. The shift is to remove the North TBCCW Pump from service for lubrication and outboard motor bearing replacement. The shift is also to perform 27.109.01, "Turbine Steam Valves Test" and will lower power to 93%.

NOTE: Pre-job Briefing for the reactor power decrease and Turbine Steam Valves Test is to be conducted prior to entering the simulator. (Suggested time 30 minutes prior to beginning the scenario.)

Event No.	Malf. No.	Event Type*	Event Description
1.	N/A	N (BOP) N (SRO)	Crew shifts TBCCW Pumps due to scheduled maintenance on North TBCCW Pump.
2.	N/A	R (ATC) R (SRO)	Reactor power reduced to 93% with Recirc Flow per GOP 22.000.03, Power Operation 25% to 100% to 25%, to perform 27.109.01, Turbine Steam Valves Test.
3.	C51MF0002	I (ATC) I (SRO)	APRM #2 fails upscale high. When directed, ATC removes APRM #1 from bypass and bypasses APRM #2 per 23.605, APRM System. CRS reviews TS to determine tracking LCO.
4.	B21MF0029	C (BOP) C (SRO)	SRV G fails open, but can be manually closed. SRV G fails open a second time and cannot be manually closed. The SRV fuses are removed.
5.	C102SENSOR5 71916TVNOISE	C (ATC) C (SRO)	CRD Flow Control Valve begins operating erratically requiring manual control and adjustment of CRD Pressure.
6.	N30MF0044 C71MF0006 C11MF0001	M (ALL) C (ATC) C (SRO)	Turbine Trips with Failure to Scram (ATWS). All actions to insert rods are unsuccessful except manual rod insertion.
7.	C41MF0003 C41MF0004	C (ATC) C (SRO)	Initial SLC Pump selected trips. The second SLC Pump is started, SLC is successfully injected. (CT)
8.	N/A	M (ALL)	Reactor water level is lowered and maintained 50-100 inches on Wide Range Level. Manual rod insertion is performed (CT) . Scram-Reset-Scram section of 29.ESP.03, "Alternate Control Rod Insertion", is performed which will insert all rods. (CT)
* (N)ormal, (R)eactivity, (I)nstrument, (C)omponent, (M)ajor			

Initial conditions establish Reactor Power at 100% with the N. Turbine Lube Oil Vapor Extractor out of service for motor replacement. The crew plans to shift the operating TBCCW Pumps to remove the North for scheduled maintenance. The crew will have briefed this activity prior to entering the simulator. The TBCCW shift is in accordance with SOP 23.128, TBCCW System and is a Normal activity for BOP.

Power will be lowered to 93% in accordance with GOP 22.000.03, Power Operation 25% to 100% to 25%, to support the performance of surveillance 27.109.01, Turbine Steam Valves.

APRM #2 Fails High. ATC will evaluate alarms and report the failure. The CRS will evaluate and direct bypassing the APRM. The ATC will bypass the APRM per 23.605, "APRM System", Section 6.4. An operator will be directed to the Relay Room to investigate and report all indications. The CRS will evaluate the failure and apply Tech Specs. (Tracking LCO)

SRV G will fail open. BOP will perform immediate actions to close the SRV. He should repeatedly depress the OPEN and then the Close pushbuttons, observing plant response, between cycles of the pushbuttons. The CRS will enter AOP 20.000.25, Failed SRV. After several attempts, the SRV will close. The SRV will fail open a second time, and the BOP and CRS will repeat the previous actions. The CRS should declare the SRV inoperable and take actions per the AOP Enclosure A (remove fuses) to ensure the SRV remains closed. The CRS will review and take actions per TS.

The CRD Flow Control Valve will begin oscillating, resulting in oscillating flow. The ATC will observe and report. The CRS will enter AOP 20.106.03, CRD Flow Control Valve Failure. The crew takes action by placing the valve controller in manual. The valve/flow will stop oscillating, and ATC will manually adjust CRD flow as necessary.

The Main Turbine trips, but RPS fails to actuate resulting in a failure to scram (ATWS). RPV Water Level decreases rapidly to below Level 1, and the MSIVs close. ATC reports Failure to Scram, and the crew enters the EOPs on Scram Condition and Rx power cannot be determined to be <3%. After Scram Reports, the CRS directs actions from 29.100.01 Sheet 1A, RPV Control-ATWS. ATC performs FSQ 1-8 actions (unsuccessful). The success path for the ATWS is manual rod insertion and level-power control.

The BOP inhibits ADS, and if time allows before MSIV closure, he bypasses and restores Drywell Pneumatics. When directed, he controls level 0-50 inches on Core Level (to maintain power low) until SLC is injected and rods are inserted. He maintains pressure 900-1050 psig using Low-Low Set.

When ATC reports FSQ 1-8 is complete, the CRS directs SLC initiation. ATC initiates SLC, but the first pump trips. He starts the other pump, reports the events, and gives his Standard SLC Report, also reports that the first pump tripped. He then attempts to drift rods and then drives rods.

When 29.ESP.10 defeats are installed, ATC resets ARI and drains the SDV per 29.ESP.03, Scram-Reset-Scram, Section 4.0, so the reactor can be re-scrammed. When the SDV is drained (3D94 clear), the reactor is re-scrammed (using ARI), and all rods are fully inserted.

The scenario may be terminated after all rods are in.

Initial Conditions:

The plant has been operating for 403 days. Reactor Power is currently 100% of RTP with Control Rods at the 100% Rod Line following rod pattern adjustment. The N. Turbine Lube Oil Vapor Extractor is out of service for motor replacement. APRM #1 has failed downscale and is bypassed. I&C is working on the APRM failure. The plan for the shift is to remove the North TBCCW Pump from service for lubrication and outboard motor bearing replacement. The shift is also to perform 27.109.01, "Turbine Steam Valves Test" and will lower power to 93%.

The objectives of this scenario are to:

1. Recognize, respond to, and take the required actions for an instrument / equipment failures requiring the use of operator and Tech Spec actions.
2. Recognize and respond to a Failed SRV.
3. Recognize and respond to a CRD FCV Failure.
4. Execute steps of RPV Control-ATWS to control Reactor Pressure Vessel level (FSL) Reactor Pressure (FSP) and Reactor Power (FSQ).
5. May require the execution of steps in Primary Containment Control and operation of the RHR System to control Drywell and Torus temperature and pressure.
6. Direct and supervise the Shift team during Normal, Abnormal, and Emergency operations.

The crew will be required to respond to the following order of events:

- APRM #2 Fails Upscale (TS 3.3.1.1.A)
- SRV G Fails Open (TS 3.4.3.A, 3.6.1.6.A, & SR 3.6.1.8.2)
- CRD FCV Oscillation
- Main Turbine Trip / ATWS, with total failure of RPS
- SLC Pump A / B Failure
- EOP Contingency 5 (Level / Power Control)

Op-Test No.: <u>2008-1</u>			Scenario No.: <u>3</u>	Event No.: <u>1</u>	Page <u>4</u> of <u>15</u>
Event Description: <u>The crew shifts TBCCW Pumps to remove the N. TBCCW Pump from service for maintenance.</u>					
Time	Position	Applicant's Actions or Behavior			
0 min	SRO	<ul style="list-style-type: none"> • Short brief/discussion on crew evolution. • Directs BOP to shift TBCCW Pumps. • Makes Hi-Com announcement. 			
	BOP	<ul style="list-style-type: none"> • Crew Update: "Shifting TBCCW Pumps" • Shifts pumps IAW 23.128, "TBCCW System", Section 6.0, Alternating Pumps <ul style="list-style-type: none"> • Starts Standby P4300-C003, South TBCCW Pump. • Stops pump to be removed from service, P4300-C001, North TBCCW Pump. • Verifies Supply Header Pressure is approximately 36 to 43 psig. • Verifies P43-F405, TBCCW DP Control Vlv, is maintaining a differential pressure across the TBCCW Pumps of 20 to 30 psid (COP H11-P805) • Periodically monitors system using the following instruments: <ul style="list-style-type: none"> - P43-R805, TBCCW Headers Pressure Indicator. - P43-R803, TBCCW Heat Exchangers Temperature recorder 			

Event Description: Crew lowers reactor power to 93% for Turbine Valves Surveillance

Time	Position	Applicant's Actions or Behavior
15 min	SRO	<ul style="list-style-type: none"> • Short brief/discussion on crew evolution. • Directs BOP to contact the System Supervisor to notify him of the load decrease. • Directs ATC to maintain Turbine Flow Limiter 5% above reactor power, throughout power decrease. • Assigns BOP as backup/verifier of Turbine Flow Limiter adjustment, throughout power decrease. • Assigns BOP to have TB Rounds monitor, adjust, and verify > 2000 gpm through each inservice Condensate Filter Demin. • Directs ATC to lower reactor power to 93% by lowering recirc pump flow. • Makes Hi-Com announcement.
	ATC	<ul style="list-style-type: none"> • Acknowledges SRO direction. • Commences power reduction IAW 23.138.01, "Reactor Recirculation System", Section 6.1 Speed Control. <ul style="list-style-type: none"> ○ If desired place B31-R621A (B), N (S) RR MG Set Speed Controller, in AUTO. (Verifies RRMG speed controller in AUTO.) • Crew Update "Commenced Lowering Reactor Power." • Adjust setpoint (SP) of B31-R621A (B), N (S) RR MG Set Speed Controllers to desired speed. (By intermittently depressing the setpoint down arrow on the speed controller.) • Monitors the speed indicator on the speed controller and maintains both controllers approximately matched. • Monitors power on the APRMs and adjusts the Turbine Flow Limiter to maintain ~5% above reactor power.
	BOP	<ul style="list-style-type: none"> • Acknowledges SRO direction. • Contacts the System Supervisor to notify him of the load decrease. <div style="border: 1px solid black; padding: 5px; margin: 10px 0;"> ROLE PLAY: System Supervisor acknowledges the load decrease. Asks, "Approximately how many MWe decrease." </div> <ul style="list-style-type: none"> • Contacts TB Rounds to monitor, adjust, and verify > 2000 gpm through each inservice Condensate Filter Demin. <div style="border: 1px solid black; padding: 5px; margin: 10px 0;"> ROLE PLAY: TB Rounds acknowledges direction from BOP. </div> <ul style="list-style-type: none"> • Acts as backup/verifier of Turbine Flow Limiter adjustment, throughout power decrease. • Acts as backup/verifier for RRS speed adjustment.

Event Description: APRM #2 Fails Upscale High

Time	Position	Applicant's Actions or Behavior
5 min	SRO	<div>C51MF0002 - APRM #2 Fails Upscale</div> <ul style="list-style-type: none">Reviews TS 3.3.1.1.A, and declares APRM #2 inoperable. (12 hrs to place channel in trip) (Mode 2 within 6 hours Tracking LCO.) Discusses with the crew.
	ATC	<ul style="list-style-type: none">Acknowledges and reports alarms:<ul style="list-style-type: none">3D097, APRM NEUTRON FLUX UPSCALE TRIP3D101, APRM THERM PWR UPSCL TRIP3D102, APRM SIM THERM PWR UPSCL3D113, CONTROL ROD WITHDRAWAL BLOCKCrew Update, “APRM #2 Failed Upscale.”Contacts operator to verify Relay Room indications. <div>ROLE PLAY: Relay Room indications confirmed APRM #2 has failed upscale high.</div>

Event Description: SRV G Fails Open

Time	Position	Applicant's Actions or Behavior
35 min	SRO	<div style="border: 1px solid black; padding: 5px; margin-bottom: 10px;"> B21MF0029 – SRV “G” Fails Open </div> <ul style="list-style-type: none"> ○ Directs BOP to close SRV “G”. • Announces the event over the Hi-Com. • Crew Update, “Entering SRV Failure AOP.” • Conducts AOP brief. • Directs SRV G fuse removal IAW 20.000.25, Enclosure A, to de-activate SRV G and maintain closed. • Reviews TS and declares SRV G Inop: <ul style="list-style-type: none"> • TS 3.4.3.A, SRVs, Tracking LCO • TRM 3.7.7.F, 7 day LCO • TS 3.6.1.6.A, Low-Low Set Valves, 14 Day LCO • TS 3.6.1.8, Suppression Chamber-to-Drywell Vacuum Breakers. Determines SR 3.6.1.8.2 applies, perform vacuum breaker test within 12 hrs. after SRV discharge to Torus. • When SRV lifts a second time, directs SRV G fuse removal IAW 20.000.25, Enclosure A, to de-activate SRV G and maintain closed. • Directs Rapid Power Reduction per 23.623. • Contacts FSS to inform him of the SRV problem and to have him contact maintenance for troubleshooting. • Contacts WWM to request a review of scheduled maintenance that may be affected by SRV “G” being inoperable. May contact the Emergent Issues Team (EIT) Leader to develop a troubleshooting plan IAW MWC05. ○ May discuss preparations for shutdown based on results of investigation.
	BOP	<ul style="list-style-type: none"> • Crew Update, “SRV “G” has failed open.” • Performs immediate actions for AOP 20.000.25, “Failed SRV”. <ul style="list-style-type: none"> • Depresses OPEN pushbutton. • Depresses CLOSE pushbutton. • Repeats as necessary. • Crew Update, “Closed indication on SRV “G”.” • Crew Update, “SRV “G” has re-opened.” • Crew Update, “SRV “G” is not re-closing.”

Event Description: SRV G Fails Open

	ATC	<ul style="list-style-type: none"> • Reports steam flow / feed flow mismatch. • Reports MWe decrease. • Reports steam flow and feed flow have returned to original values after SRV closure. • Reports MWe returned to original value after SRV closure. • When directed, performs Rapid Power Reduction per 23.623. • Crew Update, "Commencing Rapid Power Reduction." • Crew Update, "Loss of Heater Drains is due to runback." • When directed reviews ARP 5D85, LOSS OF HEATER DRAINS" and AOP 20.107.02, "Loss of Feedwater Heating" to verify feedwater temperature is within expected range and attributable to the power decrease.
	BOP	<ul style="list-style-type: none"> • When directed to Perform Condition E: <ul style="list-style-type: none"> • Depresses Div I and Div II Low-Low Set Logic reset pushbuttons. • Directs an operator to the Relay Room to monitor SRV Tailpipe Temperatures. <div style="border: 1px solid black; padding: 5px; margin: 10px 0;"> <p>ROLE PLAY: Operator reports SRV G Tailpipe Temp is 285°F and slowly lowering.</p> </div> <ul style="list-style-type: none"> • When directed, directs an operator to remove SRV "G" fuses. <div style="border: 1px solid black; padding: 5px; margin: 10px 0;"> <p>ROLE PLAY: Report removing fuses on SRV "G". 2 min later, report fuses are removed.</p> </div>

Event Description: CRD Flow Oscillation

Time	Position	Applicant's Actions or Behavior
45 min	SRO	<div style="border: 1px solid black; padding: 5px; margin-bottom: 10px;"> C102SENSOR571916TVNOISE – CRD Controller Noise </div> <ul style="list-style-type: none"> • Crew Update, “Entering AOP 20.106.03, “CRD FCV Failure.” • Conducts AOP Brief. • Directs ATC to perform AOP 20.106.03, “CRD FCV Failure”, Condition A. • Contacts FSS to inform him of the CRD FCV problem and to have him contact maintenance for troubleshooting.
	ATC	<ul style="list-style-type: none"> • Acknowledges alarm 3D13, CRD HYDRAULIC TEMPERATURE HIGH. • Reviews ARP 3D13, CRD HYDRAULIC TEMPERATURE HIGH. • Observes and reports CRD flow oscillations. Crew Update, “CRD FCV is oscillating.” • When directed, performs AOP 20.106.03, “CRD FCV Failure”, Condition A: <ul style="list-style-type: none"> • Places CRD Flow Controller in MANUAL. • Adjusts CRD Flow Controller to establish 37-63 gpm on C11-R800.
	BOP	<ul style="list-style-type: none"> • Directs an operator to the CRD FCV to investigate.

Event Description: Turbine Trips / Failure to Scram ATWS

Time	Position	Applicant's Actions or Behavior
55 min	SRO	<div style="border: 1px solid black; padding: 5px;"> N30MF0044 – Main Turbine Trip C71MF0006 – Total Scram Failure C11MF0001 – All Rods Stuck 93% </div> <ul style="list-style-type: none"> • Announces the event over the Hi-Com. • Crew Update, “Entering EOP 29.100.01, RPV Control–ATWS, Sheet 1A, based on Failure to Scram Condition.” • Requests Scram Reports and records on EOP Chart. • Directs ATC to perform FSQ 1-8. • Directs BOP to confirm isolations and actuations as they occur. • Directs BOP to inhibit ADS, bypass and restore DW Pneumatics, and perform 29.ESP.11.
	ATC	<ul style="list-style-type: none"> • Observes P603 alarms and indications. • Places Mode Switch in SHUTDOWN, observes scram failure. • Depresses Manual Scram pushbuttons, observes scram failure. • Crew Update, “Failure to scram.” • When asked, gives Scram Report. • When directed, performs FSQ 1-8, (Rx will not shutdown, success path is through manual control rod insertion.) <div style="border: 1px solid black; padding: 5px;"> NOTE: ARI will insert the withdrawn control rods a couple notches. </div> <ul style="list-style-type: none"> • Reports FSQ 1-8 is complete and Reactor Power is ~41%.
	BOP	<ul style="list-style-type: none"> • When asked, gives Scram Report. • When directed, confirms isolations and actuations as they occur. • When directed, inhibits ADS, bypasses and restores DW Pneumatics, and performs 29.ESP.11.

Op-Test No.: <u>2008-1</u>			Scenario No.: <u>3</u>	Event No.: <u>7</u>	Page <u>11</u> of <u>15</u>
Event Description: <u>Initial SLC Pump Selected Trips</u>					
Time	Position	Applicant's Actions or Behavior			
58 min	SRO	<ul style="list-style-type: none"> • Directs ATC to inject SLC. • Acknowledge SLC Report and records on EOP Chart. 			
CRITICAL TASK	ATC	<ul style="list-style-type: none"> • After FSQ 1-8 are complete, ATC reports, "Standing by to inject SLC." • Starts first SLC pump, observes pump trips. • Starts remaining SLC Pump, observes proper operation, and RWCU is isolated. (G3352-F004 & G3352-F220 are CLOSED.) • Reports, "SLC is injecting, Time _____, SLC Tank level is <u>~73 inches</u>, and RWCU is isolated." • Reports failure of first SLC Pump. 			

Time	Position	Applicant's Actions or Behavior
60 min	SRO	<ul style="list-style-type: none"> • Directs BOP to maintain RPV Water Level 50-100" on Wide Range level indication. • Directs BOP to maintain pressure band 900-1050 psig, use Low-Low Set. • Directs ATC to order 29.ESP.10 (ARI Logic Defeats), use 29.ESP.03 to insert rods. • When ALL rods are reported in, directs BOP to raise RPV Water Level to 173-214 inches. • Crew update, "Entering EOP 29.100.01, PC Control, Sheet 2, due to high DW and Torus temperatures. • Directs BOP to restart DW Cooling Fans. • Directs BOP to align for 1 division of SGTS and CCHVAC.
CRITICAL TASK	ATC	<ul style="list-style-type: none"> • Contacts RTC and directs 29.ESP.10 (ARI Logic Defeats) to be performed. • Inserts rods using 29.ESP.03.
		<p>ROLE PLAY: Booth operator will perform 29.ESP.03 Defeats. After 5 min, report 29.ESP.10 is complete.</p>
		<ul style="list-style-type: none"> • 29.ESP.03 "Alternate Control Rod Insertion Methods", for existing conditions, per 29.ESP.03 Enclosure A: <ol style="list-style-type: none"> 1. Increase CRD Cooling Water D/P (Section 2.0) 2. Manual Control Rod Insertion (Section 3.0) <ol style="list-style-type: none"> 3. Scram Reset Scram (Section 4.0) 4. Vent CRD Over piston Volume (Section 8.0) • Increase CRD Cooling Water D/P (Section 2.0): <ol style="list-style-type: none"> 1. Place C11-R600, CRD Flow Controller, in MANUAL. 2. Start standby Control Rod Drive pump. 3. Open Flow Control Valve using C11-R600, CRD Flow Controller. 4. Open C1152-F003, CRD Drive/Clg Water PCV, to maximize cooling water flow. • Manual Control Rod Insertion (Section 3.0): <ol style="list-style-type: none"> 1. Place C11-R600, CRD Flow Controller, in MANUAL 2. Start both CRD pumps. 3. Direct an Operator to close C1100-F034, CRD Charging Water Header Isolation Valve. (RB1-G10)
		<p>ROLE PLAY: After 2 minutes RB Rounds reports C1100-F034 is closed. (Booth Operator will perform C11RF0123, Charging Water Header Isolation Valve F034, 0% with a 30 sec ramp.)</p>

Event Description: ATWS (Continued)

Time	Position	Applicant's Actions or Behavior
CRITICAL TASK	ATC	<ol style="list-style-type: none"> 5. As necessary, throttle C1152-F003, CRD Drive/Clg Water PCV, to maintain sufficient drive water D/P for rod motion. 6. As necessary, adjust C11-R600, CRD Flow Controller, to maintain sufficient drive water D/P for rod motion 7. Place the Rod Worth Minimizer keylock switch in BYPASS. 8. Insert the Cram Array using EMERGENCY IN. 9. When the Cram Array has been inserted, attempt to achieve a checkerboard control rod pattern using EMERGENCY IN as follows: <ol style="list-style-type: none"> a. Select and fully insert control rods in a spiral out from center pattern, other concurrent actions may preclude obtaining an actual checkerboard pattern. 10. Continue to fully insert all remaining control rods using EMERGENCY IN as follows: <ol style="list-style-type: none"> a. Select and fully insert control rods in a spiral out from center pattern. <ul style="list-style-type: none"> • Scram Reset Scram (Section 4.0): <ol style="list-style-type: none"> 1. Reset ARI as follows: <ol style="list-style-type: none"> a. Verify or defeat ARI logic trips in accordance with 29.ESP.10, "Defeat of ARI Logic Trips". b. Depress ATWS ARI/RPT Div I (II) RESET pushbuttons. c. Verify ARI is reset <div style="border: 1px solid black; padding: 5px; margin: 5px 0;"> <p>NOTE: When ARI is reset, malfunction C11MF0001 will automatically clear to allow the control rods to be inserted.</p> </div> <ol style="list-style-type: none"> 2. Verify the SDV vent and drain valves are open. <p>NOTE: It is not required to fully drain the scram discharge volume prior to reinitiating a manual reactor scram.</p> <ol style="list-style-type: none"> 3. Allow the scram discharge volume to drain. (3D94 Clear) 4. Initiate a manual scram by performing the following: <ul style="list-style-type: none"> • Arm and depress the four ATWS ARI/RPT manual initiation pushbuttons. 5. IF control rods move inward, return to Step 1 <ul style="list-style-type: none"> • Crew Update, "ALL rods are IN."
CRITICAL TASK		

Event Description: ATWS (Continued)

Time	Position	Applicant's Actions or Behavior
	BOP	<ul style="list-style-type: none">• Lowers RPV Water Level 50-100 inches on wide range as directed by the CRS.• Control RPV Water Level 50-100 inches on Wide Range Level. <p>NOTE: MSIVs may be closed on Level 1 due to rapid level decrease and RFPTs will coast down. Pressure will be controlled by SRVs (Low-Low Set)</p> <ul style="list-style-type: none">• Dials down HPCI to stop injection. (Eventually Trips HPCI)• Dials down RCIC to 200-300 gpm.• Water level will be controlled with RCIC, SLC, & CRD.• Restarts all DW Cooling Fans.• Aligns for 1 division of SGTs and shuts down CCHVAC Emergency Makeup Fan.• Controls pressure in pressure band with Low-Low Set.• When all rods are reported in and when directed, raises water level to 173-214 inches, using available high pressure systems. (RCIC, HPCI, SBFW)
80 min		END SCENARIO

Scenario # 3

Lesson “Scenario #3.lsn” Malfunction List:

Label	Description	Target	Delay	Ramp	Step
H_P804_A173_4	North TLO Vapor Extractor OFF Light	0	0	0	1
C11MF0001	All Rods Stuck (ATWS)	93	0	0	1
C71MF0006	Total Scram Failure	ACTIVE	0	0	1
C51MF0001	APRM Channel 1 Failure	-5	0	0	1
C41MF0003	SLC Pump A Trip cd='P603_B002_1 EQ 1 AND C41MF0004 EQ 0'	ACTIVE	0	0	1
C41MF0004	SLC Pump B Trip cd='P603_B002_3 EQ 1 AND C41MF0003 EQ 0'	ACTIVE	0	0	1
C51MF0002	APRM Channel 2 Failure	130	0	0	2
B21MF0029*	Main Steam SRV Failure B21-F013G	100	0	0	3
B21MF0029*	Main Steam SRV Failure B21-F013G	100	0	0	4
H_P601_B223_2	SRV G Div 2 OPEN Light	0	0	0	5
H_P601_B224_2	SRV G Div 2 CLOSE Light	0	0	0	5
B21MF0029*	Main Steam SRV Failure B21-F013G	0	0	0	5
C102SENSOR571916T VNOISE**	CRD Flow Controller Noise Amplitude	0.3	0	60	6
N30MF0044	Main Turbine Trip	ACTIVE	0	0	7
C11RF0123	C11-F034, Charging Water Hdr Isol. Vlv	0	0	30	8
EOPRF0011	Division 1 ARI Level 2 Isolation Defeat	DEFEAT	0	0	9
EOPRF0012	Division 1 ARI Pressure Isolation Defeat	DEFEAT	0	0	9
EOPRF0013	Division 2 ARI Level 2 Isolation Defeat	DEFEAT	0	0	9
EOPRF0014	Division 2 ARI Pressure Isolation Defeat	DEFEAT	0	0	9

* Auto deletes when SRV is manually closed.

** Auto deletes when controller is placed in Manual.

Step 1 = Setup
 Step 2 = APRM Fails High
 Step 3 = SRV Failure #1
 Step 4 = SRV Failure #2
 Step 5 = Pull SRV Fuses
 Step 6 = CRD FCV Oscillations
 Step 7 = Main Turbine Trip
 Step 8 = Close C11-F034
 Step 9 = 29.ESP.10

Simulator Instructions:

1. Initialize simulator to **IC-19**, and place in **RUN**.
2. Open and Execute Lesson **Scenario #3.lsn**.
3. **Trigger Step 1, Setup.**
4. **Place an RT dot near the N. Turbine Lube Oil Vapor Extractor CMC switch.**
5. **Bypass APRM #1.**
6. Bring crew into simulator and begin scenario when ready.
7. **Trigger Step 5 when directed to pull SRV fuses.**
8. **Trigger Step 8 when directed to close C11-F034.**
9. **Trigger Step 9 when directed to perform 29.ESP.10.**
10. Trigger all other steps as cued by examiner.