Facility: Fermi 2 (50-341) Scenario No.: 1-1 Op-Test No.: 2010-301

Examiners: _____ Operators: _____

Initial Conditions: Reactor Power 5-10%; NOP/NOT; five control rods have slow scram times

Turnover: Plant startup in progress per GOP 22.000.02, Plant Startup to 25% Power

Event No.	Malf. No.	Event Type*	Event Description
1		N (SRO, RO)	Transition to MODE 1.
2		I (RO)	IRM sticks in intermediate position when withdrawing detectors. The SRO will address TS 3.3.1.1
3		N (BOP)	Perform 24.206.01, RCIC System Pump And Valve Operability Test
4		C (BOP) C (SRO) TS (SRO)	RCIC isolation signal. Fails to auto isolate. The SRO will address TS 3.6.1.3 Condition A – PCIS and TS 3.5.3 Condition A – RCIC
5		I (RO)	CRD Flow Transmitter fails low, such that FCV opens.
~~6~~		~~C(RO)~~	~~Reactor Feed Pump Minimum Flow valve fails opens (loss of air).~~ (see Notes on next page)
7		M	Loss of feed requiring manual scram/Partial ATWS / Excessive Cooldown

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

SUMMARY

The scenario starts with the plant at 5-10% rated thermal power, at normal operating temperature and pressure, ready to make the transition to Mode 1. Five (5) control rods have slow scram times. While withdrawing the IRM detectors, power to one of the detector drive motors will be lost failing the detector in an intermediate position and the SRO will address the Technical Specification impacts per TS 3.3.1.1. IRM is subsequently withdrawn following fuse replacement. When the conditions for running RCIC are established, the BOP operator will perform the RCIC surveillance. Once the necessary running data is obtained, a steam leak will develop, the system will fail to isolate automatically, but one containment isolation valve will isolate manually. The SRO will address the Technical Specification impacts per TS 3.5.3 and TS 3.6.1.3. Once the Tech Specs are addressed, the CRD flow transmitter will fail (low) such that the FCV begins to open, requiring that the RO take manual control to return flow to normal. The minimum flow valve for the running feed pump will fail open. ~~requiring an increase in RFPT speed to stabilize RPV level.~~ After RPV level is stabilized, the running heater drain pump will trip resulting in a loss of feed and subsequent scram and a partial ATWS. Actions will be taken in accordance with EOP 29.100.01 Sheets 1, 1a, and 2. Due to low decay heat efforts to control the cooldown rate will be required while the crew inserts control rods.

NOTES ON THE AS-ADMINISTERED SCENARIO

1. The initial condition setup for this scenario used an IC that was established for the scenario during on-site validation. The original scenario was intended to have the applicants perform a reactivity manipulation (control rod withdrawal) to increase power and an IC was created to support that evolution by inserting control rods from a controlled IC. The reactivity manipulation was deleted during on-site validation to shorten the scenario length. The revised scenario was meant to be run using the original controlled IC. The simulator operator used the lower power powered IC and as a result the Reactor Feed Pump Min Flow Valve failure did not require any operator actions as the control system was able to compensate without any operator intervention. The subsequent runs of this scenario were run using the controlled IC as intended.

2. EOP entry was incorrectly identified during validation. Because reactor power is less than 3% and RPV water level did not drop below Level 3, NO EOP entry conditions were met. Partial ATWS mitigated in accordance with SCRAM Abnormal Operating Procedure (AOP)

I. SIMULATOR SETUP

A. Initial Conditions

1. Reset the simulator to an IC ~~(IC-11)~~ with the plant at the following conditions:
   a) 5-10% rated thermal power
   b) normal operating temperature and pressure
   c) ready to make the transition to Mode 1
2. Place RHR in Torus Cooling Mode

B. Malfunctions and Remotes

MF/RF/POLBL	DESCRIPTION	TARGET VALUE	STEP NO.	RAMP	DELAY
C11MF0001	RODS STUCK	50%	1	N/A	N/A
EOPRF0024	E51-F007 DEFEAT	DEFEAT	1	N/A	N/A
EOPRF0025	E51-F008 DEFEAT	DEFEAT	1	N/A	N/A
E5ACRL_CLOSE TVSP	E51-F007 CLOSE RELAY	FAILED	1	N/A	N/A
NMFJRELAY_D6 54468TVSP	TRIP BOTH MAIN VACUUM PUMPS	FALSE	1	N/A	N/A
C51MF0021	IRM E STUCK	ACTIVE	2	N/A	30 sec
E51MF0010	RCIC STEAM LEAK	0.25	3	300 sec	N/A
C102SENSOR57 1916TFASIS	CRD FLOW TRANSMITTER FAILURE	TRUE	4	N/A	N/A
C102SENSOR57 1916ZSOUT	CRD FLOW TRANSMITTER OUTPUT	1.0	4	N/A	N/A
N21MF0018	S RFP MIN FLOW VALVE FAILURE	1.0	5	N/A	N/A
N20MF0025	W HFP TRIP	ACTIVE	6	N/A	N/A
EOPRF0011	DIVISION 1 ARI LVL DEFEAT	DEFEAT		N/A	N/A
EOPRF0012	DIVISION 1 ARI PRESS DEFEAT	DEFEAT		N/A	N/A
EOPRF0013	DIVISION 2 ARI LVL DEFEAT	DEFEAT		N/A	N/A
EOPRF0014	DIVISION 2 ARI PRESS DEFEAT	DEFEAT		N/A	N/A
	29.ESP.11				
	29.ESP.10				
	29.ESP.03				

C. Communications

EVENT	POSITION/TITLE	MESSAGE
1	SNE	When requested, report that APRM readings are acceptable.
1	Chemist	Acknowledge request to perform 74.000.18
2	Maintenance	Acknowledge request to investigate stuck IRM. After approximately 5 minutes, report back that a blown fuse, for the IRM E drive motor, was found and replaced.
3	NO assigned to RCIC Surveillance	When requested, report that RCIC Pump and Turbine oil levels are normal. When requested, report Remote Shutdown Panel RCIC Flow indicator reading (as appropriate for condition) When requested to record local system parameters (step 5.1.27) and to perform local visual inspection (5.1.28) report completion after an appropriate time delay.
4	NO	After fire alarm, report a steam leak from RCIC and the RCIC Quad was evacuated.
6	Rounds	IF asked to investigate Reactor Feed Pump Min Flow, report air line to valve is broken off. Valve is fully open.
7		Acknowledge direction to perform assigned ESP procedures and report completion after appropriate time delays.
7	NO	If dispatched to investigate Mechanical Vacuum Pump trips, report that there is obvious indication for failure to start.
7	Maintenance	If contacted to investigate Mechanical Vacuum Pump failures, acknowledge direction. (no report on cause will be given).

D. Required Materials

Shift Turnover Package

Marked up copy of GOP 22.000.02, “Plant Startup To 25% Power,” completed through step 6.2.27. Step 6.2.28 Sub-steps 1-4 complete.

Marked up copy of 24.206.01, RCIC System Pump And Valve Operability Test

- Section 3.0, Required Equipment, completed
- Section 4.0, Prerequisites
    - Steps 4.1 through 4.11, and 13 through 16 initialed as complete
    - Step 4.12 marked N/A
- Section 5.0,
    - Steps 5.1.21 and 5.1.29 marked N/A
    - Section 5.3 marked N/A
    - Include Attachment 1
- Stopwatch

II. REQUIRED OPERATOR ACTIONS

TIME	POSITION	EXPECTED ACTIONS
	CRS	Focus/Turn Over Brief
		<u>EVENT 1 – TRANSITION TO MODE 1</u>
	CRS /STA	Ensures conditions are met for transitioning to MODE 1 in accordance with GOP 22.000.02. ☐ All required surveillances have been performed – **Initial Condition** ☐ No outstanding work that would prohibit transition to Mode 1 – **Initial Condition** ☐ No outstanding LCO's – **Initial Condition** ☐ Reactor Power 5-10% o Requests SNE verify APRM reading acceptable (**Role Play**) ☐ All APRM "Downscale Alarms" are clear ☐ Main Steam Line Low Pressure Channel IPCS points clear Directs P603 to Place Reactor Mode Switch in RUN. Ensures Chemistry notified to perform Startup Gaseous Effluent Power Change in accordance with 74.000.18, "Chemistry Shiftly, 72 Hour, And Situation Surveillances." (**Role Play**) Change MODE on IPCS to PWR OPERATION. Verify Mode Status on IPCS is MODE 1. Change MODE on VAS to PWR OPERATION Directs P603 to fully withdraw SRM and IRM Detectors
	P603	Place Reactor Mode Switch in RUN. Verify Annunciator 3D87, MN STM LINE ISO VALVE CHANNEL TRIP BYPASSED, is clear. Verify APRMs 1-4 indicate Run Mode.

TIME	POSITION	EXPECTED ACTIONS
		Fully withdraws IRM Detectors (two at a time) and verifies IRM readings decrease as detectors are withdrawn in accordance with 23.603, "Intermediate Range Monitoring System." ☐ Momentarily depress Power On switch and verify backlight comes ON. ☐ Select IRM detector(s) to be moved. ☐ Verify Retract Permit light for desired IRM is ON. ☐ Depress and hold DRIVE OUT pushbutton until desired IRM position is attained. ☐ Depress and release IRM Select Switch for IRM Detector(s) that were moved. ☐ Prior to moving other IRM Detectors, monitor count rate for detector(s) that were moved. ☐ Verify indication has stabilized with respect to position of detector and power level at that position. ☐ Upon completion of the desired movements, depress and release power On switch.

TIME	POSITION	EXPECTED ACTIONS
		EVENT 2 – STUCK IRM DETECTOR
	P603	Recognizes that IRM E is not withdrawing with other IRM detectors and reports same to CRS (may bypass IRM E) ~~Completes IRM E withdrawal after fuse replacement~~. **[NOTE: IRM E was bypassed until troubleshooting could determine cause for failure to move.]**
	CRS	Refers to TS 3.3.1.1 Requests Maintenance support to troubleshoot stuck IRM (**Role Play**) ~~Directs P603 to withdraw IRM E IAW 23.603 after fuse is replaced.~~ **[CRS directed that IRM E be bypassed until troubleshooting could determine cause for failure. CRS directed Work Control to initiate a work request but did not request immediate assistance from maintenance since IRM was bypassed. Chief Examiner elected to proceed to the next event since actions to bypass IRM were satisfactory response actions for the malfunction.]**

TIME	POSITION	EXPECTED ACTIONS
		<u>EVENT 3 – RCIC SURVEILANCE TEST</u>
	CRS	When required bypass valve position is achieved, directs CRNSO to perform 24.206.01, RCIC System Pump And Valve Operability Test
	CRNSO	Performs 24.206.01, RCIC System Pump And Valve Operability Test ☐ Verifies completion of Prerequisites o Necessary Plant Conditions (Mode 1 with Bypass Valves > 15% open) o Establish communications ☐ Verify Div 1 CS Pumps Room Cooler, in RUN (COP H11-P808) ☐ Verify P1100-F606, CST Common Rtrn Iso Valve, OPEN. ☐ Verify P1100-F610, CRT Common Rtrn Iso Valve, CLOSED. ☐ Verify or place E41-K820, Test Iso/PCV E41-F011 Ctrlr, in AUTO. ☐ Place E4100-M001, E41-F011 HPCI/RCIC Test Iso/PCV, selector switch in OPER. ☐ Verify E41-F011, HPCI/RCIC Test Iso/PCV, CLOSED. ☐ Open E5150-F022, RCIC Test Line Iso Vlv. ☐ Place E5101-C004, RCIC Baro Cndr Vacuum Pump, CMC switch in RUN. ☐ Select E41-F011, HPCI/RCIC Test Iso/PCV, Valve Position and Pressure Permissive. o At H11-P602, adjust E41-K820, Test Iso/PCV E41-F011 Ctrlr, to set valve position opening setpoint to approximately 20% open (S-display). o At H11-P602, adjust E41-K820, Test Iso/PCV E41-F011 Ctrlr, to set discharge pressure setpoint to 250 psi (Y-display). ☐ Announces impending start of the RCIC System. ☐ Open E5150-F046, RCIC Oil Clr Clg Water Iso Vlv, measure stroke time ☐ Manually start RCIC System as follows: o Open E5150-F095, RCIC Turb Stm Inlet Byp Vlv. o 15 seconds after opening E5150-F095, RCIC Turb Stm Inlet Byp Vlv, open E5150-F045, RCIC Turb Steam Inlet Vlv, measure stroke time o Verify E5150-F045 meets acceptable limits. o Verify RCIC Turbine starts and speed increases. ☐ Verify E41-F011, HPCI/RCIC Test Iso/PCV, strokes open to approximately 20% (E41-K820, V-Display), after pump discharge pressure exceeds 250 psig (E41-K820, P-Display). ☐ Verify proper operation of E5150-F019, RCIC Min Flow Vlv

TIME	POSITION	EXPECTED ACTIONS
		☐ If necessary after RCIC Turbine Speed is steady: o Establish a discharge pressure between Rx Pressure plus 100 psi and Rx Pressure plus 150 psi as indicated on E51-R609, RCIC Pump Pressure Indicator. (green pointer) o Record valve position below (E41-K820, V-display): ☐ Record operating parameters ☐ Verify RCIC flow indication difference meets acceptable limits. ☐ Verify RCIC Barometric Condenser Condensate Pump auto starts as necessary. ☐ Verify the following valves are closed: o E5150-F025, RCIC Turb Stm Drn Pot Inbd Iso. o E5150-F026, RCIC Turb Stm Drn Pot Otbd Iso. o E5150-F004, RCIC Cond to RW Inbd Iso Vlv. o E5150-F005, RCIC Cond to RW Otbd Iso Vlv. o E5150-F095, RCIC Turb Stm Inlet Byp Vlv. o E5150-F019, RCIC Min Flow Vlv. ☐ Ensures local operations are completed. ☐ Adjust RCIC System speed and flow rate as follows and record time: o RCIC Pump Flow Controller, in MANUAL. o Adjust turbine speed to 4305 – 4405 rpm (target 4355 rpm) o Establish a flow rate of 605 – 705 gpm (target 655 gpm) on E51-R613, RCIC Pump Flow Indicator.

TIME	POSITION	EXPECTED ACTIONS
		<u>EVENT 4 RCIC STEAM LEAK</u>
	CRNSO	Responds to the following Alarms - 16D27, FIRE ALARM (Zone 5) - 1D70, STEAM LEAK DETECTION DIFF TEMP HIGH - 1D66, STEAM LEAK DETECTION AMBIENT TEMP HIGH Recognizes that RCIC did not isolate automatically OR initiates manual isolation of system prior to auto isolation Attempts to close E5150-F007 and E5150-F008 Reports that E5150-F008 is closed, but that E5150-F007 would not close. May dispatch NO to RCIC room to investigate Fire Alarm; addresses safety and radiological hazards. Dispatches an operator to RR H11-P614, NSSS Temperature Recording and Leak Detection Cabinet, to determine alarming location.

	CRS	Announces entry into 29.100.01 SH 5, "Secondary Containment and Rad Release" and AOP 20.000.02, “Abnormal Release.” **[NOTE: EOP entry not required due to prompt isolation of leak.]**
		- Directs actions to ensure RCIC is isolated.
		- May exit 29.100.01 SH 5 when RCIC is verified and area temperatures are decreasing.
		
		Addresses the following Technical Specification Requirements:
		- Technical Specifications Section 3.6.1.3, Primary Containment Isolation Valves.
		  - A.1, Within 4 hours isolate affected penetration with closed and deactivated valve.
		  - A.2, Verify affected flow path isolated every 31 days.
		- Technical Specifications Section 3.3.6.1, Primary Containment Isolation Instrumentation.
		  [NOTE: Not applicable if leak is isolated before isolation logic is actuated]
		  - A.1, Within 24 hours place channel in trip
		  - B.1, Within 1 hour restore isolation capability
		  - C, Within 1 hour of not completing A.1 and/or B.1, isolate affected flow path
		- Technical Specifications Section 3.5.3, RCIC System.
		  - A.1, Immediately verify HPCI Operable
		  - A.2, Within 14 days restore RCIC to Operable Status

TIME	POSITION	EXPECTED ACTIONS
		EVENT 5 – CRD FLOW TRANSMITTER FAILURE
	P603	Observes and reports CRD Flow Control Valve open/opening
	CRS	Announces Entry into 20.106.03, CRD FLOW CONTROL VALVE FAILURE Directs P603 to take manual control of CRD Flow Control Valve

	P603	Takes the following action as directed (20.106.03)
		- Place CRD Flow Controller in MANUAL.
		- Adjust CRD Flow Controller to establish 37-63 gpm on C11-R800. (NOTE: Flow instrument is failed; must use alternate indications; e.g., other parameters within acceptable ranges and/or local indications)
		- Adjust CRD PCV to establish:
		  - Drive Water Diff Press (255-265 psid).
		  - Cooling Water Diff Press (6-30 psid).
		- May direct Local Operator to verify parameters

~~TIME~~	~~POSITION~~	~~EXPECTED ACTIONS~~
		~~**EVENT 6 – REACTOR FEED PUMP MIN FLOW VALVE FAILS OPEN**~~
	~~P603~~	~~Responds to the following alarms:~~ ~~- 3D153, RFP STARTUP VALVE OPEN~~ ~~- 3D156, REACTOR WATER LEVEL LOW~~ ~~Observes and reports that RPV Startup LCV (N21-F403) is > 80% open and that RPV level is decreasing~~ ~~Increases RFP speed until RPV level begins to increase and RPV Startup LCV is , 80% open.~~ ~~Maintain RPV water level greater than 192.69 inches(L4) but less than 201.7 inches(L7).~~ ~~Observes and reports that RFP Min Flow Valve is full open.~~
	~~CRS~~	~~Directs response in accordance with ARPs~~

TIME	POSITION	EXPECTED ACTIONS
		<u>EVENT 7 – LOSS OF FEED/MANUAL SCRAM/PARTIAL ATWS</u>
	CRNSO	Responds to following alarms: - 5D24, N/S RFP SUCTION PRESS LOW TRIP/FAULT - 5D68, RFP LOW FLOW/S RFPT TRIPPED
	CRS	Announces entry into AOP 20.107.01, "Loss of Feedwater or Feedwater Control." Directs P603 to place Reactor Mode switch in SHUTDOWN
	P603	Places Reactor Mode switch in SHUTDOWN Observes and reports that several control rods failed to insert. Post-Scram Report: - Reactor Mode Switch in SHUTDOWN - Control Rod Status (Not Inserted) - Reactor Power and Trend (APRMs downscale) - RPS Status (Actuated) - Turbine Status (Tripped or On-Line)
	CRNSO	Post-Scram Report - RPV Water Level Status - RPV Pressure Status - MSIV Status (Open)

TIME	POSITION	EXPECTED ACTIONS
	CRS	Announces Entry into AOP 20.000.21, "Reactor SCRAM"~~29.100.01, Sht. 1, "RPV Control" and transition to 29.100.01, Sht. 1A, "RPV Control – ATWS"~~ **[NOTE: EOP entry was incorrectly identified during validation. Because reactor power is less than 3% and RPV water level did not drop below Level 3, NO EOP entry conditions were met.]** Directs the following actions per AOP 20.000.21, "Reactor SCRAM"~~29.100.01, Sht. 1A, "RPV Control – ATWS"~~ RPV LEVEL ~~(FSL)~~ ~~o Confirm Isolations and Actuations~~ ~~o Inhibit ADS~~ ~~o Perform 29.ESP.11, "Defeat of RPV Level 1 and High Rad MSIV and Main Steam Line Drain Valve Isolation Signals"~~ o Restore and Maintain RPV Water Level between ~~-25"~~ **[173"]** and 214" ~~(preferably high in the band)~~ using sources that inject outside the shroud (Cond/FW, SBFW, CRD, etc.) RPV PRESSURE ~~(FSP)~~ o Stabilize RPV Pressure **[900-1050 psig]** ~~< 1093 psig~~ o Initiates actions to limit excessive cooldown ▪ Trip RFP not needed for injection (already tripped) ▪ Place N30-K999 in Setpoint Setdown (depress PB1) ▪ Start Mechanical Vacuum Pump ▪ Shutdown SJAE ▪ Close Main Steam Line Drains RX POWER ~~(FSQ) [NOTE: May exit this leg per the override and direct these actions per AOP 20.000.21, "Reactor SCRAM"]~~ ~~o Confirm actuation of ARI (29.ESP.03)~~ o ***Insert control rods*** **[(29.ESP.03)](CRITICAL TASK)** ▪ **[Defeat RPS (29.ESP.09)]** ▪ Defeat ARI (29.ESP.10) if necessary ~~o Monitor Torus Water Temperature (BITT)~~ o Monitor for neutron flux oscillations
	P603	~~Manually initiates ARI~~ **Insert control rods [(29.ESP.03)] (CRITICAL TASK)** Monitors for neutron flux oscillations ~~Confirms Isolation and Actuations~~

TIME	POSITION	EXPECTED ACTIONS
	CRNSO	~~Inhibits ADS~~ Restores and Maintains RPV Water Level between ~~-25"~~ **[173"]** and 214" (preferably high in the band) using sources that inject outside the shroud (Cond/FW, SBFW, CRD, etc.) Performs one or more of the following actions to limit excessive cooldown ☐ Trip RFP not needed for injection (already tripped) ☐ Place N30-K999 in Setpoint Setdown (depress PB1) ☐ Start Mechanical Vacuum Pump ☐ Shutdown SJAE ☐ Close Main Steam Line Drains Observes and reports that Neither Mechanical Vacuum Pump will start. Dispatches NO to investigate Continues with other actions to limit excessive cooldown.

TERMINATION CRITERIA		
		The scenario may be terminated when: ☐ All control rods are inserted, AND ☐ RPV Pressure under the control of the crew, OR MSIV's are closed and pressure continues to decrease due to lack of decay heat. OR ☐ When directed by the Chief Examiner

III. CRITICAL TASKS

A. Isolates RCIC steam leak outside containment by manually closing E5150-F008.

B. Completes reactor shutdown by:

   a. Inserts control rods, and/or

   b. injects boron before Torus water temperature reaches the BITT (110°F)