Facility: __Palisades Nuclear Plant__ Scenario No.: NRC-1 Op-Test No.: _____

Examiners: _____ Operators: _____

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Initial Conditions: The plant is at 100% power, middle of core life. P-66B, High Pressure Safety Injection Pump is removed from service for motor replacement. The CVCS is in single letdown and charging. The Main Feedwater Pump Combined Speed Controller is in manual for I&C testing of the controller.

Turnover: Shift orders are to return the Main Feedwater Pump Combined Speed Controller to the Cascade mode per SOP-12.

Critical Tasks:

1. Isolate a PCS Leak at power
2. Trip 2 Leave 2 PCP strategy
3. Remove all PCPs when conditions do not support their operation.
4. Initiate Containment Spray

Event No.	Malf. No.	Event Type*	Event Description
1	N/A	BOP (N)	Return MFP Combined Speed Controller to Cascade
2	FW06A	BOP (I/C)	CV-0701, E-50A Feed Regulating Valve drifts in the closed direction in auto
3	RP22A	RO (I/C) BOP (N) SRO (TS)	T_{HOT} Fails low
4	CV06 CV18	RO (I/C) SRO (TS)	CVCS Backpressure regulator fails closed with failure of RV-2006 to seat.
5	FW163	BOP (I/C)	Heater Drain Tank Outlet Valve, CV-0608, HDP outlet valve fails open
6	N/A	All (N) RO (R)	Emergency power reduction to stabilize feed system
7	RC03 RC04	ALL (M)	LOCA inside of Containment
8	SI09B	RO (I/C)	Failure of “A” HPSI Pump to auto start
9	SI16A SI16B SI16C	RO (I/C)	Failure of P-54A, Containment Spray Pump AND Failure of P-54B, C to auto start

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

Scenario NRC-1 summary

The crew takes the shift at 100% power and the BOP places the Main Feed Pump Combined Speed Controller in to the CASCADE mode of operation.

The BOP then will determine an issue exists with the automatic control of the feed regulating valve for the 'A' SG and takes MANUAL Control of the valve to control SG level.

The ATC will respond to a failed PCS RTD Thot. Controlling channels will need to be reselected. The BOP will BYPASS TM/LP Trips in RPS. The SRO will make Tech Spec and ORM determinations.

The ATC will respond to a failure of the Letdown Intermediate Pressure Controller that results in the lifting of a relief to the quench tank. The ATC will control letdown intermediate pressure manually. A leak rate determination will be performed. Valves will be closed to isolate the leak. The SRO will apply Tech Specs.

The BOP will respond to a failure of level control in the Moisture Separator Drain Tank that affects Main Feed Pump Suction Pressure. The crew will perform a rapid power reduction to stabilize tank level and suction pressure. The ATC will manipulate Control Rods to match Tave with Tref. The BOP will manually control 'A' SG level. The SRO will monitor for Tech Spec LCO entry on Control Rods (PDIL).

A small break LOCA starts at 100 gpm and leads the crew into a manual reactor trip. When the reactor trips, the LOCA ramps to 1100 gpm over 5 minutes. One HPSI pump must be manually started, and Containment Spray must be established on at least one train as a result of the LOCA and post trip equipment failures. Required SI flow must be established before minimum subcooling is reached. PCPs must be stopped for small break LOCA concerns, and for conditions that do not allow continued operation.

The scenario ends when a PCS Cooldown is in progress or at the Lead Examiner's discretion.

Facility: Palisades Scenario No.: **NRC-2** Op-Test No.: _____

Examiners: _____ Operators: _____

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Initial Conditions: The plant is at 87% power with rods just above the PPDIL level. The PCS is being sampled to determine/confirm possible fuel failure.

Turnover: Shift orders are to Borate to the SRWT.

Critical Tasks

1. Equalize PCS and Ruptured S/G Pressures
2. Avoid overfill of ruptured S/G
3. Isolation of Faulted / Ruptured S/G from the control room

Event No.	Malf. No.	Event Type*	Event Description
N/A	RC22	N/A	Failed Fuel
1	N/A	BOP (N)	Borate to the SRWT
2	N/A	SRO (TS)	Chemistry results provided to SRO showing high activity
3	CW01A	BOP (I/C)	Trip of P-39A, Cooling Tower Pump
4	N/A	RO (R) BOP (N)	Rapid Downpower
5	P-56B-1 P-56A-1	RO (C) SRO (TS)	Boric Acid Pump Trip
6	ED89A ED93	BOP (I/C) SRO (TS)	Spurious trip of bus 1C with failure of auto transfer to Startup power resulting in EDG 1-1 supplying Bus
7	SW10A SW10C	RO (I/C) SRO (TS)	Failure of Service Water Pump to start from NSD Sequencer
8	SG01B	BOP (I/C) SRO (TS)	Steam Generator Tube Leak on “B” S/G
9	SG01B	ALL (M)	SGTR on “B” S/G coincident with ESDE (SV) on ‘B’ S/G
10	ED13A ED13B	All (C)	Failure of auto SIAS on both trains

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

NRC Scenario 2 Summary

The plant is at 87% power with rods just above the insertion limit. The PCS is being sampled for activity to confirm suspected failed fuel.

The BOP will perform a normal boration of the SIRWT.

During the boration of the SIRWT, the chemistry results are reported confirming a small amount of failed fuel. DE I-131 is 4.2 uCi/gm, gross activity is 18uCi/gm, E-Bar is 5. The SRO will apply Tech Specs for high activity.

After the SRO figures out the PCS Activity Tech specs, a cooling tower pump trip occurs, necessitating a rapid reduction of power. As the turbine controls are manipulated by the BOP, and the Control Rods are moved by the ATC, the running boric acid pump trips. This results in rods being inserted past the insertion limit, and another opportunity for the SRO to apply tech specs.

The ATC will respond to a trip of the Boric Acid Pump that occurs during the downpower.
The SRO will determine Tech Spec applicability for borated flow paths.
Restoration of boric acid transfer pump flow is available from the other train.

A spurious trip of the normal feed breaker to 2400VAC Bus 1C occurs with the failure of fast transfer, causing the UV start of EDG 1-1. One of the previously running SW pumps does not restart automatically. To restore enough SW flow, P-7B or P-7C must be manually started by the ATC. The applicable AOP directs the restoration of offsite power and the shutdown of the EDG.

After restoring power, a small tube leak occurs on ‘B’ SG, which is diagnosed and quantified by the BOP.

The tube leak becomes a tube rupture, and when the reactor trips, an ESDE occurs on the affected SG (failed open MSSV) and since auto SI is failed, requires manual Safety Injection actuation. The crew responds to the SGTR and ESDE by using EOP-9.0 (FRP)

The scenario is terminated when the crew has control of the cooldown.

Facility: Palisades Scenario No.: NRC-3 Op-Test No.: _____

Examiners: _____ Operators: _____

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Initial Conditions: The plant is at 60 % power escalating to full power. The second Main Feedwater Pump has just been started.

Turnover: Shift orders are to alternate CCW pumps and then continue power escalation.

Critical Tasks:

1. Isolate S/G with ESDE (with failure of MSIV auto Close)
2. Throttle SI
3. Manually start CCW

Event No.	Malf. No.	Event Type*	Event Description
1	N/A	BOP (N)	Alternate CCW pumps
2	N/A	ALL (R, N)	Power Escalation
3	ED08A	BOP (C) SRO (TS)	Loss of EY-10, Preferred AC
4	CC02B CC13A CC13C	RO (C) SRO (TS)	Trip of CCW Pump with failure of auto start on other pumps
5	RX15B	BOP (C)	Main Steam Flow Transmitter Failure
6	RX08B	RO (I)	Pressurizer Level Channel (2) fails low
7	TC04D	BOP (C)	Main Turbine GV failure
8	MS15B	BOP (C)	ESDE outside of Containment
9	TC02	BOP (C)	Main Turbine Auto Trip Failure
10	MS15B	ALL (M)	ESDE raises
11	MS01A MS01B	BOP (C)	Failure of MSIVs to auto close

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

NRC Scenario 3 Summary
The plant is at 60% power and escalating. MFP P-1B was just started.

The BOP will alternate CCW pumps as a normal evolution.

The Crew will continue the power escalation.

After the reactivity change, a loss of Preferred Bus EY-10 occurs due to a tripped DC input breaker. Operable channels will be selected for Tave, PPCS, PLCS by the ATC. The BOP will bypass reactor trip channels, and place EY-10 on the bypass regulator. The BOP will coordinate local closure of isolation valve for MFP P-1A recirc valve. The SRO will investigate several tech Specs.

A trip of a CCW pump with the failure of the standby auto start feature will require the ATC to manually start a CCW pump. The SRO will apply Tech specs.

Later, a Main Steam Flow Transmitter failure affects feed flow requiring control by the BOP.

A PLCS level channel failure requires manual action by the ATC.

A Governor valve fails closed causing a pressure spike in the Main Steam system that results in a weld failure where a Main Steam Safety Valve connects. This 0.5 MLBM / hr high energy line break causes PCS Temperature and pressure to lower and power to rise. The crew should trip the reactor and isolate steam.

The Turbine fails to auto trip and requires the BOP to manually trip the turbine. When the turbine is manually tripped, the steam leaks grows to 4.0 MLBM / hr over 30 seconds. The crew responds per EOP-6.0 ESDE.

The scenario terminates when the crew has controlled the cooldown.

Facility: Palisades Scenario No.: **NRC-4** Op-Test No.: _____

Examiners: _____ Operators: _____

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Initial Conditions: The plant is at 100% power.

Turnover: Shift orders are to close 25F7 breaker in the switchyard.

Critical Tasks:

1. Trip PCP in distress
2. Energize Bus 1C and/or 1D
3. Start AFW Pump

Event No.	Malf. No.	Event Type*	Event Description
1	N/A	BOP (N)	Close switchyard breaker 25F7
2	RM08C	BOP (C)	RIA-1810 failure low
3	RC12D	RO (C)	P-50D Lower Seal Failure
4	RC13D	RO (C)	P-50D Middle Seal Failure
5	N/A	RO (R)	Plant shutdown due to PCP seal failure
6	CV17	RO (C)	VCT level failure resulting in charging suction swapping to SIRWT
7	RC16D	RO (C)	P-50D vibration resulting in manual reactor trip
8	ED01	ALL (C)	Post trip, loss of offsite power
9	ED12A ED11B	BOP (C)	Failures of both EDG requires manual action to restore power to either bus 1C and / or 1D
10	RC21	ALL (M)	Ramped Vapor Space LOCA
11	FW16A FW03B FW03C	RO (C)`	Failure of running AFW Pump and auto start of remaining AFW Pumps

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

NRC Scenario 4 Summary
With the plant at 100% power, the BOP will reclose Switchyard Breaker 25F7.

After aligning the switchyard, RIA 1810 fails low, which has Tech Spec actions and requires the closure of specific dampers by the BOP.

Following the ventilation realignment, the ATC operator will address P-50D PCP, that has developed seal problems. First the lower seal, then the middle seal. The AOP will allow continued operation until the second seal problem occurs. The AOP procedurally drives an immediate plant shutdown, then stopping the PCP.

During the ramp down, the VCT level transmitter fails such that the suction swaps to the SIRWT. The crew could respond by raising the ramp rate of the power reduction, and / or the ATC stopping charging.

As the PCP seal degrades. Vibrations rise. When imminent PCP failure conditions are approached, the ATC will manually trip the reactor and PCP. Shortly thereafter, the plant will lose offsite power.

Both EDGs fail to automatically energize their buses, but this can be remedied manually by the BOP.

A vapor Space LOCA results in a Safety Injection. As a PCS cooldown is undertaken by the steaming of the SGs, the only running AFW pump trips, necessitating a manual start of an AFW pump by the BOP.

The scenario is terminated when AFW is restored, and a controlled cooldown of the PCS is in progress.