Appendix D	Scenario Outline	Form ES-D-1

Facility: Fermi 2 Nuclear Plant Scenario No.: 1 Op-Test No.: 2021-301

Examiners: _____ Operators: _____

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Initial Conditions: 100% power, MOL, steady state conditions following a rod pattern adjustment. EDG 11 Diesel is out of service for emergent troubleshooting and repair following a "Start Failure Trip" that occurred during performance of the "Start And Load Test" surveillance run on the previous shift. SR 3.8.1.1 has been completed for Operable Offsite Circuits and a Common Cause Failure investigation is in progress to determine if the cause of inoperability exists on the other EDGs (3 hours into the 24-hour Required Action Time for the determination). CTG 11-1 is currently unavailable (tagged out, cooling system drained, piping disconnected) due to scheduled corrective maintenance to repair piping leaks in the "Off Base" cooling water skid. Heavy thunderstorms and lightning are forecasted for the next 12 hours. TWMS is in Bypass Mode.

Turnover: Plans for the shift are to maintain 100% power, support EDG-11 troubleshooting / repair activities and Common Cause Failure determination efforts on the operable EDGs. Transfer TWMS from Bypass Mode to Cleanup Mode.

Critical Tasks: **(CT-1)** Manually Start EDG 12
(CT-2) Emergency Depressurize and Maximize Injection

Event No.	Malf. No.	Event Type*	Event Description
1		N (BOP) N (SRO)	Transfer TWMS from Bypass Mode to Cleanup Mode.
2		I (ATC) I (SRO) TS	RPV Water Level 3 Instrument Failure (B21-N080C); Results in Downscale Trip on Trip Unit B21-N680C with No RPS (A2) Half Scram Signal.
3		C (BOP) C (SRO) TS	HPCI Logic Bus B Power Failure (Renders HPCI inoperable and unavailable).
4		C (ATC) C (SRO) TS	CRD Pump A Breaker Fault/Trip; Start CRD Pump B.
5		R (ATC) R (SRO)	FWH Level Instrument Failure; Requires Power Reduction Due to Loss of Feedwater Heating.
6		C (BOP) C (SRO)	SJAE Trip; Swap SJAEs.
7		M (ALL)	Lightning Strike Causes Loss of Offsite Power.
8		C (BOP) C (SRO)	EDG 12 Fails to Auto Start (Recoverable). Start Failure Trips on EDG 13 and 14. **(CT-1)**;

9		M (ALL) C (BOP)	SBLOCA (Increase Ramp Over 5 Minutes) with RCIC Trip on Overspeed (Recoverable After RPV Level Reaches 0" but Will Not Maintain Level Above TAF); Emergency Depressurization, Maximize Injection With EDG 12 Powered Low Pressure ECCS Injection Systems. **(CT-2)**
* (N)ormal, (R)eactivity, (I)nstrument, (C)omponent, (M)ajor			

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SCENARIO SUMMARY

Event 1:

The scenario begins with the Unit at 100% power following a rod pattern adjustment and EDG-11 out of service for emergent troubleshooting and repair following a "Start Failure Trip" (Essential Trip) that occurred during performance of the "Start And Load Test" surveillance run on the previous shift. A Common Cause Failure investigation is in progress to determine if the cause of inoperability exists on the other EDGs. After turnover, the crew will transfer the TWMS from Bypass Mode to Cleanup Mode in accordance with 23.144, "Torus Water Management System."

Event 2:

Once the TWMS has been placed in Cleanup Mode, the crew will respond to annunciator 3D73,"Trip Actuators A1/A2 Tripped," and determine that an RPV Water Level 3 instrument failure (B21-N080C) resulted in a downscale trip condition on Trip Unit B21-N680C, with the failure of RPS instrumentation to initiate an A2 trip logic half scram. The SRO will reference SOP 23.601, "Instrument Trip Sheets," and enter Tech Specs 3.3.1.1 (Table 3.3.1.1-1, Function 4) and 3.3.6.1 (Table 3.3.6.1-1, Functions 2.a & 7.a). The RPS failure will require the crew to insert a manual half scram on the "A" Trip System to comply with the Tech Spec Required Action to place the inoperable channel in "Trip."

Event 3:

Following insertion of the manual half scram, the crew will respond to annunciator 2D50,"HPCI Logic Bus Power Failure," determine that power is lost to Logic Bus 'B,' and take action to manually isolate HPCI, rendering the system both inoperable and unavailable. The SRO will enter Tech Specs 3.3.5.1 (Table 3.3.5.1-1, Function 3), 3.3.6.1 (Table 3.3.6.1-1, Function 3), 3.5.1, and 3.6.1.3.

Event 4:

Once HPCI has been isolated, CRD Pump 'A' will trip on breaker fault. The crew will respond to annunciators 3D5, "CRD Charging H2O Pressure Low," and 3D96, "Motor Tripped," enter AOP 20.106.01, "CRD Hydraulic System Failure," and start standby CRD Pump 'B." The crew will also address annunciator 3D10, "CRD Accumulator Trouble," by dispatching a Field Operator to investigate. The Field Operator will report that accumulator pressure is low (925 psig) on one HCU only. The crew will direct the Field Operator to add nitrogen to the accumulator in accordance with 23.106, "Control Rod Drive Hydraulic System." The SRO will enter Tech Spec 3.1.5.

Event 5:

Once standby CRD Pump 'B' has been started and the HCU accumulator low pressure condition addressed, a Feed Water Heater (FWH) level transmitter fails high, resulting in a loss of one 3, 4, 5 FWH String and reduction in feedwater heating. The crew will enter AOP 20.107.02, "Loss of Feedwater Heating," and reduce power to ≤ 85% using reactor recirc flow, while ensuring operation within the Power/Flow Map. The crew, using Enclosure A, "Feedwater Inlet Temperature vs. Reactor Power," will evaluate the feedwater temperature decrease, excluding the temperature decrease due to the power reduction, and determine that they are operating in the Acceptable Area of the "Reduced FW Temperature Region."

Event 6:

Once the power reduction has been completed, the in-service Steam Jet Air Ejector (SJAE) will trip. The crew will enter AOP 20.125.01, "Loss of Condenser Vacuum," and take prompt action to place the standby SJAE in service in accordance with SOP 23.125, "Condenser Vacuum System."

Events 7 to 9:

Once the standby SJAE has been placed in service and condenser vacuum has stabilized, a loss of offsite power occurs due to lightning strike. This immediately results in a Reactor Scram and MSIV closure. EDGs 13 and 14 experience Start Failure Trips (the result of a Common Cause Failure). EDG12 fails to auto start but can be manually started to restore power to 4.16 KV ESS Bus 64C. A Station Blackout Condition will exist until EDG 12 is recovered **(CT-1)**. The crew will enter EOP 29.100.01 SH 1, "RPV Control," on RPV Low Level and RPV High Pressure, prioritize Level Control with RCIC (HPCI is unavailable due to the Logic Bus 'B' Power Failure (Event 3)) and Pressure Control with SRVs. RCIC is the only available high pressure injection source. The crew may also enter AOPs 20.300.Offsite, "Loss of Offsite Power," and 20.300.SBO, "Loss of Offsite and Onsite Power." The crew will enter EOP 29.100.01 SH 2, "Primary Containment Control," when Suppression Pool Temperature reaches 95°F due to inability to cool the Torus (EDG 12 is the only available power source).

Shortly after the initial actions to stabilize reactor level and pressure have been completed, a Small Break LOCA occurs. Crew re-enters the RPV Control and Primary Containment Control EOPs on High Drywell Pressure. RCIC subsequently trips on overspeed, leaving no source of high pressure injection available to maintain level. RHR Pump 'C' and Core Spray Pump 'C' are the only Low Pressure ECCS Systems available for RPV injection. RCIC can be recovered (provided Maintenance was dispatched) after level reaches the Top of Active Fuel (0 IN), but will not preclude required crew actions to perform an Emergency Depressurization. The crew, after determining that RPV Level *cannot* be maintained ≥ 0 IN, will (a) inhibit ADS at 32 IN, and (b) exit the RPV Control Pressure Leg, Emergency Depressurize the RPV, and maximize injection using EDG 12 powered Low Pressure ECCS Systems **(CT-2)**. The scenario may be terminated when RPV blowdown is in progress and RPV water level can be restored and maintained between 173 IN and 214 IN.

Appendix D	Scenario Outline	Form ES-D-1

Facility: Fermi 2 Nuclear Plant Scenario No.: 3 Op-Test No.: 2021-301

Examiners: _____ Operators: _____

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Initial Conditions: 100% power, MOL, steady state conditions. The Transmission System Operator (TSO) has issued a Maximum Emergency Generation Alert due to grid instabilities. SRO review of surveillance procedure 24.106.04, "Scram Discharge Volume Vent and Drain Valve Operability Test," conducted on the previous shift, identified that the test was not performed in its entirety (Section 5.3 not performed).

Turnover: Perform 24.106.04, "Scram Discharge Volume Vent and Drain Valve Operability Test," Section 5.3 only. Maintain reactor power at 100% and comply with TSO requests for grid support as necessary.

Critical Tasks: **(CT-1)** Inhibit ADS
(CT-2) Terminate and Prevent; Lower RPV Water Level (Maintain -25" to 0")
(CT-3) Restore and Maintain RPV Injection Above MCSFIR (Rx Pwr > 11.3%)
(CT-4) Insert ALL Control Rods ≤ 02

Event No.	Malf. No.	Event Type*	Event Description
1		N (ATC) N (SRO)	Perform SDV Vent and Drain Valve Operability Test, Section 5.3 Only.
2		C (ATC) C (SRO)	Degrading Condition on the In Service North RRMG Set Lube Oil Pump (Fluctuating Amps & Intermittent Alarms), with Failure of the Standby Lube Oil Pump to Auto Start.
3		C (ATC) C (BOP) C (SRO)	#3 TCV Unitized Actuator Fault (Oil Pump Trip Results in Low System Pressure (< 1200 psig)). Reduce Power < 91.5% / Lock Close #3 TCV / Reset Half Scram.
4		I (BOP) I (SRO) TS	Leading Edge Flow Meter (LEFM) System Failure.
5		C (BOP) C (SRO) TS	RWCU Leak with Auto Isolation Failure (Manual Isolation Successful).
6		TS (SRO)	Turbine First Stage Pressure Instrument Failure (C71-N052A); Trip Unit C71-N652A Output Signal Downscale and Auto Bypass of Channel A1.
7		R (ATC) R (SRO)	South Heater Drain Pump Trip with Failure of Manual Runback Pushbutton to Lower Power.
8		M (ALL)	Neutron Flux Instabilities / Hydraulic ATWS / SLC Common Discharge Header Rupture. **(CT-1)**
9		C (ATC) C (BOP) C (SRO)	Main Turbine Trip / Bypass Valves Fail Close While Lowering Level. Restore and Maintain RPV Injection Above MCSFIR (Rx Power > 11.3%). **(CT-2) (CT-3) (CT-4)**

10		C (BOP) C (SRO)	Div II RHRSW Pump Trip (B or D). Throttle F068B for Single Pump Flow and RHRHX Vibration Limits.
* (N)ormal, (R)eactivity, (I)nstrument, (C)omponent, (M)ajor			

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SCENARIO SUMMARY

Event 1:

The scenario begins with the Unit at 100% power. The Transmission System Operator (TSO) has issued a Maximum Emergency Generation Alert due to grid instabilities. SRO review of surveillance procedure 24.106.04, "Scram Discharge Volume Vent and Drain Valve Operability Test," conducted on the previous shift, identified that the test was not performed in its entirety (Section 5.3 not performed). After turnover, the crew will perform 24.106.04, "Scram Discharge Volume Vent and Drain Valve Operability Test," Section 5.3 only.

Event 2:

Once Section 5.3 of surveillance procedure 24.106.04 has been completed, annunciators 3D108, "Recirc Sys A Fluid Drive Lube Oil Press Low," and 3D130, "Recirc Sys A Circ Lube Oil Pump Auto Start," will alarm intermittently (pressure bouncing around the 30 psig setpoint value), alerting the crew to a degrading condition on the in-service North RRMG Set Lube Oil Pump. The Standby Lube Oil Pump fails to auto start. The crew will observe indications of fluctuating amps on the in-service Lube Oil Pump Motor and take timely action to manually start the Standby Lube Oil Pump to restore Recirc System A lube oil pressure prior to trip of the North RRMG Set (30 psig decreasing for 6 seconds). The crew may reference SOP 23.138.01, "Reactor Recirculation System," when performing the pump shift.

Event 3:

Once the Standby Lube Oil Pump has been started and Recirc System A lube oil pressure has stabilized, the crew will respond to annunciator 4D2, "Unitized Actuator Throttle Vlv Fault," evaluate indications on the Unitized Actuator (UA) mimic, and determine that the alarm was due to a low pressure condition (< 1200 psig) on the #3 Turbine Control Valve (TCV) UA that was caused by a trip of the associated oil pump. The crew, in accordance with SOP 23.109, "Turbine Operating Procedure," will (a) lower power to ≤ 91.5%, (b) Lock Close #3 TCV, (c) reset the RPS the Half Scram, and (d) continue operations with three steam lines supplying the turbine.

Event 4:

Once the RPS Half Scram has been reset, the crew will respond to annunciator 3D17, "IPCS Computer Trouble," evaluate the IPCS Alarm Screen, and determine that an LEFM System Failure has occurred. The crew will transfer feedwater input for the IPCS heat balance calculation from LEFM Mode to Venturi Mode in accordance with 23.615.04, "Leading Edge Flow Meter (LEFM)." The SRO will enter TRM 3.3.7.3, "Feedwater Flow Instrumentation."

Event 5:

Once the LEFM has been transferred to the Venturi Mode and the TRM addressed, a leak in excess of 55 gpm will occur in the RWCU System. The crew will respond to annunciator 2D115, "RWCU Diff Flow High," and verify that RWCU System Differential Flow Indication is greater than 55 gpm. RWCU will fail to isolate after the 44-second time delay elapses. If the crew takes no action to isolate the system before the Flow Timer times out, they will diagnose the failure to isolate and take prompt action to

manually perform the isolation. The SRO will enter Tech Spec 3.3.6.1 (Table 3.3.6.1-1, Function 5.a). If the crew is proactive and isolates RWCU before the 44-seconds is up, Tech Spec 3.3.6.1 will not be evaluated. The crew may perform the isolation from memory or using the guidance contained in ARP 2D115, AOP 20.707.01, "Loss of RWCU," or SOP 23.601, "Instrument Trip Sheets."

Event 6:

Once RWCU has been isolated, the crew will respond to annunciator 3D91, "Turbine Stop/Cont Val Channel Trip By-Passed," and verify that HP Turbine First Stage Pressure is greater than 161.9 psig. The crew will determine that Turbine First Stage Pressure Instrument C71-N052A has failed such that the output from associated Trip Unit C71-N652A is downscale, resulting in a bypass condition on Channel A1. The SRO will reference SOP 23.601, "Instrument Trip Sheets," and enter Tech Spec 3.3.1.1 (Table 3.3.1.1-1, Functions 9 and 10). The instrument failure will require a fuse to be pulled to place the A1 Channel in a non-bypass condition to comply with the Tech Spec Required Action to place the inoperable channel in "Trip."

Event 7:

Once Tech Specs have been addressed, the South Heater Drain Pump (HDP) will trip, requiring the crew to perform a Rapid Power Reduction to ≤ 85%. The crew will enter AOP 20.107.01, "Loss of Feedwater or Feedwater Control," and take Immediate Action to lower power using the Recirc Manual Runback Pushbutton. The Recic Manual Runback Pushbutton will fail, requiring the crew to manually lower recirc flow using the speed controllers. The crew will evaluate the P/F Map and insert the CRAM Array as necessary.

Events 8-10:

Once power has been lowered to ≤ 85%, Neutron Flux Instabilities (i.e., power-to-flow oscillations) will be observed, prompting the crew to take Immediate Action to manually scram the reactor. Following the manual scram action, a High Power Hydraulic ATWS will occur. The crew will enter EOP 29.100.01 SH 1, "RPV Control," and perform "initial" ATWS actions to (a) Inhibit ADS **(CT-1)**, (b) Terminate and Prevent injection (except for SLC, CRD, and RCIC) until RPV water level us lowered to ≤ 114 IN **(CT-2)**, and (c) Initiate SLC. Shortly after SLC is initiated, a rupture occurs in the discharge piping common to both pumps, rending SLC unavailable as a boron injection source. The crew will transition to EOP 29.100.01 SH 1A, "ATWS." While lowering level to the initial target value of ≤ 114 IN, the Main Turbine will trip, leaving Bypass Valves and SRVs as the primary means of pressure control. Shortly after the turbine trip, Bypass Valves will fail closed, forcing additional steam low through the SRVs and placing a greater heat load on the Torus. When Torus temperature exceeds 110°F, the crew will execute ATWS EOP override FSL-OR1 to deliberately lower RPV level by controlling injection rate until level reaches 0 IN (one or more SRVs remain open with Rx Power > 11.3 %) **(CT-2)**. The crew will maintain level between -25 IN and 0 IN in accordance with ATWS EOP Step FSL-3, using HPCI/RCIC/SBFW. With Rx Power > 11.3% and one or more SRVs still open, the crew will execute another option within ATWS EOP override FSL-OR1, to restore and maintain injection above the "Minimum Core Steam Flow Injection Rate" (MCSFIR) of 3,120 gpm, but as low as practicable **(CT-3)**.

The crew will determine that the ATWS is due to hydraulic lock conditions within the Scram Discharge Volume (SDV) and that control rods need to be inserted using the "Scram-Reset-Scram" strategy contained in Emergency Support Procedure 29.ESP.03,

"Alternate Control Rod Insertion Methods." The crew will observe some control rod movement following the initial "Scram-Reset-Scram" attempt and achieve success inserting all control rods following the second attempt **(CT-4)**. Due to significant heat addition to the Torus and potential challenges to containment, the crew will enter EOP 29.100.01 SH 2, "Primary Containment Control," and place two loops of Torus Cooling in service. Once Torus Cooling has been established, one of the Div II RHRSW Pumps (B or D) will trip. The crew will diagnose the failure and throttle E1150-F068B, Div 2 RHR Hx Serv Wtr Outlet FCV," in the close direction to maintain 5400-6300 gpm to prevent excessive vibration of E1150-F068B and runout of the other Div II RHRSW Pump. Throttling E1150-F068B in the close direction will test applicant knowledge of RHR HX Service Water Outlet FCV operation, as this valve is only designed to throttle in the open direction. Throttling the valve closed is accomplished by momentarily depressing the OPEN pushbutton to interrupt valve travel in the closed direction. Guidance for throttling E1150-F068A/B closed and establishing an operational band of 5400-6300 gpm is contained in SOP 23.208, "RHR Complex Service Water Systems." The scenario may be terminated once all rods have been fully inserted, EOP 29.100.01 SH 1A is exited, EOP 29.100.01 SH 1 entered, and RPV water level is in the process of being restored 173 IN and 214 IN.