Facility:	San Onofre	Scenario No.: 1	Op Test No.: NRC
Examiners:		Operators:	

Initial Conditions:
- 99.5% power MOC - RCS Boron is 883 ppm (by sample)
- Train A Component Cooling Water Pump (P-025) in service
- Train A Containment Spray Pump (P-012) OOS
- Train A High Pressure Safety Injection Pump (P-017) OOS
- Condenser Air Ejector Low Range Radiation Monitor (RM-7818) OOS
- Fire Computer OOS

Turnover: Maintain steady-state power conditions.

Critical Tasks:
- Transfer the Non-Critical Loop (Train A Critical Loop rupture).
- Trip any RCP not satisfying RCP operating limits.
- Manually initiate MSIS (Auto actuation failure).
- Stabilize RCS temperature/pressure following loss of heat removal from the faulted Steam Generator.
- Isolate the most affected Steam Generator (ESDE).

Event No.	Malf. No.	Event Type*	Event Description
1 + 10 min	CH04A	TS (CRS)	Containment Pressure Transmitter (PT-0352-1) fails high.
2 + 20 min	CV16A	I (RO, CRS)	VCT Level Instrument fails low (LT-0226).
3 + 35 min	SEIS OBE FW25	C (BOP, CRS) TS (CRS)	Seismic event without Main Feedwater Pump trip. Auxiliary Feedwater Pump (P-140) trip.
4 + 65 min		R (RO) N (BOP, CRS)	Initiate Rapid Power Reduction at 15% per hour.
5 + 75 min	CC03A	C (BOP, CRS) TS (CRS)	Rupture of Component Cooling Water line to the Shutdown Cooling Heat Exchanger.
6 + 105 min	MS03B	M (ALL)	Excess Steam Demand Event on Steam Generator (E-089) inside Containment.
7 + 105 min	RP01C	C (RO)	Train B High Pressure Safety Injection Pump (P-019) start failure.
8 + 105 min	RPS LP	I (BOP)	Main Steam Isolation Signal fails to actuate, manual actuation required.

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

SCENARIO SUMMARY NRC #1

The crew will assume the watch and maintain steady-state conditions per SO23-5-1.7, Power Operations. When turnover is complete, a Containment Pressure Transmitter fails high. The crew will perform actions per the Annunciator Response Procedures (ARP). Abnormal Operating Instruction (AOI) SO23-13-18, Reactor Protection System Failure will require placing the channel in Bypass. The CRS will evaluate Technical Specifications. When actions of SO23-13-18 are complete, the VCT Level Transmitter (LT-0226) will fail low. The crew will secure VCT makeup per the ARP and SO23-3-2.2, Makeup Operations. The RCS Makeup Control System will then be aligned for Manual Blended Makeup mode.

When plant conditions are stable, a seismic event will occur. The crew will respond per AOI SO23-13-3, Earthquake. The initial earthquake will cause trip and damage to the linkage of the Steam Driven Auxiliary Feedwater Pump. The CRS will evaluate Technical Specifications. The CRS will determine that a normal plant shutdown is required per SO23-13-3 and initiated per SO23-5-1.7, Power Operations at 15% per hour. The Shift Manager will direct the CRS to perform a Rapid Power Reduction at 15% per hour to expedite the downpower.

Once the power descension is underway, a seismic aftershock will cause a Train A Component Cooling Water header rupture. The crew will respond per AOI SO23-13-7, Loss of Component Cooling Water (CCW) / Saltwater Cooling (SWC). The crew will align Train B SWC & CCW and the ruptured header will be removed from service. The CRS will evaluate Technical Specifications.

The EOI entry point is caused by an Excess Steam Demand Event (ESDE) on Steam Generator E-089 inside Containment. The crew performs Emergency Operating Instruction (EOI) SO23-12-1, Standard Post Trip Actions and diagnoses an ESDE. The crew will transition to EOI SO23-12-5, Excess Steam Demand Event and perform necessary actions to stabilize RCS temperature. The Main Steam Isolation Signal (MSIS) fails to actuate and the BOP will be required to manually actuate MSIS. Additionally, the RO will be required to manually start Train B HPSI Pump P-019. The scenario is terminated when the crew stabilizes RCS temperature and pressure following loss of heat removal from the faulted Steam Generator. The final action is isolation of SG E-089.

Risk Significance:

- Risk important components out of service: CS P-012, HPSI P-017
- Failure of risk important system prior to trip: Loss of CCW Train due to rupture
- Risk significant core damage sequence: ESDE without MSIS
- Risk significant operator actions: Transfer the Non-Critical Loop
  Manually start HPSI Pump
  Manually initiate MSIS
  Stabilize RCS temp following ESDE

Scenario Event Description NRC Scenario 1

SONGS
2007 Facility NRC Retake License Examination
Simulator Scenario Setup
Scenario 1

Machine Operator:	**EXECUTE IC #181 and NRC Scenario #1 SETUP file to align components.** **HANG Control Board Tags on P-012 and P-017.** **CHANGE Operator Aid Tags #029 (CVCS) and #005-4 (CVCS Ion Exchanger) to reflect the scenario boron concentration.** **RESET CVCS Batch Counters to zero (0).** **VERIFY both Pressurizer Spray Valves in AUTO.** **VERIFY Master Alarm Keylock Switch in NORMAL.** **PLACE procedures in progress on the RO desk:** **- Copy of SO32-5-1.7, Power Operations open to Section 6.4, Guidelines for Steady State Operation.** **PLACE the MOC copies of OPS Physics Summary Book on RO Desk and SO23-5-1.7, Attachment 8 on Control Board (located on the desk behind and adjacent to Grid Breaker Display Smart Board).**
Control Room Annunciators in Alarm at 100%: **57A52 – CONTAINMENT SPRAY SYS TRAIN A INOPERABLE**	

Op Test No.: NRC	Scenario # 1	Event # 1	Page 5 of 72
Event Description:	Containment Pressure Transmitter Failure		

Time	Position	Applicant's Actions or Behavior
Machine Operator:		**When directed, EXECUTE Event 1.** **- CH04A, Cont. Pressure Transmitter (PT-0352-1) fails high**
Indications available:		**56A08** - **CTMT PRESS HI HI ESFAS CHANNEL TRIP** **56A18** - **CTMT PRESS HI HI ESFAS PRETRIP** **56B06** - **PPS CHANNEL 1 TROUBLE** **63B02** - **UNIT 2 CRITICAL PARAMETER PROBLEM**
+ 1 min	RO	REFER to Annunciator Response Procedures.
	RO	RECOGNIZE Containment Pressure Channel failure and INFORM the CRS AOI SO23-13-18 entry required.
	CRS	DIRECT performance of AOI SO23-13-18, Reactor Protection System Failure/Loss of Vital Bus.
	RO	DETERMINE failure by observing instrumentation for the affected channel and alternate redundant indications monitoring the same parameter.
	RO	IDENTIFY Containment Pressure Channel PT-0352-1 failure.
	CRS	REFER to Attachment 5 and DETERMINE Functional Unit(s) affected.
	RO	PLACE the affected Functional Unit in BYPASS per SO23-3-2.12, Reactor Protection System.
M.O. Cue:		**When directed, EXECUTE the following Remote Functions:** **RP51 = OPEN (PPS Door Open Annunciator 56B46)** **RP52S = BYPASS (Containment Pressure Channel A)** **Delete RP51 (PPS Door Open Annunciator 56B46)**

Op Test No.: NRC	Scenario # 1	Event # 1	Page 6 of 72
Event Description:	Containment Pressure Transmitter Failure		

Time	Position	Applicant's Actions or Behavior
	RO	VERIFY the Trip Channel Bypassed Annunciator alarm.
		• 56A29 - PPS CHANNEL 1 TRIP BYPASSED
	RO	LOG the bypass and the reason for the bypass in the Control Operator's Log.
	CRS	INITIATE a LCOAR or follow guidelines of SO123-0-A5.
+ 10 min	CRS	EVALUATE Technical Specifications.
		• LCO 3.3.5.A, ESFAS Instrumentation.
		• CONDITION A - One or more Functions with one automatic ESFAS trip channel inoperable; ACTION A.1 - Place Functional Unit in bypass or trip within one (1) hour.
When Technical Specifications have been addressed, or at Lead Evaluator's discretion, PROCEED to Event 2.		

Op Test No.: NRC	Scenario # 1	Event # 2	Page 7 of 72
Event Description:	VCT Level Transmitter Failure		

Time	Position	Applicant's Actions or Behavior
Machine Operator:		**When directed, EXECUTE Event 2. - CV16A, VCT Level Transmitter LT-0226 fails low**
Indications available: **58A04 - VCT LEVEL HI/LO VCT Level Indicator LI-0226A lowering VCT Auto Makeup initiation**		
+ 1 min	RO	REFER to Annunciator Response Procedures.
	RO	DETERMINE that VCT Auto Makeup has started.
	RO	CHECK VCT Level indicator LI-0227 on PCS and DETERMINE that level is normal (~51% and trending up due to auto makeup initiation).
	RO	IDENTIFY that VCT level transmitter LI-0226 has failed low.
	RO	PLACE Makeup Mode Selector, HS-0210, to MANUAL.
Examiner Note:		**When Makeup Control is placed in MANUAL, the following alarms will illuminate (on short time delay):**
		• 58A06 - BORIC ACID TO VCT FLOW HI/LO
		• 58A07 - DEMIN WATER TO VCT FLOW HI/LO
	CRS	DIRECT performance of SO23-3-2.2, Makeup Operations to ensure proper CVCS alignment is achieved.
+10 min	CRS	REQUEST I&C assistance.
When VCT Makeup is in Manual or at Lead Evaluator's discretion, PROCEED to Event 3.		

Op Test No.: NRC	Scenario # 1	Event # 3	Page 8 of 72
Event Description:	Seismic Event / Loss of Auxiliary Feedwater Pump		

Time	Position	Applicant's Actions or Behavior
Machine Operator:		**When directed, EXECUTE Event 3.** **- Seismic OBE without Main Feedwater Pump trip** **- FW25, Steam Driven Auxiliary Feedwater Pump (P140) trip**
Indications Available:		**61C21 – SEISMIC RECORDING SYSTEM ACTIVATED** **61C22 – OPERATING BASIS EARTHQUAKE DETECTED** **61C03 – SPENT FUEL POOL LEVEL HI/LO** **64A26(29) – CCW SURGE TANK TRAIN A(B) LEVEL HI/LO** **99B49 – TURBINE VIBRATION HI** **99A11 – TPCW SURGE TANK LEVEL HI/LO** **53A15 – MFWP TURBINE K006 VIBRATION HI PRETRIP** **53A30 – MFWP/TURBINE P062/K006 VIBRATION HI** **53B58 – CONDENSATE TANK T120 LEVEL HI/LO** **50A54 – CEDMCS MG OUTPUT CONTACTOR OPEN** **50A55 – ATWS/DSS TROUBLE** **58A25(35) – BAMU TANK T072 (T071) LEVEL HI/LO** **57A(B)16 – RWST T006 (T005) LEVEL LO** **63B(C)50 – DIESEL GEN 2G002 (2G003) STORAGE TANK LEVEL HI/LO** **52A53 – TURBINE AUX FW PUMP GOVERNOR OVERSPEED/OOS**
+1 min	CREW	REFER to Annunciator Response Procedures.
	BOP	RECOGNIZE Operating Basis Earthquake and INFORM the CRS AOI SO23-13-3 entry required.
	BOP	DETERMINE Steam Driven Auxiliary Feedwater Pump (P-140) tripped and REPORT to the CRS.
	CRS	DIRECT performance of SO23-13-3, Earthquake.
	CRS	DISPATCH an operator to the AFW Pump Room.
M.O. Cue:		**Once dispatched, WAIT three (3) minutes and REPORT P140 linkage is damaged and pump is tripped.**

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Event Description: Seismic Event / Loss of Auxiliary Feedwater Pump

Time	Position	Applicant's Actions or Behavior
Floor Cue:		**If requested, the Shift Manager will SHOW Seismic Panel indications to the CRS after a two (2) minute time delay (copy located at the end of the scenario).**
	CRS	VERIFY the following occurred:
		• Valid activation of any of the following alarms or Seismic Instrument Panel indications:
		• 2UA61C21, Seismic Recording System Activated alarm – illuminated.
		• Strong Motion Acceleration System Activation (light indication on 2UA-8020, actuates at 0.019g)
		• Event 2ZLH-8020G (light indication on 2XY-8020), AND
		• Ground motion that is readily felt by a consensus of Control Room personnel.
Floor Cue:		**Shift Manager will REPORT there was ground motion.**
	CRS	DETERMINE Operating Basis Earthquake occurred:
	BOP	• 2UA61C22, Operating Basis Earthquake Acceleration alarm – ILLUMINATED (actuates at 0.33g), AND
	BOP	• OBE alarms (both white lamps: Containment Base OBE AND Containment Operating Level OBE) on Seismic Instrumentation Panel ILLUMINATED.
	CRS	INITIATE Attachment 1, Post Operating Basis Earthquake Inspections.
	CRS	INITIATE Attachment 4, Seismic Annunciator Data Collection.
M.O. Cue:		**When the ARO is directed to perform Attachment 4, WAIT two (2) minutes then CLEAR the Seismic alarms on Control Board Panel 61C (61C21 & 61C22) in preparation for the aftershock preceding Event 5.**

Op Test No.: NRC Scenario # 1 Event # 3 Page 10 of 72

Event Description: Seismic Event / Loss of Auxiliary Feedwater Pump

Time	Position	Applicant's Actions or Behavior
	CRS	INITIATE Attachment 2, Post Seismic Event Inspections.
	CRS	EVALUATE Technical Specifications.
		• LCO 3.7.5.B, Auxiliary Feedwater System.
		• CONDITION B - One AFW Train inoperable for reasons other than Condition A in MODE 1, 2, or 3; ACTION B.1 - Restore AFW train to OPERABLE status within 72 hours.
+ 15 min	CRS	INITIATE a normal plant shut down per SO23-13-3, Attachment 1 following guidance of SO23-5-1.7, Power Operations.
Floor Cue: Once the decision to shut down the plant is initiated by the CRS, REPORT as the Shift Manager to perform a Rapid Power Reduction at 15% per hour per SO23-5-1.7, Power Operations.		
When SO23-13-3, Attachment 1 is initiated and Technical Specifications are addressed, or at Lead Evaluator's discretion, PROCEED to Event 4.		

Op Test No.: NRC Scenario # 1 Event # 4 Page 11 of 72

Event Description: Rapid Power Reduction at 15%/hour

Time	Position	Applicant's Actions or Behavior
Machine Operator:		**If contacted as Grid Control Center, ACKNOWLEDGE Rapid Power Reduction at 15%/hour due to seismic event.**
	CRS	DIRECT performance of actions in SO23-5-1.7, Power Operations, Step for Rapid Power Reduction.
	BOP	INITIATE a Moisture Separator Heater cooldown per SO23-10-2, Attachment for MSR Cooldown for Load Reduction/ Turbine Shutdown.
+1 min	RO/BOP	IMPLEMENT Attachment 8 to determine the amount of Boration and CEAs to be used (located on Control Board).
		• A combination of CEA insertion and/or Boron will be used.
	RO	BORATE to the Charging Pump suction (Borate Mode).
	BOP	LOWER Turbine load (to raise Tc) until SBCS permissives are in by lowering Main Generator load using HS-2210, Main Turbine Speed Load Control to LOWER.
	RO	INSERT CEAs for power reduction and ASI control.
Examiner Cue:		**Once the power change is under way it may be desirable to initiate conditions for Event 5 as there is an approximate seven (~7) minute time delay before the CCW Surge Tank low-level alarm is received. The next event is preceded by an aftershock.**
	RO	STOP CEA insertion any time the PPDIL alarm is received. PROCEED after PPDIL alarm has reset.

Op Test No.: NRC	Scenario # 1	Event # 4	Page 12 of 72
Event Description:	Rapid Power Reduction at 15%/hour		

Time	Position	Applicant's Actions or Behavior
+20 min	RO	FORCE Pressurizer Normal Spray flow using both Spray Valves.
When power level is lowered 3-5%, or at Lead Evaluator's discretion, PROCEED to Event 5.		

Op Test No.: NRC Scenario # 1 Event # 5 Page 13 of 72

Event Description: CCW Train A Header Rupture

Time	Position	Applicant's Actions or Behavior
M.O. Cue:		**When directed, INITIATE the Seismic alarms on Control Board Panel 61C (61C21 & 81C22) to simulate an aftershock.**
Floor Cue:		**Shift Manager will REPORT there was ground motion.**
Floor Cue:		**If requested, the Shift Manager will SHOW Seismic Panel indications to the CRS after a two (2) minute time delay (aftershock copy located at the end of the scenario).**
Machine Operator:		**When directed, EXECUTE Event 5.** **- CC03A, CCW Train A rupture at SDC HX E004 @ 500 gpm**
Indications available: **64A26 – CCW SURGE TANK TRAIN A LEVEL HI/LO (time delay of ~7 min)** **64A07 – CCW PUMP TRAIN A DISCH PRESS LO** **64A45 – CCW HX TRAIN A OUTLET PRESS LO** **64A17 – CCW TRAIN A RETURN FLOW LO** **56C58 – SAFETY EQPT BLDG SUMP LEVEL HI-HI (time delay of ~10 min)**		
+30 sec	BOP	REFER to Annunciator Response Procedures.
	BOP	RECOGNIZE lowering surge tank level and CCW Pump discharge pressure and INFORM the CRS AOI SO23-13-7 entry required.
+1 min	CRS	DIRECT performance of AOI SO23-13-7, Loss of CCW/ SWC.
	BOP	ISOLATE Radwaste by closing 2HV-6465, 3HV-6465, 2HV-6217, and 3HV-6217.
	CRS/BOP	DETERMINE that the leak is not isolated.
	CRS	DIRECT placing Train B CCW in service.

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Event Description: CCW Train A Header Rupture

Time	Position	Applicant's Actions or Behavior
	BOP	START CCW Pump P-026 and VERIFY that SWC P-114 automatically starts.
+3 min	CRS	DIRECT transfer of the CCW Non-Critical Loop to Train B.
Critical Task Statement		**With loss of flow to the CCW Non-Critical Loop and prior to exceeding RCP operating limits, restore flow to the NCL from any available CCW train.**
CRITICAL TASK	BOP	TRANSFER the CCW Non-Critical Loop to Train B.
	CRS	DIRECT transfer of Letdown HX to Train B.
	BOP	TRANSFER Letdown HX to Train B.
	CRS/RO	DISPATCH PEO to investigate flooding alarms.
	CRS	DIRECT securing CCW Pump P-025.
	BOP	STOP CCW Pump P-025 and SWC Pump P-112.
M.O. Cue:		**If directed to rack out breaker for CCW Pump P-024, WAIT 3 minutes and EXECUTE remote functions CC57A (DC to P-024) and CC58A (P-024 Breaker).** **If directed to rack out breaker for CCW Pump P-025, WAIT 3 minutes and EXECUTE remote functions CC57B (DC to P-025) and CC58B (P-025 Breaker).**
	CRS/ BOP	DISPATCH PEO to close Loop A CCW Surge Tank Outlet, HV-6225.

Op Test No.: NRC Scenario # 1 Event # 5 Page 15 of 72

Event Description: CCW Train A Header Rupture

Time	Position	Applicant's Actions or Behavior
M.O. Cue:		**If directed to close HV-6225, Loop A CCW Surge Tank Outlet, WAIT 3 minutes and EXECUTE remote function CC60.**
M.O. Cue:		**If contacted to report status of Unit 3 CCW Surge Tank Level, REPORT that Train A CCW Surge Tank level is stable and unchanged.**
+10 min	CRS	EVALUATE Technical Specifications.
		• LCO 3.7.7.A, Component Cooling Water System.
		• CONDITION A - One CCW Train inoperable; ACTION A.1 - Restore CCW Train to OPERABLE status within 72 hours.
Examiner Note:		**The crew may decide to place CCW pumps P-024 and P-025 OOS, swap CCW Pump P-025 to Train B, and/or place Train A HPSI and CS Pumps OOS. Crew may remove DC Control Power for Train A HPSI and CS pumps to avoid damage due to lack of cooling water.**
M.O. Cues:		**If directed to open the DC power supply breaker for the Train A ESF Pumps, ACKNOWLEDGE the order but do not perform (Time restriction).** **If directed to transfer Emergency Chiller E-336 to Unit 3, ACKNOWLEDGE the order but do not perform (Time restriction).** **If directed to transfer CCW Pump P-025 from Train A to Train B, ACKNOWLEDGE the order but do not perform (Time restriction).**
	CRS	ENSURE ECCS is not required.
		• HPSI, LPSI, CS pumps are stopped.
When Technical Specifications are addressed, or at Lead Evaluator's discretion, PROCEED to Events 6, 7, & 8.		

Op Test No.: NRC Scenario # 1 Event # 6, 7 & 8 Page 16 of 72

Event Description: ESDE on SG E089 / MSIS Fails to Actuate / HPSI Pump Start Failure

Time	Position	Applicant's Actions or Behavior
Machine Operator:		**When directed, EXECUTE Events 6, 7, and 8.** **- MS03B, ESDE on E089 inside Containment @ 1.2%** **- RPS LP, MSIS fails to actuate** **- RP01C, HPSI Pump P019 start failure**
Indications available: **60A02 – CONTAINMENT HUMIDITY HIGH** **60A12 – REACTOR CAVITY TEMP HI** **60A03 – CONTAINMENT / FHB TEMP HI** **56A35 – CONTAINMENT PRESSURE HI PRETRIP** **56A17 – CONTAINMENT PRESS HI ESFAS PRETRIP**		
+30 secs	RO/BOP	RECOGNIZE that an uncontrolled cooldown is in progress and INFORM the CRS that a Reactor trip is required.
	CRS	DIRECT entry into SO23-12-1, Standard Post Trip Actions.
	RO	VERIFY Reactor Trip:
		• VERIFY Reactor Trip Circuit Breakers (8) - open.
		• VERIFY Reactor Power lowering and Startup Rate - negative.
		• VERIFY maximum of one full length CEA - NOT fully inserted.
	BOP	VERIFY Turbine Trip:
		• VERIFY Main Turbine tripped.
		• HP and LP Stop and Governor valves - closed.
		• VERIFY both Unit Output Breakers - open.
		• VERIFY Main Turbine speed <2000 RPM or lowering.
	CRS	DETERMINE Reactivity Control criteria satisfied.

Op Test No.: NRC Scenario # 1 Event # 6, 7 & 8 Page 17 of 72

Event Description: ESDE on SG E089 / MSIS Fails to Actuate / HPSI Pump Start Failure

Time	Position	Applicant's Actions or Behavior
	CRS	INITIATE Administrative Actions:
		• ANNOUNCE Reactor trip via PA system.
		• INITIATE Attachment 4, Worksheet.
		• INITIATE Attachment 5, Administrative Actions.
	BOP	VERIFY Vital Auxiliaries functioning properly:
		• VERIFY both 1E 4 kV Buses A04 and A06 - energized.
		• VERIFY both 1E 480 V Buses B04 and B06 - energized.
		• VERIFY all Class 1E DC Buses – energized.
		• VERIFY all Non-1E 4 kV Buses – energized.
		• VERIFY one CCW Train - operating AND aligned to Non-Critical Loop (NCL) and Letdown Heat Exchanger.
M.O. Cue:		**If directed to check Main Steam Safety Valve status, REPORT that all safety valves appear to be seated, with no steam coming from the MSIV roof.**
	RO	DETERMINE RCS Inventory Control criteria NOT satisfied:
		• DETERMINE PZR level NOT between 10% and 70% AND NOT trending to between 30% and 60%.
		• [RNO] DETERMINE PZR Level Control System is NOT restoring PZR level.
		• VERIFY Core Exit Saturation Margin ≥ 20°F:
		• QSPDS page 611.
		• CFMS page 311.

Op Test No.: NRC Scenario # 1 Event # 6, 7 & 8 Page 18 of 72

Event Description: ESDE on SG E089 / MSIS Fails to Actuate / HPSI Pump Start Failure

Time	Position	Applicant's Actions or Behavior
	RO	DETERMINE RCS Pressure Control criteria NOT satisfied:
		• DETERMINE PZR pressure (WR and NR) NOT between 1740 PSIA and 2380 PSIA AND NOT trending to between 2025 PSIA and 2275 PSIA.
		• [RNO] DETERMINE PZR Pressure Control System is NOT restoring PZR pressure.
		• [RNO] ENSURE Normal and Aux Spray valves - closed.
		• [RNO] ENSURE SIAS, CCAS, and CRIS - actuated.
		• [RNO] If PZR pressure is < 1430 PSIA, then ENSURE at least one RCP in each loop - stopped.
		• [RNO] If RCP NPSH requirements NOT satisfied, then ENSURE all RCPs - stopped.
	RO	REPORT that HPSI Pump P-019 failed to start and START HPSI Pump P-019.
	RO	DETERMINE Core Heat Removal criteria is NOT satisfied:
		• DETERMINE no RCPs should be operating due to CIAS.
		• VERIFY Core Exit Saturation Margin ≥ 20°F.
		• QSPDS page 611.
		• CFMS page 311.
	BOP	DETERMINE RCS Heat Removal criteria NOT satisfied:
		• VERIFY at least one SG level between 21% and 80% NR and Feedwater available.
		• DETERMINE T_C less than 545°F and NOT controlled.
		• DETERMINE heat removal is excessive:
		• [RNO] T_C – less than 545°F.
		• [RNO] ENSURE SBCS valves closed.
		• [RNO] ENSURE ADVs closed.

Op Test No.: NRC Scenario # 1 Event # 6, 7 & 8 Page 19 of 72

Event Description: ESDE on SG E089 / MSIS Fails to Actuate / HPSI Pump Start Failure

Time	Position	Applicant's Actions or Behavior
		• [RNO] ENSURE SG Blowdown valves closed.
		• E-088 - HV-4054 • E-089 - HV-4053
		• [RNO] ENSURE Main Steam to Reheaters valves closed.
		• HV-2703 or HV-2704; HV-2721; HV-2751
		• DETERMINE SG pressures – less than 740 PSIA.
		• ENSURE MSIS actuated.
Critical Task Statement		**Actions are taken to isolate the SGs prior to either SG blowing dry. These actions may include either manual actuation of the MSIS signal, or manual closure of MSIS actuated components.**
CRITICAL TASK		Manually INITIATE MSIS.
	RO	DETERMINE Containment Isolation criteria NOT satisfied:
		• DETERMINE Containment pressure – greater than 1.5 PSIG.
		• [RNO] DETERMINE Containment pressure > 3.4 PSIG.
		• [RNO] ENSURE SIAS, CIAS, CCAS, and CRIS actuated.
		• [RNO] ENSURE all RCPs stopped.
Critical Task Statement		**Upon loss of CCW and prior to exceeding RCP operating limits, the affected RCP(s) will be stopped.**
CRITICAL TASK	RO	• STOP all RCPs due to CIAS.
		• VERIFY Containment Area Radiation Monitors energized AND NOT alarming or trending to alarm.
		• VERIFY Secondary Plant Radiation Monitors energized AND NOT alarming or trending to alarm.

Op Test No.: NRC Scenario # 1 Event # 6, 7 & 8 Page 20 of 72

Event Description: ESDE on SG E089 / MSIS Fails to Actuate / HPSI Pump Start Failure

Time	Position	Applicant's Actions or Behavior
	RO	DETERMINE Containment Temperature and Pressure criteria NOT satisfied:
		• DETERMINE Containment average temperature > 120°F.
		• DETERMINE Containment pressure > 1.5 PSIG.
		• [RNO] ENSURE proper functioning of the Normal Containment Cooling.
		• [RNO] ENSURE at least one Containment Dome Air Circulator operating.
		• [RNO] DETERMINE Containment pressure > 3.4 PSIG.
		• [RNO] ENSURE all RCPs stopped.
		• [RNO] ENSURE all available Containment Emergency Cooling Units operating.
		• DETERMINE Containment pressure > 14 PSIG.
		• [RNO] ENSURE CSAS actuated.
		• [RNO] ENSURE all available Containment Spray Header flows > 1600 GPM.
+15 min	CRS	DIAGNOSE event in progress:
		• DETERMINE some Safety Function criteria are NOT met per Attachment 4, Worksheet.
		• [RNO] COMPLETE Attachment 1, Recovery Diagnostics.
		• [RNO] DIAGNOSE event as ESDE on SG E089.
		• DETERMINE that Reactor Trip Recovery is NOT diagnosed.
		• [RNO] DETERMINE all RCPs stopped.
		• DIRECT initiating Steps 12 through 15.
	BOP	INITIATE Steps 12 through 15.

Op Test No.: NRC	Scenario # 1	Event # 6, 7 & 8	Page 21 of 72
Event Description:	ESDE on SG E089 / MSIS Fails to Actuate / HPSI Pump Start Failure		

Time	Position	Applicant's Actions or Behavior
Examiner Note:		**When SG E089 reaches dryout conditions the crew should initiate FS-30, Establish Stable RCS Temperature during ESDE.**
	CRS	DIRECT performance of SO23-12-5, Excess Steam Demand Event.
		• RECORD time of EOI entry.
	CRS	VERIFY ESDE diagnosis.
		• INITIATE SO23-12-10, Safety Function Status Checks.
		• INITIATE Foldout Page.
		• DIRECT performance of FS-7, Verify SI Throttle/Stop Criteria.
		• DIRECT performance of FS-3, Monitor Natural Circulation.
		• DIRECT performance of Attachment 22, Non-Qualified Loads Restoration.
		• DIRECT performance of FS-30, Stabilize RCS Temperature.
		• VERIFY ESDE diagnosis using Figure 1, Break Identification Chart.
		• INITIATE sampling of both Steam Generators for radioactivity and boron.
M.O. Cue:		**If directed to sample SGs, WAIT 10 minutes and then REPORT that E088 and E089 both have activity near background, and normal boron levels. If the SG sample valves are closed, REPORT that you are unable to establish sample flow.**
	CRS	INITIATE Administrative Actions.
		• NOTIFY Shift Manger/Operations Leader of entry into SO23-12-5, Excess Steam Demand Event.
		• ENSURE Emergency Plan is initiated.
		• IMPLEMENT Placekeeper.

Op Test No.: NRC Scenario # 1 Event # 6, 7 & 8 Page 22 of 72

Event Description: ESDE on SG E089 / MSIS Fails to Actuate / HPSI Pump Start Failure

Time	Position	Applicant's Actions or Behavior
	RO	VERIFY ESF actuation.
		• VERIFY SIAS actuation required.
		• PZR pressure less than SIAS setpoint.
		OR
		• Containment pressure > 3.4 PSIG.
		• ENSURE the following actuated:
		• SIAS / CCAS / CRIS
	RO/BOP	VERIFY SIAS, CCAS, CRIS actuated.
	CRS	RECORD time of SIAS.
	BOP	STOP unloaded Diesel Generators.
	BOP	INITIATE SO23-12-11, Attachment 22, Non-Qualified Load Restoration.
M.O. Cue:		**When directed to restore non-qualified loads, WAIT 2 minutes, then EXECUTE ED85, Non-Qualified Loads Restoration. INFORM the Control Room that you have restored non-qualified loads.**
	BOP	VERIFY MSIS actuation required and ENSURE MSIS actuated.
		• SG pressure < 740 PSIA.
	RO	VERIFY CIAS actuation required and ENSURE CIAS actuated.
		• Containment pressure > 3.4 psig.
		• CFMS pages 342 and 343.
	RO	VERIFY SIAS actuated.

Op Test No.: NRC Scenario # 1 Event # 6, 7 & 8 Page 23 of 72

Event Description: ESDE on SG E089 / MSIS Fails to Actuate / HPSI Pump Start Failure

Time	Position	Applicant's Actions or Behavior
Examiner Note:		**At this point, the CRS may elect to secure Train A ECCS components due to loss of CCW.**
	RO	ESTABLISH Optimum SI Alignment.
		• ESTABLISH one or two train operation:
		• All Charging Pumps operating.
		• One HPSI and one LPSI per train operating.
		• All Cold leg flow paths aligned.
		• VERIFY SI flow required:
		• SI flow indicated OR RCS pressure >1250 psia.
		OR
		• DETERMINE FS-7, Verify SI Throttle/Stop criteria NOT satisfied.
	BOP	CLOSE MSIVs and MSIV Bypasses:
		• ENSURE MSIVs - closed:
		• HV-8205 for E088.
		• HV-8204 for E089.
		• ENSURE MSIV Bypasses - closed:
		• HV-8203 for E088.
		• HV-8202 for E089.
	CREW	PREVENT Pressurized Thermal Shock.
		• INITIATE FS-30, Establish Stable RCS temperature during ESDE.
		• INITIATE FS-7, Verify SI Throttle/Stop Criteria.
Examiner Note:		**The following steps from FS-30 will be performed when conditions are met. Both the ESDE procedure and the ESDE Foldout Page direct performance of these steps.**

Op Test No.: NRC Scenario # 1 Event # 6, 7 & 8 Page 24 of 72

Event Description: ESDE on SG E089 / MSIS Fails to Actuate / HPSI Pump Start Failure

Time	Position	Applicant's Actions or Behavior
+20 min	BOP	VERIFY SG least affected by ESDE, SG E088, NOT isolated for SGTR.
	BOP	VERIFY most affected SG level E089 - less than 50% WR.
	BOP	PERFORM the following on least affected SG E088:
		• TRANSFER ADV to Auto/Modulate.
		• MAINTAIN least affected SG pressure 200 PSIA above most affected SG pressure.
	BOP	VERIFY SG dryout on most affected SG E089:
		• RCS Tcold - stable or rising, OR
		• SG pressure - 200 PSIA
Critical Task Statement		**With loss of heat removal from the affected SG, transfer the primary to secondary heat sink to the least affected SG. Actions shall include the following:** • **Steaming of the least affected (non-ESDE) SG to maintain P_{sat} for lowest RCS T_c ;** • **Manipulation of feedwater controls to maintain SG level of 40% to 80% NR.**
CRITICAL TASK	BOP	STABILIZE least affected SG E088 pressure:
		• VERIFY ADV on SG E088 in Auto/Modulate.
		• MAINTAIN P_{sat} for lowest RCS Tc on SG E088.
		• STABILIZE AFW flow on SG E088.
	RO	VERIFY RCS pressure is to the right of the Appendix E curve on Attachment 29, Post-Accident Pressure/Temperature Limits.

Op Test No.: NRC Scenario # 1 Event # 6, 7 & 8 Page 25 of 72

Event Description: ESDE on SG E089 / MSIS Fails to Actuate / HPSI Pump Start Failure

Time	Position	Applicant's Actions or Behavior
	BOP	OPERATE feedwater on SG E088 to maintain level between 40% and 80% NR.
Examiner Note:		**The following steps are from EOI SO23-12-11, Attachment 28, Isolation of SG with ESDE.**
	BOP	DETERMINE E089 is the most affected SG.
	CRS	NOTIFY Shift Manager / Operations Leader of the SG most affected by the ESDE.
	BOP	VERIFY SG least affected by ESDE available for heat removal and not affected by SGTR.
Critical Task Statement		**Identify and isolate the most affected Steam Generator (ESDE).**
CRITICAL TASK	BOP	ISOLATE SG E089. CLOSE/STOP the following components:
		• MSIV HV-8204
		• MSIV Bypass HV-8202
		• ADV HV-8421
		• MFIV HV-4052
		• AFW valves HV-4715, HV-4731
		• Steam to AFW P-140 HV-8200
		• SG Blowdown Isolation HV-4053
		• SG Water Sample Isolation HV-4057
		• Electric AFW Pump P-141
+30 min	BOP	ENSURE SG E089 ADV HV-8421 selected to MANUAL.
When Steam Generator E089 is isolated, TERMINATE the scenario.		

Op Test No.: NRC	Scenario # 1	Event # 3	Page 26 of 72
Event Description:	Cue Card For Initial Seismic Event		

Time	Position	Applicant's Actions or Behavior

OPERATOR INDICATIONS AT 2UA-8020, SEISMIC PANEL INITIAL SEISMIC EVENT

- Strong Motion Acceleration System Activation light (0.019g) - ON
- 2ZLH-8020G, Event Light Indication, (0.019g) Power Panel - ON
- Containment Base OBE (0.33g) - ON
- Containment Operating Level OBE (0.33g) - ON

OPERATOR INDICATIONS AT 2UA-8020, SEISMIC PANEL AFTERSHOCK EVENT

- Strong Motion Acceleration System Activation light (0.019g) - ON
- 2ZLH-8020G, Event Light Indication, (0.019g) Power Panel - ON
- Containment Base OBE (0.33g) - ON
- Containment Operating Level OBE (0.33g) - ON

Facility:	San Onofre		Scenario No.:	2	Op Test No.: NRC
Examiners:			Operators:		

Initial Conditions:	• 69% power MOC - RCS Boron is 956 ppm (by sample) • Train A Component Cooling Water Pump (P-025) in service • Train A Containment Spray Pump (P-012) OOS • Train A High Pressure Safety Injection Pump (P-017) OOS • Fire Computer OOS
Turnover:	Dilution and power ascension in progress at 10% per hour.
Critical Tasks:	• Restore flow to the CCW Non-Critical Loop (RCPs operating). • Energize at least one vital 4 kV 1E Bus and associated 480 V 1E Bus. • Establish Reactivity Control (≥ 2 FLCEAs Not Fully Inserted & No SIAS).

Event No.	Malf. No.	Event Type*	Event Description
1 + 15 min		R (RO) N (BOP, CRS)	Dilution and power ascension at 10% per hour.
2 + 25 min	RC24A	I (RO, CRS) TS (CRS)	Pressurizer Spray Valve (PV-0100A) fails open.
3 + 35 min	SG05G	I (BOP, CRS) TS (CRS)	Steam Generator E-089 Narrow Range Level Transmitter (LT-1113-3) fails low.
4 + 50 min	ED03A	C (ALL) TS (CRS)	Bus 2A04 Overcurrent lockout.
5 + 85 min	TU08 PG24 PG57	M (ALL)	Turbine trip. Loss of Offsite Power. Loss of SDG&E Switchyard.
6 + 85 min	RD8802 RD8902 RD9002 RD9102	C (RO)	Four fully stuck CEAs; Loss of Reactivity Control.
7 + 85 min	EG08B	C (BOP)	Emergency Diesel Generator (2G003) mechanical failure. Station Blackout.

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

SCENARIO SUMMARY NRC #2

The crew will assume the watch and resume a dilution and power ascension per SO23-5-1.7, Power Operations.

When the power change is underway, the Pressurizer Spray Valve will fail to 80% open. The crew will diagnose and stabilize the primary plant using Annunciator Response Procedures (ARP) and Abnormal Operating Instruction (AOI) SO23-13-27, Pressurizer Pressure and Level Malfunction. The CRS will evaluate Technical Specifications.

After the crew has removed power from the Pressurizer Spray Valve, a narrow range level transmitter will fail low on Steam Generator E-089. The crew will diagnose a level transmitter failure per the ARPs and Abnormal Operating Instruction (AOI) SO23-13-18, Reactor Protection System Failure/Loss of Vital Bus, and are required to bypass the affected Functional Units using SO23-3-2.12, Reactor Protective System Operation. The CRS will evaluate Technical Specifications.

This is followed by a bus fault and lockout on 1E Bus 2A04. The crew will refer to AOI SO23-13-26, Loss of Power to an AC Bus. Actions include transferring the Non-Critical Loop to Train B, starting a standby Charging Pump, and stopping and placing the Train A Emergency Diesel Generator in Maintenance Lockout. The CRS will evaluate Technical Specifications and determine that a plant shutdown is required.

Once the decision to shutdown is made, a Loss of Offsite Power will occur. The Reactor will trip and the crew will perform Emergency Operating Instruction (EOI) SO23-12-1, Standard Post Trip Actions (SPTAs). Emergency Diesel Generator 2G003 will trip while SPTAs are being performed (one minute post-trip). Four rods remain stuck out of the core requiring manual boration alignment on the part of the RO in preparation for Bus 2A06 power restoration.

- The crew diagnoses a Loss of Reactivity Control due to four (4) full length CEAs stuck out with a Station Blackout and enters EOI SO23-12-9, Functional Recovery. The success path will require cross-tying power with Unit 3 and establishing a boration flowpath.
-
- The scenario is terminated when Bus 2A06 is energized and boration at greater than 40 gpm is established.

Risk Significance:

- Risk important components out of service: CS P-012, HPSI P-017
- Failure of risk important system prior to trip: Loss of Vital Inverters
- Risk significant core damage sequence: SBO with Loss of Reactivity Control
- Risk significant operator actions: Establish Non-Critical Loop CCW flow
  Vital AC power restoration
  Establish boration flowpath

SONGS
2007 Facility NRC Retake License Examination
Simulator Scenario Setup
Scenario 2

Machine Operator:	**EXECUTE IC #182 and NRC Scenario #2 SETUP file to align components.** **HANG Control Board Tags on P-012 and P-017.** **CHANGE Operator Aid Tags #029 (CVCS) and #005-4 (CVCS Ion Exchanger) to reflect the scenario boron concentration.** **RESET CVCS PMW Batch Counter to 1140.** **VERIFY both Pressurizer Spray Valves in AUTO.** **VERIFY Master Alarm Silence Switch in NORMAL.** **PLACE procedures in progress on the RO desk:** **- Copy of SO23-5-1.7 open to Step 6.3.15, 50-80% Reactor Power.** **- MARKED UP copy of SO23-5-1.7, Attachment 9.** **- Copy of SO23-3-2.2 with Steps 6.5.1 through 6.5.5 checked off.** **- Copy of SO23-3-1.10 open to Section 6.2, Forcing Pressurizer Sprays.** **VERIFY that dilution is in progress then PLACE in FREEZE.** **PLACE the MOC copies of OPS Physics Summary Book on RO Desk and SO23-5-1.7, Attachment 8 on Control Board (located on the desk behind and adjacent to Grid Breaker Display Smart Board).** **If Group Position(s) is (are) not correct, MOVE CEAs and then RETURN CEAs to Shift Turnover Sheet position(s).**

Control Room Annunciators in Alarm at 70%:

57A52 – CONTAINMENT SPRAY SYS TRAIN A INOPERABLE

Op Test No.: NRC	Scenario # 2	Event # 1	Page 31 of 72
Event Description:	Dilution and Power Ascension in Progress at 10%/hr		

Time	Position	Applicant's Actions or Behavior
Machine Operator:		**When turnover is complete, PLACE Simulator in RUN.**
+1 min	CRS	DIRECT performance of SO23-5-1.7, Power Operations, SO23-3-2.2, Makeup Operations, and SO23-10-1, Turbine Startup and Normal Operation.
	RO	VERIFY Batch Counter and Makeup Integrator settings.
	RO	PERFORM dilution valve alignment.
		• PLACE FV-9253 in OPEN.
		• VERIFY FIC-0210X in AUTO at ~ 19 gpm.
		• PLACE HS-0210 in DILUTE.
	RO	VERIFY Tcold changing as dilution progresses.
	RO	ADJUST CEAs as required for ASI control.
+15 min	BOP	MAINTAIN Tcold within required band by raising Main Generator load using HS-2210, Main Turbine Speed Load Control to RAISE.
When power has been raised 3 to 5%, or at Lead Evaluator's discretion, PROCEED to Event 2.		

Op Test No.: NRC Scenario # 2 Event # 2 Page 32 of 72

Event Description: Pressurizer Spray Valve Fails Open

Time	Position	Applicant's Actions or Behavior
Machine Operator:		**When directed, EXECUTE Event 2.** **- RC24A @ 80%, Pressurizer Spray Valve fails open**
Indications available: **50A14 – PZR PRESS HI/LO (+90 seconds from event initiation)**		
Examiner Note:		**Because both Spray Valves will be open during the power ascension, PV-100A is failed 80% open. This is equivalent to a 40% open failure when not forcing sprays with all heaters energized.**
+2 min	RO	REFER to Annunciator Response Procedures.
	RO	RECOGNIZE PZR Pressure Control failure and INFORM the CRS AOI SO23-13-27 entry required.
	CRS	DIRECT performance of SO23-13-27, Pressurizer Pressure and Level Malfunction.
	RO	START and/or VERIFY PZR Backup and Proportional Heaters energized.
	CRS/RO	DETERMINE Pressurizer Pressure channel is NOT between 2225 and 2275 psig.
	CRS/RO	DETERMINE Pressurizer Pressure is NOT stable.
	RO	OBSERVE PV-0100B, Pressurizer Spray Valve from Loop 1B, is failed ~80% open.
M.O. Cue:		**Closely MONITOR pressure and REDUCE malfunction RC24A to 60% once identified (this will allow pressure to stabilize and avoid a plant trip).**

Op Test No.: NRC Scenario # 2 Event # 2 Page 33 of 72

Event Description: Pressurizer Spray Valve Fails Open

Time	Position	Applicant's Actions or Behavior
	CRS	DIRECT an ARO to fail closed PV-0100A, PZR Spray Valve, by removing the connector block at Cabinet L-138, SPEC 200 Power Supply Cabinet, Nest 4, Slot 10. (HC-0100A)
M.O. Cue:		**REDUCE malfunction RC24A to 0% and REPORT to the Control Room that the connector block at Cabinet L-138, SPEC 200 Power Supply Cabinet, Nest 4, Slot 10 was removed.**
	RO/CRS	DETERMINE Pressurizer pressure is recovering.
	RO	VERIFY the Pressurizer Pressure signal has not failed high.
	RO	VERIFY Pressurizer Pressure Control System is operating properly in automatic.
	RO	VERIFY Pressurizer Spray was not initiated with delta temperature > 180°F.
Examiner Note:		**The following Technical Specification is entered if RCS pressure drops below 2025 PSIA during this event.**
+10 min	CRS	EVALUATE Technical Specifications.
		• LCO 3.4.1.A, RCS DNB Limits.
		• CONDITION A - Pressurizer pressure not within limits; ACTION A.1 - Restore Pressurizer pressure to within limit within two (2) hours.
When Technical Specifications are addressed, or at Lead Evaluator's discretion, PROCEED to Event 3.		

Op Test No.: NRC	Scenario # 2	Event # 3	Page 34 of 72
Event Description:	Steam Generator E089 NR Level Transmitter Fails Low		

Time	Position	Applicant's Actions or Behavior
Machine Operator:		**When directed, EXECUTE Event 3.** **- SG05G, LT-1113-3 S/G E089 Level Instrument fails low**
Indications Available: **52A06 - SG1 E089 LEVEL HI/LO** **52A07 - FWCS SG1 E089 LEVEL DEVIATION**		
+1 min	BOP	REFER to Annunciator Response Procedures.
	BOP	IDENTIFY failed transmitter is Steam Generator E089 NR Level Transmitter Channel "C", 2LT-1113-3.
	CRS	DIRECT performance of AOI SO23-13-18, Reactor Protection System Failure.
	CRS	IDENTIFY a Single PPS Channel failed.
	CRS	IDENTIFY Affected Functional Units for Channel "C", using Attachment 5 of AOI SO23-13-18.
		• SG 1 Level - Low (RPS)
		• SG 1 Level - High (RPS)
		• SG 1 Level - High (DEFAS-1)
		• SG 1 ΔP (EFAS-1)
	CRS	DIRECT placing the affected Functional Unit in BYPASS per SO23-3-2.12, Section for Bypass Operation of Trip Channels.

Op Test No.: NRC Scenario # 2 Event # 3 Page 35 of 72

Event Description: Steam Generator E089 NR Level Transmitter Fails Low

Time	Position	Applicant's Actions or Behavior
	RO	CONTACT an outside operator to place the Affected Functional Units in Bypass per SO23-3-2.12, Reactor Protective System Operation.
M.O. Cue:		**When outside operator is contacted to bypass the associated trips, WAIT 3 minutes and then CALL when ready to begin. When directed, EXECUTE individual events for Bypassing RPS Trips.**
M.O. Cue:		**When directed, EXECUTE the following Remote Functions:** **RP51 = OPEN (PPS Door Open Annunciator 56B46)** **RP54G = BYPASS (Low SG-1 Level Channel C)** **RP54I = BYPASS (High SG-1 Level Channel C)** **RP54U = BYPASS (High SG-1 DP EFAS-1 Channel C)** **RP68A = BYPASS (DEFAS-1 L-034)** **RP68B = BYPASS (DEFAS-1 L-035)** **Delete RP51 (PPS Door Open Annunciator 56B46)**
	CRS	CONFIRM failure does NOT affect RPS/ESFAS matrix or logic.
	CRS	CONFIRM failure does affect Feedwater Digital Control System.
	BOP	• BYPASS 2LT-1113-3 per SO23-3-2.38, Section for Bypassing Selected Feedwater Control Signals.

Op Test No.: NRC Scenario # 2 Event # 3 Page 36 of 72

Event Description: Steam Generator E089 NR Level Transmitter Fails Low

Time	Position	Applicant's Actions or Behavior
+10 min	CRS	EVALUATE Technical Specifications.
		• LCO 3.3.1.A, RPS Instrumentation - Operating.
		• CONDITION A - One or more Functions with one automatic RPS trip channel inoperable; ACTION A.1 - Place channel in Bypass or Trip within one (1) hour.
		• LCO 3.3.5.A, ESFAS Instrumentation.
		• CONDITION A - One or more Functions with one automatic ESFAS trip channel inoperable; ACTION A.1 - Place Functional Unit in bypass or trip within one (1) hour.
		• LCO 3.3.12.A, Remote Shutdown System.
		• CONDITION A - One or more required Functions inoperable; ACTION A.1 - Restore required Functions to OPERABLE status within 30 days.
When Technical Specifications have been addressed, or at Lead Evaluator's discretion, PROCEED to Event 4.		

Op Test No.: NRC Scenario # 2 Event # 4 Page 37 of 72

Event Description: Bus 2A04 Overcurrent Lockout

Time	Position	Applicant's Actions or Behavior
Machine Operator:		**When directed, EXECUTE Event 4.** **- ED03A, Bus 2A04 overcurrent**
Indications Available: **63B05 - 2A04 VOLTAGE LO** **63B06 - 2B04 VOLTAGE LO** **63B25 - 2A04 SUPPLY BREAKER 2A0418 OC**		
+30 sec	RO/BOP	REFER to Annunciator Response Procedures.
	RO/BOP	RECOGNIZE low bus voltage and INFORM the CRS AOI SO23-13-26 entry required.
	CRS	DIRECT performance of SO23-13-26, Loss of Power to an AC Bus.
	CRS	DIRECT aligning of Train B CCW and SWC.
Critical Task Statement		**With loss of flow to the CCW Non-Critical Loop and prior to exceeding RCP operating limits, restore flow to the NCL from any available CCW train.**
	BOP	START the Train B CCW Pump.
CRITICAL TASK		• TRANSFER the Non-Critical Loop to Train B.
		• TRANSFER the Letdown Heat Exchanger to Train B.
	RO	START Charging Pump P-192.
	CRS	DISPATCH an operator to VERIFY loss of the 1E 4 kV Bus is NOT due to a fire in the 1E Switchgear Room.
	RO/BOP	DETERMINE overcurrent annunciators are alarming on Bus 2A04.

Op Test No.: NRC Scenario # 2 Event # 4 Page 38 of 72

Event Description: Bus 2A04 Overcurrent Lockout

Time	Position	Applicant's Actions or Behavior
	CRS	DIRECT initiation of SO23-6-9, 6.9 kV, 4 kV and 480V Bus and Feeder Faults, to return Bus 2A04 to service.
	CRS	DIRECT initiation of Equipment Actions for Loss of the 1E 4 kV Bus 2A04.
+5 min	BOP	STOP G002 Diesel Generator by placing in MAINTENANCE LOCKOUT.
	CRS	Within 1 hour, DIRECT performance of SO23-3-3.23, Attachment for AC Sources Verification, for both Units.
	RO	SELECT HS-0210, Makeup Mode Selector Switch to MANUAL and PLACE a Caution Tag at the switch to prevent inadvertent dilution.
	CRS	EVALUATE Technical Specifications.
		• LCO 3.0.3 - Due to loss of two 1E Battery Chargers.
		• ACTION - Within 1 hour, place the Unit in MODE 3 within 6 hours.
M.O. Cue:		**When directed, EXECUTE the following Remote Functions:** **RP51 = OPEN (PPS Door Open Annunciator 56B46)** **RP52C = BYPASS (Channel A Hi Local Power)** **RP52D = BYPASS (Channel A Low DNBR)** **Delete RP51 (PPS Door Open Annunciator 56B46)**
	RO	VERIFY the Trip Channel Bypassed Annunciator alarms.
		• 56A29 - PPS CHANNEL 1 TRIP BYPASSED

Op Test No.: NRC Scenario # 2 Event # 4 Page 39 of 72

Event Description: Bus 2A04 Overcurrent Lockout

Time	Position	Applicant's Actions or Behavior
	CRS	DIRECT Bypassing Channel A DNBR and LPD trips.
+15 min	CRS	DIRECT setting CEAC 2 INOP Flags in all CPCs by changing each CPC Addressable Constant Point ID 062 to 2.
When Technical Specifications have been addressed, or at Lead Evaluator's discretion, PROCEED to Events 5, 6, and 7.		

Machine Operator:		**When directed, EXECUTE Events 5, 6, and 7.** **- TU08, Turbine Trip** **- PG24, Loss of Offsite Power** **- RD8802/8902/9002/9102, Stuck CEAs** **- EG08B, 2G003 EDG Mechanical Failure (+1 minute)** **- PG57, Loss of SDGE Switchyard (+5 minutes)**
Indications available: **Numerous Loss of Offsite Power related alarms**		
+ 10 secs	RO/BOP	RECOGNIZE Reactor trip and Loss of Offsite Power and INFORM the CRS SO23-12-11 entry required.
	CRS	DIRECT performance of SO23-12-1, Standard Post Trip Actions.
	RO	VERIFY Reactor Trip:
		• VERIFY Reactor Trip Circuit Breakers (8) - open.
		• VERIFY Reactor Power lowering and Startup Rate - negative.
		• DETERMINE four (4) full length CEAs - NOT fully inserted.
Examiner Note:		**The following Critical Task may be started; however, it cannot be completed until power is available later in the scenario.**
CRITICAL TASK	RO	• [RNO] COMMENCE emergency boration at greater than 40 gpm.
	CRS	DETERMINE Reactivity Control criteria NOT satisfied.

	BOP	VERIFY Turbine Trip:
		• VERIFY Main Turbine tripped.
		• HP and LP Stop and Governor valves - closed.
		• VERIFY both Unit Output Breakers - open.
		• VERIFY Main Turbine speed <2000 RPM or lowering.
	CRS	INITIATE Administrative Actions:
		• ANNOUNCE Reactor trip via PA System.
		• INITIATE Attachment 4, Worksheet.
		• INITIATE Attachment 5, Administrative Actions.
	BOP	DETERMINE Vital Auxiliaries NOT functioning properly:
		• DETERMINE both 1E 4 kV Buses A04 and A06 de-energized.
		• [RNO] PLACE DG G003 in Maintenance Lockout.
		• [RNO] INITIATE Attachment 2, Diesel Generator Failure Follow-Up Actions for Bus 2A06.
		• DETERMINE both 1E 480 V Buses B04 and B06 de-energized.
		• VERIFY all Class 1E DC Buses – energized.
		• DETERMINE all Non-1E 4 kV Buses de-energized.
		• [RNO] ENSURE MSIVs - closed.
		• [RNO] OPERATE ADVs to maintain 1000 PSIA.
		• DETERMINE CCW Train NOT operating and NOT aligned to Non-Critical Loop (NCL) and Letdown Heat Exchanger.
M.O. Cue:		**If directed to investigate 2G003, WAIT 3 minutes and REPORT it is shutdown and there is a large amount of oil on the DG Room floor.**

	RO	DETERMINE RCS Inventory Control criteria NOT satisfied:
		• DETERMINE PZR level between 10% and 70% and NOT trending to between 30% and 60%.
		• VERIFY Core Exit Saturation Margin – greater than or equal to 20°F:
		• QSPDS page 611.
		• CFMS page 311.
	RO	DETERMINE RCS Pressure Control criteria NOT satisfied:
		• DETERMINE PZR pressure (WR and NR) between 1740 PSIA and 2380 PSIA and NOT controlled AND trending between 2025 PSIA and 2275 PSIA.
		• [RNO] DETERMINE PZR Pressure Control System is NOT restoring PZR pressure.
		• [RNO] ENSURE Normal and Aux Spray valves - closed.
	RO	DETERMINE Core Heat Removal criteria is NOT satisfied:
		• DETERMINE no RCPs are operating.
		• VERIFY Core Exit Saturation Margin ≥ 20°F.
		• QSPDS page 611.
		• CFMS page 311.
	BOP	VERIFY RCS Heat Removal criteria satisfied:
		• VERIFY both SGs level – greater than 21% NR.
		• VERIFY both SGs level – less than 80% NR.
		• VERIFY Auxiliary feedwater available to restore both SGs level – between 40% NR and 80% NR.
		• [RNO] If required, manually INITIATE EFAS.
		• VERIFY heat removal adequate:
		• T_C – trending to between 545°F and 555°F.
		• SG pressures – approximately 1000 PSIA.
	RO	VERIFY Containment Isolation criteria satisfied:

		• VERIFY Containment pressure – less than 1.5 PSIG.
		• DETERMINE some Containment Area Radiation Monitors energized and NOT alarming or trending to alarm.
		• DETERMINE some Secondary Plant Radiation Monitors energized and NOT alarming or trending to alarm.
	RO	VERIFY Containment Temperature and Pressure criteria satisfied:
		• VERIFY Containment average temperature – less than 120°F.
		• VERIFY Containment pressure – less than 1.5 PSIG.
+15 min	CRS	DIAGNOSE Event in Progress:
		• DETERMINE some Safety Function criteria are NOT met per Attachment 4, Worksheet.
		• [RNO] COMPLETE Attachment 1, Recovery Diagnostics.
		• [RNO] DIAGNOSE loss of Reactivity Control and Station Blackout.
		• DETERMINE that Reactor Trip Recovery is NOT diagnosed.
		• [RNO] DETERMINE all RCPs stopped.
		• DIRECT initiating Steps 12 through 15.
	BOP	INITIATE Steps 12 through 15.
M.O. Cue:		**If SC&E GCC is contacted for grid status, REPORT that cause of grid loss is unknown and field crews are investigating. No estimate on time to restore a line.**
M.O. Cue:		**If Unit 3 status is requested, REPORT that Bus 3A06 is energized from EDG 3G003 and Bus 3A04 is energized from EDG 3G002.**
	CRS	DIRECT performance of SO23-12-9, Functional Recovery.

M.O. Cue:	**When SO23-12-9 is initiated, CALL as SDG&E GCC and REPORT that SONGS Switchyard appears to have several faults and will not be available until a crew can be dispatched to determine the problem.**	
	CRS	VERIFY Functional Recovery diagnosis:
		• INITIATE SO23-12-10, Safety Function Status Checks.
		• INITIATE Foldout Page.
		• DIRECT performance of FS-3, Monitor Natural Circulation.
		• DIRECT performance of SO23-12-11, Attachment 19, Non-1E DC Load Reduction.
		• DIRECT performance of SO23-12-11, Attachment 20, Class1E Battery Load Reduction.
		• DIRECT performance of FS-18, Secondary Plant Protection.
		• DIRECT performance of SO23-12-11, Attachment 24, Supply 1E 4 kV Bus with Opposite Unit Diesel.
		• DIRECT performance of SO23-12-11, Attachment 6, Diesel Generator Failure Follow-up Actions.
		• DIRECT performance of SO23-12-11, Attachment 8, Restoration of Offsite Power.
		• DIRECT Chemistry to sample both SGs for radioactivity and boron.
M.O. Cue:	**If directed to sample SGs, WAIT 10 minutes and REPORT that E088 and E089 sample lines were frisked, and both have activity near background. If the SG sample valves are closed, REPORT that you are unable to establish sample flow.**	
M.O. Cue:	**When directed to initiate Non-1E DC Load Reduction, ACKNOWLEDGE and STATE you will report when complete.**	
M.O. Cue:	**When directed to initiate Class 1E Battery Load Reduction, ACKNOWLEDGE and STATE you will report when complete.**	
	CRS	DIRECT performance of SO23-12-11, Attachment 24, Supplying 1E 4 kV Bus with Opposite Unit Diesel.

	CRS	DETERMINE Train B is available.
	CRS	OBTAIN approval of Shift Manager to cross connect Train B using 10 CFR 50.54(x) on both units to supply 1E 4 kV Bus 2A06 with the opposite unit Diesel Generator.
	CRS/BOP	REQUEST SM initiate NRC notification within one hour regarding actions per this attachment.
	CRS/BOP	NOTIFY opposite Unit SRO that automatic sequencing of ESF loads onto opposite Unit 1E 4kV Bus 3A06 will be blocked.
	BOP	ENSURE 1E 4kV Bus Tie breaker AUTO/MANUAL transfer switches selected to MANUAL.
		• 2A0619 (2HS-1639B2) and 3A0603 (3HS-1639B2).
	BOP	ENSURE 1E 4kV Bus Tie breakers open.
		• 2A0619 and 3A0603.
	BOP	ENSURE 2G003 Diesel Generator selected to MAINTENANCE LOCKOUT.
	CRS	DIRECT performance of Train B Diesel Generator Cross-Tie Permissive switch alignment on 50' Elevation.
	BOP	CONTACT the PPEO and INITIATE Unit 2 Train A Diesel Generator Cross-Tie Permissive switch alignment on 50' Elevation.
		• VERIFY feeder faults NOT indicated by relay flags on:
		• 2A0616 – Unit Aux Transformer
		• 2A0618 – Reserve Aux Transformer
		• 2A0619 – 2A06 Bus Tie
		• 2A0613 – 2G003 EDG
M.O. Cue: **When asked, REPORT no feeder faults on breakers.**		

	BOP	DIRECT the PPEO to SELECT both Unit 2 Train B Diesel Generator Cross-Tie Permissive switches on Fire Isolation Panel 2L-413 to 50.54X.
		• 2HS-5054XA2 and 2HS-5054XB2
M.O. Cue:		**When directed, PERFORM remote functions EG62A and EG62B and REPORT that the Unit 2 50.54X switches have been aligned.**
	BOP	CONTACT the PPEO and INITIATE Unit 3 Train B Diesel Generator Cross-Tie Permissive switch alignment on 50' Elevation.
		• VERIFY feeder faults NOT indicated by relay flags on:
		• 3A0603 – 3A06 Bus Tie
M.O. Cue:		**When asked, REPORT no feeder faults on breakers.**
	BOP	DIRECT the PPEO to SELECT both Unit 3 Train B Diesel Generator Cross-Tie Permissive switches on Fire Isolation Panel 3L-413 to 50.54X.
		• 3HS-5054XA2 and 3HS-5054XB2
M.O. Cue:		**When directed, PERFORM remote functions EG62C and EG62D and REPORT that the Unit 3 50.54X switches have been aligned.**
	BOP	VERIFY 3G003 Diesel Generator loading less than 3.4 MW.
	BOP	VERIFY Bus 2A06 NOT energized.
	BOP	VERIFY Unit 2 overcurrent/ground alarms reset.
		• 63C15 - 2A06 SUPPLY BKR 2A0616 OC
		• 63C25 - 2A06 SUPPLY BKR 2A0618 OC
	BOP	VERIFY 1E DC bus voltages 2D2 and 3D2 greater than 108 VDC.
M.O. Cue:		**When asked, REPORT 3D2 voltage at 129 VDC.**

	BOP	ESTABLISH final Train B configuration.
	BOP	ENSURE 1E 4kV Bus 2A06 supply breakers open.
		• 2A0616 – Unit Aux Transformer
		• 2A0618 – Reserve Aux Transformer
		• 2A0613 – 2G003 EDG
	BOP	ENSURE 1E 4kV Bus A06 tie breakers open.
		• 2A0619 – 2A06 Bus Tie
		• 3A0603 – 3A06 Bus Tie

	BOP	ENSURE 1E 4kV Bus 2A06 load breakers open.
		• Emergency Chillers
		• Containment Spray Pumps
		• HPSI Pumps
		• LPSI Pumps
		• AFW Pumps
		• CCW Pumps
		• SWC Pumps
	BOP	VERIFY Train B Diesel Generator Cross-Tie Permissive switches on both units are in the 50.54X position.
	BOP	CLOSE Unit 3 Bus Tie breaker 3A0603.
	BOP	VERIFY Unit 3 Diesel Generator 3G003 output breaker remains closed.
Critical Task Statement		**With a loss of 1E power, energize at least one 4 kV and the associated 480 VAC 1E bus before DC Bus D2 voltage drops to 107.3 VDC and DC Bus D4 drops to 106.5 VDC.**
CRITICAL TASK	BOP	CLOSE Unit 2 Bus Tie breaker 2A0619.
	BOP	VERIFY Unit 2 1E buses 2A06 and 2B06 energized.
	BOP	START CCW Pump P-026 on Train B.

Critical Task Statement		**With failure of 2 or more Full Length CEAs to fully insert, perform an emergency boration (or some other alignment which adds boric acid from either the BAMU Tanks or RWST at 40 gpm or more).**
CRITICAL TASK	RO	START Charging Pump P-192 on Train B and COMMENCE boration at > 40 gpm.
		• OPEN HV-9235 and HV-9240 Gravity Feed Valves.
+35 min		• CLOSE LV-0227B VCT Outlet Block Valve.
When power is restored to Bus 2A06 and emergency boration is started, or at Lead Evaluator's discretion, TERMINATE the scenario.		

Facility:	San Onofre	Scenario No.: 3	Op Test No.: NRC
Examiners:		Operators:	
Initial Conditions:	• Reactor Critical at 2.5x10E-4% power BOC - RCS Boron is 2038 ppm (by sample) • Train A Component Cooling Water Pump (P-025) in service • Condenser Air Ejector Low Range Radiation Monitor (RM-7818) OOS • Fire Computer OOS		
Turnover:	Power increase in progress to ~ 2% power; Mini-purge & PMW sampling in progress.		
Critical Tasks:	• Restore CCW Critical Loop flow. • Trip any RCP not satisfying RCP operating limits. • Manually initiate Containment Isolation Actuation Signal.		

Event No.	Malf. No.	Event Type*	Event Description
1 + 20 min		R (RO) N (BOP, CRS)	Rod withdrawal and power increase in progress to ~2% power.
2 + 30 min	CV12	C (RO, CRS)	Inadvertent Reactor Coolant System dilution.
3 + 40 min	SG03C	TS (CRS)	Steam Generator Pressure Transmitter (PT-1023-3) fails low.
4 + 50 min	RPK624A	C (BOP, CRS) TS (CRS)	Emergency Feedwater Actuation Signal (EFAS-1) partial actuation.
5 + 65 min	RC18B	C (RO, CRS) TS (CRS)	Pressurizer Safety Valve (PSV-0201) leak less than Charging Pump capacity.
6 + 95 min	RC18A RC18B	M (ALL)	Pressurizer Safety Valves (PSV-0200 and PSV-0201) fail open.
7 + 95 min	CC06B CC06D	C (BOP)	Train A Component Cooling Water Pump (P-025) trip on SIAS. Train B Component Cooling Water Pump (P-026) trip on SIAS.
8 + 95 min	RPS LP	I (RO)	Containment Isolation Actuation System fails to actuate.

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

SCENARIO SUMMARY NRC #3

The crew will assume the watch with the Reactor critical at ~2.5x10-4% power. The crew will raise power using rod withdrawal per SO23-5-1.3.1, Plant Startup from Hot Standby to Minimum Load. A Containment Mini-Purge is in service and sampling of the Primary Water Makeup Tank is being performed at the time of turnover.

With the plant stable at 1% to 2% power, an inadvertent dilution event will occur. The crew will respond per Abnormal Operating Instruction (AOI) S023-13-11, Emergency Boration of the RCS / Inadvertent Dilution or Boration. The event is terminated when the inadvertent dilution is recognized and isolated. The crew will be required to maintain power level as the diluted water enters the RCS from the VCT throughout the scenario.

When steps of AOI SO23-13-11 are complete, a Steam Generator Pressure Transmitter will fail low. The crew will determine pressure instrument failure per Annunciator Response Procedures (ARPs), enter SO23-13-18, Reactor Protection System Failure and be required to bypass the failed channel using SO23-3-2.38, Digital Control System Operation. The CRS will evaluate Technical Specifications. The next event is a Partial ESFAS Actuation. The crew will restore Auxiliary Feedwater flow per ARPs and/or SO23-3-2.22, ESFAS Operations. The CRS will evaluate Technical Specifications.

The next event is a Pressurizer Safety Valve leak greater than 10 gpm but less than Charging Pump capacity. The crew will respond per the ARPs and AOI SO23-13-14, Reactor Coolant System Leak. The RO will be required to secure the Containment Mini-Purge and the CRS will evaluate Technical Specifications and determine that a rapid shutdown per the AOI is required.

Once the requirement to shutdown is determined, both Pressurizer Safety Valves will fail open. The crew will initiate a plant trip and perform Emergency Operating Instruction (EOI) SO23-12-1, Standard Post Trip Actions.

Train A and B Component Cooling Water Pumps will trip upon receipt of an SIAS signal. The BOP must manually start the standby CCW Pump (P-024). A Containment Isolation Actuation Signal fails to actuate and must be manually initiated by the RO.

Scenario is terminated when a transition to EOI SO23-13-3, Loss of Coolant Accident is entered and a plant cooldown is in progress.

Risk Significance:

- Failure of risk important system prior to trip: Inadvertent dilution
  Loss of AFW flow
- Risk significant core damage sequence: LOCA with CCW and CIAS failure
- Risk significant operator actions: Restore Critical Loop CCW flow
  Manually actuate CIAS

SONGS
2007 Facility NRC Retake License Examination
Simulator Scenario Setup
Scenario 3

Machine Operator:	**EXECUTE IC #183 and NRC Scenario #3 SETUP file to align components.** **VERIFY Control Board Tags removed on P-012 and P-017.** **CHANGE Operator Aid Tags #029 (CVCS) and #005-4 (CVCS Ion Exchanger) to reflect the scenario born concentration.** **VERIFY both Pressurizer Spray Valves in AUTO.** **CHANGE Operator Aid Tag #005-9 (AFW T-120/121 alignment) to AUTO MAKEUP for both T-120 and T-121.** **VERIFY Master Silence Keylock Switch in NORMAL.** **PLACE procedures in progress on the RO desk:** **- Copy of SO23-5-1.3.1 INITIALED through Step 6.4.5.** **- MARKED UP copy of SO23-5-1.7, Attachment 9.** **- MARKED UP copy of SO23-1-4.2, Attachment 6.** **PLACE the BOC copies of OPS Physics Summary Book on RO Desk and SO23-5-1.7, Attachment 8 on Control Board (located on the desk behind and adjacent to Grid Breaker Display Smart Board).** **With Simulator in RUN, OPERATE TV-0224B as follows: DEPRESS MANUAL; then ION EXCHANGE; then AUTO.** **VERIFY Primary Water Pump P-201 is running for sample.** **If Group Position(s) is (are) not correct, MOVE CEAs and then RETURN CEAs to Shift Turnover Sheet position(s).**

Significant Control Room Annunciators in Alarm at 2.5×10^{-4}%:

50A02 – COLSS ALARM
50A07 – SBCS DEMAND PRESENT
53A(B)03 – MFWP TURBINE K006 (K005) TRIP
56A30/40/50/60 – LOSS OF LOAD CHANNEL 1/2/3/4 TRIP DISABLED
63E10 – SCE CB TRIP
99A02 – EMERGENCY PUSHBUTTON TURBINE TRIP
99A24 – TURBINE TRIP RELAY TRIPPED
99B01 – GENERATOR TRIP
99B19 – VACUUM PROTECTION PLC TROUBLE
99B41(42) – AVR CH A(B) FAULT

Op Test No.: NRC	Scenario # 3	Event # 1	Page 53 of 72
Event Description:	Rod Withdrawal and Power Increase to ~2% power		

Time	Position	Applicant's Actions or Behavior
Machine Operator:		**ENSURE all Simulator Scenario Setup actions are complete.**
+1 min	CRS	DIRECT performance of SO23-5-1.3.1, Plant Startup from Hot Standup to Minimum Load.
	RO	BYPASS the High Log Power Trip on all PPS Modules per SO23-3-2.12.
	RO	POSITION Group Select switch to CEA Group 6.
	RO	POSITION Mode Select Switch to MG (Manual Group) or MS (Manual Sequential).
	RO/CRS	When directed by CRS, WITHDRAW Control Rods as required.
	RO	ESTABLISH a Startup Rate of ≤ 0.5 DPM.
Floor Cue:		**The initial startup rate based on Attachment 9 data will be ~ 0.25 DPM. In order to facilitate time requirements, REPORT as the Shift Manager that a startup rate of ≤ 0.5 DPM is desired.**
M.O. Cue:		**If asked, REPORT long path recirculation is secured.**
	RO	When CEA positioning is complete, PLACE Mode Select Switch to OFF.
	BOP	VERIFY proper operation of Steam Bypass Control System when the Point of Adding Heat is reached (~$2E^{-1}$%).

Op Test No.: NRC	Scenario # 3	Event # 1	Page 54 of 72
Event Description:	Rod Withdrawal and Power Increase to ~2% power		

Time	Position	Applicant's Actions or Behavior
+20 min	BOP	MAINTAIN Tcold within band by monitoring SBCS operation.
When power has been raised to ~2%, or at Lead Evaluator's discretion, PROCEED to Event 2.		

Op Test No.: NRC Scenario # 3 Event # 2 Page 55 of 72

Event Description: Inadvertent Reactor Coolant System Dilution

Time	Position	Applicant's Actions or Behavior
Machine Operator:		**When directed, EXECUTE Event 2.** **- CV12, Inadvertent RCS dilution**
Indications Available:		**FQIS-0210, Blended Makeup Total Flow Integrator clicking** **VCT level rising** **FIC-0210X, Flow Controller indicates ~35 gpm** **FI-7171, PMW Flow indication @ 35 gpm**
+1 min	RO	DETERMINE an inadvertent dilution by observing FQIS-0210, Blended Makeup Total Flow clicking, FIC-0210X, Flow Controller indication, and FI-7171, PMW Flow indication.
	RO	INFORM CRS of inadvertent dilution and INFORM the CRS SO23-13-11, Emergency Boration of the RCS / Inadvertent Dilution or Boration entry required.
	CRS	DIRECT placing Makeup Mode Selector to MANUAL.
	RO	PLACE Makeup Mode Selector to MANUAL.
	CRS	DIRECT stopping Primary Makeup Water Pump.
	RO	STOP Primary Makeup Water Pump.
	RO	ENSURE Letdown Heat Exchanger Outlet Temperature is maintaining at ~115°F with TIC-0223, CCW Temperature Controller in AUTO.
	RO	PLACE T-0224B, CVCS Ion Exchanger in BYPASS.
	RO	VERIFY Deborating Ion Exchange not in service.

Op Test No.: NRC Scenario # 3 Event # 2 Page 56 of 72

Event Description: Inadvertent Reactor Coolant System Dilution

Time	Position	Applicant's Actions or Behavior
	RO	ENSURE dilution flow paths isolated.
	RO	ENSURE FIC-0210X, PMW Flow Controller, and FIC-0210Y, BAMU Flow Controller, are set for correct blended makeup per SO23-3-2.2, Section to Establish Automatic Makeup Mode.
	RO	VERIFY RCS and VCT boron samples within 7 ppm.
M.O. Cue:		**When directed to perform RCS and VCT boron samples, REPORT the VCT is 5 ppm less than the RCS.**
+10 min	CRS	EVALUATE inadvertent dilution event terminated.
When plant conditions have been restored to normal, or at Lead Evaluator's discretion, PROCEED to Event 3.		

Op Test No.: NRC	Scenario # 3	Event # 3	Page 57 of 72
Event Description:	Steam Generator Pressure Transmitter Fails Low		

Time	Position	Applicant's Actions or Behavior
Machine Operator:		**When directed, EXECUTE Event 3.** **- SG03C, PT-1023-3, SG E088 Pressure Transmitter fails low**
Indications Available:		**52A13 - FWCS TROUBLE** **56A41 - SG2 E088 PRESS LO CHANNEL TRIP** **56A44 - SG1 E089 PRESS > SG2 E088 ESFAS CH TRIP** **56A51 - SG2 E088 PRESS LO PRETRIP** **56A54 - SG1 E089 PRESS > SG2 E088 PRETRIP** **56B26 - PPS CHANNEL 3 TROUBLE**
+30 sec	RO/BOP	REFER to Annunciator Response Procedures.
	BOP	RECOGNIZE Steam Generator E088 pressure instrument failed low and INFORM the CRS SO23-13-18, Reactor Protection System Failure entry required.
	CRS	REFER to Attachment 5 and DETERMINE PT-1023-3 is Functional Unit affected.
	RO	PLACE the affected Functional Unit in BYPASS per SO23-3-2.12, Section for Bypass Operation of Trip Channels.
	RO	VERIFY that the same bistable is not in bypass on any other Channel.
M.O. Cue:		**When directed, EXECUTE the following Remote Functions:** **RP51 = OPEN (PPS Door Open Annunciator 56B46)** **RP54L = BYPASS (Low SG-2 Pressure Channel C)** **RP54U = BYPASS (High SG-1 DP EFAS-1 Channel C)** **RP54V = BYPASS (High SG-2 DP EFAS-2 Channel C)** **Delete RP51 (PPS Door Open Annunciator 56B46)**
	RO	OBSERVE annunciator 56A49 - PPS CHANNEL 3 TRIP BYPASS goes into alarm.

Op Test No.: NRC Scenario # 3 Event # 3 Page 58 of 72

Event Description: Steam Generator Pressure Transmitter Fails Low

Time	Position	Applicant's Actions or Behavior
	CRS	CONFIRM failure does NOT affect RPS/ESFAS Matrix Logic, RPS/ESFAS Initiation Logic, RTCBs, RPS/ESFAS Manual Trip, or ESFAS Actuation Logic.
	CRS	CONFIRM failure affects the Feedwater Digital Control System.
	BOP	RECOGNIZE Steam Generator E089 level instrument failed low and INFORM the CRS SO23-3-2.38, Digital Control System Operation entry required.
	CRS	DIRECT performance of Section 6.6, Bypassing Selected Feedwater Control Signals.
	BOP	ACCESS the PCS Console for the Digital Feedwater Control System.
	BOP	ACCESS the **Selected Signals** screen for SG E088.
	BOP	VERIFY SG E088 Channel D signal is valid.
	BOP	SELECT BYPASS for the Channel C level instrument.
	BOP	VERIFY the Channel C level instrument indicates BYPASS.
	BOP	VERIFY the Channel D is not in BYPASS.
+5 min	BOP	VERIFY the Selected Signal output looks valid.

Op Test No.: NRC Scenario # 3 Event # 3 Page 59 of 72

Event Description: Steam Generator Pressure Transmitter Fails Low

Time	Position	Applicant's Actions or Behavior
+10 min	CRS	EVALUATE Technical Specifications.
		• 3.3.1.A, Reactor Protection System Instrumentation.
		• CONDITION A - One or more Functions with one automatic RPS trip channel inoperable; ACTION A.1 - Place Channel in bypass or trip within one (1) hour.
		• 3.3.5.B, ESFAS Instrumentation.
		• CONDITION B - One automatic trip channel inoperable for SG Pressure-Low or SG Pressure Difference-High for the EFAS function; ACTION B.1 - Place Functional Unit in bypass within one (1) hour.
When the SG pressure instrument is bypassed, or at Lead Evaluator's discretion, PROCEED to Event 4.		

Op Test No.: NRC Scenario # 3 Event # 4 Page 60 of 72

Event Description: EFAS-1 Partial Actuation

Time	Position	Applicant's Actions or Behavior
Machine Operator:		**When directed, EXECUTE Event 4. - RPK624A, Partial EFAS-1 Actuation**
Indications available: **57A11 - ESFAS TRAIN A PARTIAL ACTUATION Increase in AFW flow due to AFW Valve 2HV-4713 failing open AFW Flow indication is off-scale high on Steam Generator E089 SG E089 level increasing**		
+1 min	RO/BOP	REFER to Annunciator Response Procedure.
	RO/BOP	REFER to Plant Monitoring System Alarm Page.
	RO/BOP	DETERMINE that a Partial ESFAS Actuation has occurred and INFORM the CRS.
	CRS	DIRECT BOP to CLOSE AFW Valves and/or STOP P-141.
	BOP	CLOSE AFW Valve HV-4731 and/or STOP P-141 by DEPRESSING the STOP pushbutton.
	CRS	DIRECT performance of SO23-3-2.22, Engineering Safety Features Actuation System Operation to determine valves that may have operated.
Examiner Note:		**The crew should analyze methods to restoring feedwater flow including starting the Turbine Driven AFW Pump (P-140).**
	CRS/RO	RESTORE feedwater flow as required.

Op Test No.: NRC	Scenario # 3	Event # 4	Page 61 of 72
Event Description: EFAS-1 Partial Actuation			

Time	Position	Applicant's Actions or Behavior
Examiner Note:		**The crew may use any or all of the following procedures to aid in identifying the failed relay:** • **SO23-3.2.22, ESFAS Operation, Attachment 14** • **SO23-3-3.43, ESF Subgroup Relays Test, Attachment 3** • **SO23-3.3.43.33, ESF Subgroup Relay K-624A Test, Section 6.5**
+10 min	CRS	EVALUATE Technical Specifications.
		• LCO 3.7.5.H, Auxiliary Feedwater System.
		• CONDITION H - An automatic valve in any flow path incapable of closing upon receipt of a Main Steam Isolation Signal; ACTION H.1 - Close the affected valve or its block valve within four (4) hours.
When feedwater flow is controlled, or at Lead Evaluator's discretion, PROCEED to Event 5.		

Op Test No.: NRC Scenario # 3 Event # 5 Page 62 of 72

Event Description: Pressurizer Safety Valve Leak

Time	Position	Applicant's Actions or Behavior
Machine Operator:		**When directed, EXECUTE Event 5.** **- RC18B @ 12%, PZR Safety Valve leak**
Indications available: **57B17 - PZR RELIEF VALVE OPEN** **Identified RCS leakrate ≥ 10 gpm** **Charging flow > Letdown flow with plant conditions stable**		
+1 min	RO	REFER to Annunciator Response Procedures.
	RO	RECOGNIZE RCS leak and INFORM the CRS AOI SO23-13-14 entry required.
Floor Cue:		**If asked, REPORT the 5th LED is flashing on both Position Transducers for PZR Safety Valve PSV-0201.**
	CRS	DIRECT performance of SO23-13-14, RCS Leak.
	CRS	DETERMINE Containment Mini-Purge is in the service and DIRECT manual initiation of CPIS and CRIS.
	RO/BOP	Manually INITIATE CPIS.
	RO/BOP	Manually INITIATE one train of CRIS.
	CRS	VERIFY RCS leak is greater than 25 gpm.
	RO	DETERMINE RCS leakrate is greater than 25 GPM.
	CRS	DIRECT initiation of a rapid shutdown per SO23-5-1.7, Section for Power Descension.
	RO	DETERMINE Pressurizer level is lowering.

Op Test No.: NRC Scenario # 3 Event # 5 Page 63 of 72

Event Description: Pressurizer Safety Valve Leak

Time	Position	Applicant's Actions or Behavior
	RO	ENSURE Charging Pumps start to maintain Pressurizer level.
+5 min	RO	VERIFY VCT level is being maintained within programmed band.
	RO	OPERATE Blended Makeup System to maintain VCT level.
	RO	VERIFY Pressurizer Level – STABLE or RISING.
	CREW	QUANTIFY RCS leakage by Charging and Letdown mismatch and REPORT leakage rate to the Shift Manager.
	CRS	EVALUATE Technical Specifications.
		• LCO 3.4.13.A, RCS Operational Leakage.
		• CONDITION A - RCS LEAKAGE not within limits for reasons other than pressure boundary LEAKAGE; ACTION A.1 - Reduce LEAKAGE to within limits in four (4) hours.
	CREW	DETERMINE source of leak:
		• INSPECT Charging and Letdown Systems.
		• INSPECT Penetration Building.
		• MONITOR Radiation Monitors.
		• SAMPLE Containment Atmosphere.
	CREW	CONFIRM Radiation Monitors and Containment Atmosphere samples indicate RCS leak is in Containment.
	CREW	VERIFY that RCS Leakage exceeds 10 gpm and the source of the leakage is identified.

Op Test No.: NRC Scenario # 3 Event # 5 Page 64 of 72

Event Description: Pressurizer Safety Valve Leak

Time	Position	Applicant's Actions or Behavior
+15 min	CRS	REDUCE the leakage rate to within limits within four (4) hours or COMMENCE a shutdown to be in Hot Standby within 6 hours per SO23-5-1.4, Plant Shutdown to Hot Standby.
When Technical Specifications are addressed, or at Lead Evaluator's discretion, PROCEED to Events 6, 7, and 8.		

Op Test No.: NRC Scenario # 1 Event # 5 Page 65 of 72

Event Description: Cue Card For Aftershock Seismic Event

Time	Position	Applicant's Actions or Behavior
Machine Operator:		**When directed, EXECUTE Events 6, 7, and 8.** **- RC18A @ 100%, PZR Safety Valve (PSV-0200) fails open** **- RC18B @ 100%, PZR Safety Valve (PSV-0201) fails open** **- CC06B, Component Cooling Water Pump (P-025) trip** **- CC06D, Component Cooling Water Pump (P-026) trip** **- RPS LP, CIAS fails to actuate**
Indications Available: **50A01 - QUENCH TANK PRESS HI** **50A11 - QUENCH TANK LEVEL HI/LO** **50A21 - QUENCH TANK TEMP HI** **50A31 - PZR RELIEF VALVE OUTLET TEMP HI**		
+30 sec	CREW	RECOGNIZE RCS pressure decreasing rapidly.
	CRS	VERIFY Reactor trip and DIRECT crew to perform actions of SO23-12-1, Standard Post Trip Actions.
	RO	VERIFY Reactor Trip:
		• VERIFY Reactor Trip Circuit Breakers (8) - open.
		• VERIFY Reactor Power lowering and Startup Rate - negative.
		• VERIFY maximum of one full length CEA - NOT fully inserted.
	CRS	DETERMINE Reactivity Control criteria satisfied.
	BOP	VERIFY Turbine Trip:
		• VERIFY Main Turbine tripped.
		o HP and LP Stop and Governor valves - closed.
		• VERIFY both Unit Output Breakers - open.
		• VERIFY Main Turbine speed <2000 RPM or lowering.

Op Test No.: NRC Scenario # 1 Event # 5 Page 66 of 72

Event Description: Cue Card For Aftershock Seismic Event

Time	Position	Applicant's Actions or Behavior
	CRS	INITIATE Administrative Actions:
		• ANNOUNCE Reactor trip via PA System.
		• INITIATE Attachment 4, Worksheet.
		• INITIATE Attachment 5, Administrative Actions.
	BOP	VERIFY Vital Auxiliaries functioning properly:
		• VERIFY both 1E 4 kV Buses A04 and A06 - energized.
		• VERIFY both 1E 480 V Buses B04 and B06 - energized.
		• VERIFY all Class 1E DC Buses – energized.
		• VERIFY all Non-1E 4 kV Buses – energized.
		• DETERMINE no CCW Trains - operating AND aligned to Non-Critical Loop (NCL) and Letdown Heat Exchanger.
Critical Task Statement		**With ESFAS equipment operation without CCW flow, take action to restore CCW Critical Loop flow to at least one train of operating ESF pumps and Emergency Cooling Units.**
CRITICAL TASK	BOP	• [RNO] DETERMINE no CCW Trains are operating and START CCW Pump P-024.
	RO	DETERMINE RCS Inventory Control criteria NOT satisfied:
		• DETERMINE PZR level NOT between 10% and 70% AND NOT trending to between 30% and 60%.
		• VERIFY Core Exit Saturation Margin ≥ 20°F:
		• QSPDS page 611.
		• CFMS page 311.

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Event Description: Cue Card For Aftershock Seismic Event

Time	Position	Applicant's Actions or Behavior
	RO	DETERMINE RCS Pressure Control criteria NOT satisfied:
		• DETERMINE PZR pressure (WR and NR) NOT between 1740 PSIA and 2380 PSIA AND NOT trending to between 2025 PSIA and 2275 PSIA.
		• [RNO] DETERMINE PZR Pressure Control System is NOT restoring PZR pressure.
		• [RNO] ENSURE Normal and Aux Spray valves - closed.
		• [RNO] If PZR pressure (WR) is less than 1740 psia, ENSURE SIAS/CCAS/CRIS actuated.
Critical Task Statement		**Upon loss of CCW and prior to exceeding RCP operating limits, the affected RCP(s) will be stopped.**
	RO	DETERMINE Core Heat Removal criteria is NOT satisfied:
CRITICAL TASK		• When CIAS is MANUALLY actuated, STOP all RCPs.
		• VERIFY Core Exit Saturation Margin ≥ 20°F.
		• QSPDS page 611.
		• CFMS page 311.
	BOP	DETERMINE RCS Heat Removal criteria NOT satisfied:
		• VERIFY at least one SGs level between 21% and 80% NR.
		• DETERMINE T_C less than 545°F and NOT controlled.
		• DETERMINE heat removal is excessive:
		• [RNO] T_C – less than 545°F.
		• [RNO] ENSURE SBCS valves closed.
		• [RNO] ENSURE ADVs closed.
		• [RNO] ENSURE SG Blowdown valves closed.
		• E-088 - HV-4054 E-089 - HV-4053
		• [RNO] ENSURE Main Steam to Reheaters valves

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Event Description: Cue Card For Aftershock Seismic Event

Time	Position	Applicant's Actions or Behavior
		closed.
		• HV-2703 or HV-2704; HV-2721; HV-2751
		• VERIFY SG pressures – greater than 740 PSIA.
		• [RNO] If required, INITIATE EFAS.
	RO	DETERMINE Containment Isolation criteria NOT satisfied:
		• DETERMINE Containment pressure – greater than 1.5 PSIG.
		• [RNO] DETERMINE Containment pressure > 3.4 PSIG.
		• [RNO] ENSURE SIAS, CCAS, and CRIS actuated.
		• [RNO] DETERMINE CIAS NOT actuated.
Critical Task Statement		**With automatic actuation failure, crew manually initiates Containment Isolation.**
CRITICAL TASK	RO	Manually INITIATE Containment Isolation Actuation Signal.
	RO	• DETERMINE Containment Area Radiation Monitors energized AND alarming or trending to alarm.
		• VERIFY Secondary Plant Radiation Monitors energized AND NOT alarming or trending to alarm.
	CRS	RECORD time of SIAS, CIAS, CCAS, CRIS.
	RO	DETERMINE Containment Temperature and Pressure criteria NOT satisfied:
		• DETERMINE Containment average temperature > 120°F.
		• DETERMINE Containment pressure > 1.5 PSIG.
		• [RNO] ENSURE proper functioning of the Normal Containment Cooling.

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Event Description: Cue Card For Aftershock Seismic Event

Time	Position	Applicant's Actions or Behavior
		• [RNO] ENSURE at least one Containment Dome Air Circulator operating.
		• [RNO] DETERMINE Containment pressure > 3.4 PSIG.
		• [RNO] ENSURE all RCPs stopped.
		• [RNO] ENSURE all available Containment Emergency Cooling Units operating.
		• VERIFY Containment pressure < 14 PSIG.
	CRS	DIAGNOSE event in progress:
		• DETERMINE some Safety Function criteria are NOT met per Attachment 4, Worksheet.
		• [RNO] COMPLETE Attachment 1, Recovery Diagnostics.
		• [RNO] DIAGNOSE event as LOCA inside Containment.
		• DETERMINE that Reactor Trip Recovery is NOT diagnosed.
		• [RNO] DETERMINE all RCPs stopped.
		• DIRECT initiating Steps 12 through 15.
	BOP	INITIATE Steps 12 through 15.
	CRS	DIRECT performance of SO23-12-3, LOCA.
		• RECORD time of EOI entry.
+15 min	CRS	VERIFY LOCA diagnosis:
		• INITIATE SO23-12-10, LOCA Safety Function Status Checks.
		• INITIATE Foldout Page.
		• DIRECT performance of FS-7, Verify SI Throttle/Stop Criteria.

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Event Description: Cue Card For Aftershock Seismic Event

Time	Position	Applicant's Actions or Behavior
		• DIRECT performance of FS-3, Monitor Natural Circulation.
		• DIRECT performance of Attachment 22, Non-Qualified Loads Restoration.
		• VERIFY LOCA diagnosis, using Figure 1, Break Identification Chart.
		• INITIATE sampling of both Steam Generators for radioactivity and boron.
M.O. Cue:		**If directed to sample SGs, WAIT 10 minutes and then REPORT that E088 and E089 both have activity near background, and normal boron levels. If the SG sample valves are closed, REPORT unable to establish sample flow.**
	CRS	INITIATE Administrative actions:
		• NOTIFY Shift Manager/Operations Leader of SO23-12-3, Loss of Coolant Accident initiation.
		• ENSURE Emergency Plan is initiated.
		• IMPLEMENT Placekeeper.
	RO	VERIFY ESF actuation.
		• ENSURE the following actuated:
		• SIAS / CCAS / CRIS
	CRS	RECORD time of SIAS.
	BOP	STOP unloaded Diesel Generators.
	BOP	INITIATE SO23-12-11, Attachment 22, Non-Qualified Load Restoration.

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Event Description: Cue Card For Aftershock Seismic Event

Time	Position	Applicant's Actions or Behavior
M.O. Cue:		**When directed to restore non-qualified loads, WAIT 2 minutes, then EXECUTE ED85, Non-Qualified Loads Restoration. INFORM the Control Room that you have restored non-qualified loads.**
Examiner Note:		**At this point, the CRS may elect to secure Train B ECCS components due to loss of CCW.**
	RO	ESTABLISH Optimum SI Alignment:
		• ESTABLISH one or two train operation.
		• All Charging Pumps operating.
		• One HPSI and one LPSI per train operating.
		• All Cold leg flow paths aligned.
		• VERIFY SI flow required:
		• SI flow indicated.
	RO	• DETERMINE FS-7, VERIFY SI Throttle/Stop Criteria NOT satisfied.
	RO	VERIFY PZR pressure:
		• DETERMINE RCP NPSH requirements of SO23-12-11, Attachment 29 NOT satisfied.
		• [RNO] VERIFY all RCPs stopped.
		• [RNO] INITIATE FS-3, Monitor Natural Circulation.
	RO	VERIFY Letdown isolated.
	RO	VERIFY outside Containment radiation alarms - NOT alarming or trending to alarm.
	RO	VERIFY outside Containment sump levels - NOT abnormally rising.

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Event Description: Cue Card For Aftershock Seismic Event

Time	Position	Applicant's Actions or Behavior
	RO	VERIFY RCS sample valves, RCS and PZR head vents are closed.
	RO	VERIFY CCW parameters are normal.
	CRS/RO	DETERMINE PZR safety valves are NOT closed.
		• Request Shift Manager/Operations Leader evaluate lowering PZR pressure to aid in resetting the safety valves.
		• [RNO] Maintain core exit saturation margin greater than or equal to 20°F.
	CRS/RO	DETERMINE rate of RCS inventory and pressure loss greater than available charging pump capacity.
+30 min	CRS	DIRECT initiation of RCS cooldown.
When the RCS cooldown is initiated, or at Lead Evaluator's discretion, TERMINATE the scenario.		