Simulation Facility Peach Bottom **Scenario No.** #1 (altered bank) **Op Test No.** 2008 NRC

Examiners _____ **Operators** _____ CRS (SRO)

_____ _____ URO (ATC)

_____ _____ PRO (BOP)

Scenario Summary The scenario begins with a plant startup in progress at approximately 5% power following a refueling outage. During shift turnover, the crew is directed to swap CRD pumps due to a noisy bearing on the 'A' pump. Following the CRD pump swap, the 'B' drywell chiller trips, requiring the crew to place the standby drywell chiller in service in accordance with ON-120 "High Drywell Temperature".

Next, a loss of MCC E224-R-B results in a loss of the 'B' RPS MG set, a half scram and PCIS outboard Group II isolation. The crew will investigate, transfer RPS to the alternate supply and reset the half scram and PCIS isolation. Following the Tech Spec evaluation, startup level controller LCV-8091 will fail open, requiring the crew to manually restore and control RPV water level in accordance with OT-110 "Reactor High Level". This event is further complicated by an inadvertent RCIC initiation, requiring entry into OT-104 "Positive Reactivity Insertion" and manual shutdown of RCIC.

Following this, an EHC failure will cause reactor pressure to rise, requiring entry into OT-102 "Reactor High Pressure". The crew will be unable to reduce reactor pressure. The reactor will fail to automatically scram on high pressure and the crew will be required to insert a manual scram. Shortly after the scram, a leak will develop in the torus, requiring the crew to enter T-103 "Secondary Containment Control" and T-102 "Primary Containment Control". A turbine bypass valve (#1) will fail (remain) open and, due to a failure of the mode switch, will result in MSIVs closing when reactor pressure decreases below 850 psig. As torus level continues to drop, the crew will be required to perform T-112 "Emergency Blowdown".

Initial Conditions IC-71, ~5% power

Turnover See Attached "Shift Turnover" Sheet

Event No.	Malfunction No.	Event Type*		Event Description
1		N	URO CRS	Swap CRD pumps
2		C	PRO CRS	Drywell chiller trip
3		C TS	URO PRO CRS	Loss of MCC E224-R-B resulting in half scram and Group II outboard isolation / transfer RPS power supplies, reset half scram and isolations
4		I	URO CRS	Startup level controller (LCV-8091) failure
5		I TS	PRO CRS	Inadvertent RCIC initiation
6		C	URO CRS	EHC failure causes rising reactor pressure / reactor scram with mode switch failure (manual scram works)
7		M	ALL	Torus leak into secondary containment (torus room) leading to emergency blowdown / turbine bypass valve fails open, causing MSIVs to close (due to failed mode switch)

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

SHIFT TURNOVER

PLANT CONDITIONS:

- Unit 2 startup IAW GP-2 "Normal Plant Startup" in progress. Procedure complete up to step 6.2.61. Variance steps include:
    - 6.2.44 (Drywell purge still in progress to support drywell inspections)
    - 6.2.60 (awaiting AO-8091 troubleshooting)
- Rod Sequence Sheet is complete up to and including Group 16, rod 42-11.
- Startup ON HOLD due to erratic operation of AO-8091. Troubleshooting equipment being installed. Stay on AO-8091 for RPV level control until equipment is installed, THEN transition to Auto Level Control on the Master Controller.
- Currently in Step 1 of ReMA PB2C18-1.0.

INOPERABLE EQUIPMENT/LCOs:

- The previous shift noticed erratic operation of the Startup Level Control Valve (AO-8091). Troubleshooting is in progress.

SCHEDULED EVOLUTIONS:

- Predictive Maintenance reports a noisy bearing on the 'A' CRD pump motor and has requested a swap to the 'B' CRD pump in order to install instrumentation on the 'A' pump. Place 2B CRD pump (Standby pump) in service using SO 3.6.A-2 "Placing the Standby Control Rod Drive Hydraulic System Pump in Service". 2B CRD pump has NOT been drained.

SURVEILLANCES DUE THIS SHIFT:

- None

ACTIVE CLEARANCES:

- None

GENERAL INFORMATION:

- Reactor level control through AO-8091 using SO 6C.1.A-2 (at step 4.4).
- Startup ON HOLD due to erratic operation of AO-8091. Troubleshooting equipment being installed. Stay on AO-8091 for RPV level control until equipment is installed, THEN transition to Auto Level Control on the Master Controller.
- Containment purge in progress using SO 7B.4.A-2 (at step 4.19).
- Shell warming in progress using SO 1B.1.A-2 (at step 4.9.10).

CRITICAL TASK LIST

1. **Manually scram the reactor on recognition of failure to automatically scram at 1085 psig reactor pressure, or in any case before reactor pressure exceeds 1100 psig. Recognize failure of the reactor mode switch and shutdown the reactor using the manual scram pushbuttons.**

2. **Perform an emergency blowdown in accordance with T-112 "Emergency Blowdown" before Torus level lowers to 10.5 feet.**

Op Test No.: 1 **Scenario No.:** 1 **Event No.:** 1 **Page:** 1 of 13

Event Description: Swap CRD pumps

Cause: Noisy pump motor bearing on the 'A' CRD pump.

Effects: N/A

Time	Position	Applicant's Actions or Behavior
	CRS	Direct the URO to swap CRD pumps in accordance with SO 3.6.A-2 "Placing the Standby Control Rod Drive Hydraulic System Pump in Service".
	URO	Swap CRD pumps IAW SO 3.6.A-2 "Placing the Standby Control Rod Drive Hydraulic System Pump in Service": • Contact the Equipment Operator to verify '2B' CRD pump ready for start IAW SO 3.6.A-2 Steps 4.2.1 through 4.2.8. • Start the 2B CRD pump and monitor pump amps. • Direct the Equipment Operator to slowly open HV-2-3-36B. • Shutdown the 2A CRD pump. • Direct the Equipment Operator to close HV-2-3-36A. • Check CRD system parameters IAW SO 3.8.A-2 "Control Rod Drive Hydraulic System Routine Inspection." • Inform the CRS the pump swap is complete.
	PRO	Monitor plant parameters and assist as directed.

Op Test No.: 1 **Scenario No.:** 1 **Event No.:** 2 **Page:** 2 of 13

Event Description: 'B' drywell chiller trip

Cause: Spurious chiller motor high temperature

Effects:

1. Alarms
   - 217 D-1 "Drywell Chiller Trouble"
   - 217 J-1 "Drywell Chilled Water Hi-Lo Temp" (approx. 15 minutes after chiller trip, depending on restoration time)
   - 217 J-2 "A Drywell Chiller Discharge Hi Temp" (approx. 5 minutes after trip)
2. 'B' chiller outlet temperature increases; chilled water supply and return, drywell cooler fan outlet and return, drywell equipment drain sump outlet, and recirc pump motor temperatures all increase.
3. Drywell temperature and pressure rise accordingly.

Time	Position	Applicant's Actions or Behavior
	URO/PRO	Recognize and report alarm 217 D-1 "Drywell Chiller Trouble" and enter the corresponding Alarm Response Card. Recognize and report alarm 217 J-1 "Drywell Chilled Water Hi-Lo Temp" and enter the corresponding Alarm Response Card, if it alarms. Recognize and report alarm 217 J-2 "A Drywell Chiller Discharge Hi Temp" and enter the corresponding Alarm Response Card.
	CRS	Enter and execute ARC 217 D-1" Drywell Chiller Trouble": • Direct placing additional drywell chillers in service IAW SO 44A.6.A-2 "Placing an Additional Drywell Chiller in Service." NOTE: Drywell chillers are NOT in outage operation. • Direct performing SO 44A.7.F-2 "Response to a Drywell Chiller Trouble Alarm."
	PRO	Place the control switch for the 'B' drywell chiller in "STOP". Start the standby drywell chiller IAW SO 44A.6.A-2 "Placing an Additional Drywell Chiller in Service." • Direct an Equipment Operator to verify 2C Drywell Chiller is ready for start by performing steps 4.7 through 4.9 of SO 44A.6.A-2. • Place the 'C' chilled water pump in service by placing the pump control switch in "RUN". • Place the 'C' drywell chiller in service by placing the chiller control switch in "START". Dispatch an Equipment Operator to perform SO 44.A.7.F-2 "Response to a Drywell Chiller Trouble Alarm."

Op Test No.: 1 **Scenario No.:** 1 **Event No.:** 3 **Page:** 3 of 13

Event Description: Loss of electrical power to E224-R-B

Cause: Overcurrent trip of 480 VAC MCC circuit breaker

Effects:
1. Initial Alarm: 002 F-1 "E224 MCC FDR BKR TRIP"
2. Loss of power to multiple pieces of ECCS equipment, which will ultimately result in a Tech Spec required shutdown.

Time	Position	Applicant's Actions or Behavior
	PRO	Recognize and report alarm 002 F-1 "E224 MCC FDR BKR Trip" and enter the corresponding Alarm Response Card. Direct an Equipment Operator to investigate the E224 MCC feeder breaker trip". Direct the Equipment Operator to "green flag" the tripped breaker by placing its local control switch to the "TRIP" position. Identify loads without power by monitoring panels, reviewing associated electrical prints and reviewing Attachment 1 of AO 56E.3-2 for E224-R-B.
	CRS	Enter and execute the alarm response card for 002 F-1 "E224 MCC BKR Trip". Review Technical Specifications and determine a 3.0.3 shutdown is required due to 'B' Core Spray and 'B' RHR inoperable. Direct transfer of 'B' RPS bus to the alternate supply IAW SO 60F.6.A-2. Direct reset of the half scram IAW GP-11.E "Reactor Protection System - Scram and ARI Reset." Direct reset of PCIS Group I, II and III isolations IAW GP-8.D "Group I, II and III Outboard Half Isolation."
	PRO	Transfer 'B' RPS bus to the alternate supply IAW SO 60F.6.A-2. • Verify "ALT SOURCE AVAILABLE" light is lit at Panel 20C017. • Verify scram solenoid group 1-4 lights are lit at Panel 20C015. • Place the "RPS M/G SET ALT FEED TRANS SW" to "ALTERNATE."

Event Description: Loss of electrical power to E224-R-B...continued

Time	Position	Applicant's Actions or Behavior
	URO	Reset the half scram IAW GP-11.E "Reactor Protection System - Scram and ARI Reset." Reset half scram IAW GP-11.E. • Place the Scram Reset switch to the "Group 1 & 4 position". • Place the Scram Reset switch to the "Group 2 & 3 position". • Verify scram solenoid group 1-4 lights are lit at Panel 20C015 and Panel 20C017. • Verify scram annunciators are reset/clear. • Place the SDV Inboard Vent and Drain Valves control switch to "OPEN" and verify the valves indicate open. • Place the SDV Outboard Vent and Drain Valves control switch to "OPEN" and verify the valves indicate open.
	PRO	Reset the PCIS Group I, II and III isolations IAW GP-8.D "Group I, II and III Outboard Half Isolation." • Verify affected equipment in "Required Position" by performing COL GP-8.D. • Direct Equipment Operator to verify Reactor Building and Refuel Floor ventilation fans are tripped and all fan control switches are placed in "OFF". • Place control switches for affected equipment in the "Place Switch To" position per GP-8.D. • Place the Outboard Isolation Logic Reset Switch (16A-S33) to the "GRP II / III" position. • Verify "GROUP II / III OUTBOARD ISOL. RELAYS NOT RESET" annunciator is clear.

Op Test No.: 1 **Scenario No.:** 1 **Event No.:** 3 **Page:** 5 of 13

Event Description: Loss of electrical power to E224-R-B...continued

Time	Position	Applicant's Actions or Behavior
	PRO	Shutdown the SBGT System IAW SO 9A.2.A "Standby Gas Treatment System Shutdown Following an Automatic Start." • Place the operating SBGT Fan control switch to "STOP" and let it spring return to "AUTO". • Close the in-service 'B' SBGT Filter Train inlet and outlet valves: o AO-00476-1 o AO-00476-2 • Close the following ventilation dampers: o AO-20469-02 o AO-20470-02 o PO-20466
	PRO	Restore Reactor Building Ventilation IAW SO 40B.1.A-2 "Reactor Building Ventilation System Startup and Normal Operation." • Verify open the following dampers: o AO-20453 o AO-20461 o AO-20462 o AO-20452 o AO-20458 o AO-20463 o AO-20464 o AO-20457 o AO-20467 o AO-20468 • Direct an Equipment Operator to startup Reactor Building Ventilation.

Op Test No.: 1 **Scenario No.:** 1 **Event No.:** 4 **Page:** 6 of 13

Event Description: Startup level controller (LCV-8091) failure

Cause: Control signal failure

Effects:

1. Alarm:
   - 210 H-2 "Reactor Hi-Lo Water Level"
2. LCV-8091 fails open, causing RPV water level to rise.

Time	Position	Applicant's Actions or Behavior
	URO	Recognize and report alarm 210 H-2 "Reactor Hi-Lo Water Level" and enter the corresponding Alarm Response Cards. Control RPV water level below +35 inches. • Recognize and report LCV-8091 has failed open. • Attempt to take manual control of LCV-8091; determine valve does not respond to manual control. • Perform any of the following actions to control the transient: o Take manual control of 'C' reactor feed pump M/A station; reduce feed pump speed to reduce pump discharge pressure below RPV pressure, OR o Close MO-8090 "C RFP Bypass" and batch feed the RPV using the C RFP discharge valve, OR o Transfer to Master Level Control using SO 6C.1.A-2 "'C' Reactor Feedwater Pump Startup With Vessel Level Control Established Through AO-8091".
	CRS	Enter and execute OT-100 "Reactor Low Level" when RPV level initially lowers. Enter and execute OT-110 "Reactor High Level" when RPV level rises. Direct maintaining RPV water level below +35 inches.

Op Test No.: 1 **Scenario No.:** 1 **Event No.:** 5 **Page:** 7 of 13

Event Description: Inadvertent RCIC initiation

Cause: Initiation relay contacts short closed

Effects:
1. Alarms:
   - 227 E-3 "RCIC Relays Not Reset"
2. RCIC injection into the RPV; reactor water level and reactor power increase

Time	Position	Applicant's Actions or Behavior
	PRO	Recognize and report RCIC initiation. Using at least two independent indications, verify mis-operation of RCIC and/or adequate core cooling is assured.
	URO	Control feed pump speed / discharge pressure as necessary to maintain RPV water level below +35 inches (N/A if transferred to Auto Master Level Control in previous event).
	CRS	(May) enter and execute OT-104 "Positive Reactivity Insertion." • Using at least two independent indications, verify mis-operation of RCIC and/or adequate core cooling is assured. • Direct RCIC shutdown in accordance with SO 13.2.A-2 "RCIC System Shutdown." Enter and execute OT-110 "Reactor High Level." • Direct maintaining RPV water level below +35 inches. Refer to Tech Spec 3.3.5.2 (RCIC Instrumentation), 3.5.1 and 3.5.3: • Verify HPCI operability immediately. • Declare RCIC inoperable within 1 hour. • Determine RCIC must be restored to operable within 14 days. Request troubleshooting/technical assistance through the Shift Manager.

Event Description: Inadvertent RCIC initiation...continued

Time	Position	Applicant's Actions or Behavior

	PRO	Perform SO 13.2.A-2 "RCIC System Shutdown":
		• Trip the RCIC turbine by depressing the "Trip" pushbutton.
		• Attempt closure of MO-2-13-021 "To Feed Line".
		• Close MO-2-13-131 "Supply".
		• Verify the following:
		  o AO-2-13-034 "Drain Isol to Mn Cndr" opens.
		  o AO-2-13-035 "Drain Isol to Mn Cndr" opens.
		  o MO-2-13-132 "Cooling Water" closes.
		• Close MO-2-13-030 "Full Flow Test".
		• Close MO-2-23-024 "Cond Tank Return".
		• Place MO-4487 "Trip Throttle Vlv" to "Close".
		• Shutdown "Vac Pump" after it has run for 10-15 minutes.

Op Test No.: 1 **Scenario No.:** 1 **Event No.:** 6 **Page:** 9 of 13

Event Description: Rising reactor pressure due to EHC regulator failure / reactor scram / mode switch failure

Cause: Pressure setpoint failure results in rising reactor pressure.

Effects:

1. Alarms
   - 210 G-2 "Reactor Hi Press"
2. Reactor pressure rises, requiring a reactor scram.

Time	Position	Applicant's Actions or Behavior
	URO	Recognize and report alarm 210 G-2 "Reactor Hi Press" and enter corresponding Alarm Response Card. Recognize failure of the EHC pressure regulator, causing rising reactor pressure.
	CRS	Enter and execute OT-102 "Reactor High Pressure".
CT		Direct insertion of a manual scram before reactor pressure reaches the automatic scram setpoint (~ 1085 psig). Ensure compliance with Tech Spec 3.4.10.
	URO	Insert a manual scram before reactor pressure reaches the automatic scram setpoint (~ 1085 psig). Perform applicable scram actions: • Place the mode switch to "SHUTDOWN".
CT		• Recognize mode switch failure / failure to automatically scram; depress both manual scram pushbuttons. • Verify / report control rods are inserting. • Verify / report APRMs are downscale. • Restore and maintain RPV level by controlling 'C' feed pump speed / discharge pressure. • Verify all control rods are inserted.

Op Test No.: 1 **Scenario No.:** 1 **Event No.:** 6 **Page:** 10 of 13

Event Description: EHC regulator failure / reactor scram / mode switch failure...continued

Time	Position	Applicant's Actions or Behavior
	PRO	Perform applicable scram actions: • Verify scram discharge volume vents and drains are closed. • Verify recirc pumps are at 30% speed. • Monitor instrument air header pressure and drywell pressure. • Report to the CRS instrument air header pressure is greater than drywell pressure.
	CRS	NOTE: the CRS should initially enter T-101 "RPV Control" due to the mode switch failure (ATWS). T-101 can then be immediately exited following the scram. Enter and execute T-100 "Scram": • Direct RPV level restored and maintained between +5 and +35 inches using feedwater. • Direct instrument nitrogen restored by performing instrument nitrogen bypass (GP-8E). • Direct RPV pressure stabilized below 1050 psig.
	URO/PRO	Bypass and restore drywell instrument nitrogen IAW GP-8E. • Place AO-2969A control switch to "CLOSE". • Place AO-2969B control switch to "CLOSE". • Place Drywell Instrument Nitrogen Bypass Switch 16A-S100 in the "BYPASS" position. • Place Drywell Instrument Nitrogen Bypass Switch 16A-S99 in the "BYPASS" position.

Op Test No.: 1 **Scenario No.:** 1 **Event No.:** 7 **Page:** 11 of 13

Event Description:
1. Torus leak
2. #1 turbine bypass valve fails open

Cause:
1. Rupture in Torus shell
2. A ground on the servo motor

Effects:
1. Torus level will lower and will eventually equalize with the torus room at approximately 7 feet.
2. Alarms:
   - 224 C-5 "Torus Room Flood"
   - 226 A-4 "Torus Level Out Of Normal Range"
3. Following the scram reactor pressure will continue to lower. Due to the mode switch failure, MSIVs will close when reactor pressure decreases below 850 psig.

Time	Position	Applicant's Actions or Behavior
	PRO	Recognize and report alarm 226 A-4 "Torus Level Out Of Normal Range" and enter corresponding Alarm Response Card. Direct an Equipment Operator to determine the source of the leak.
	CRS	Enter and execute T-102 "Primary Containment Control". • Direct torus level restored using T-233 "CST Makeup to the Torus Via HPCI Minimum Flow Line". • Direct torus level restored using T-231 "HPSW Injection Into the Torus". Enter and execute ON-110 "Loss of Primary Containment".
	PRO	Perform T-233 "CST Makeup to the Torus Via HPCI Minimum Flow Line". • Verify HPCI suction MO-2-23-017 OPEN. • OPEN HPCI minimum flow MO-2-23-025.

Op Test No.: 1 **Scenario No.:** 1 **Event No.:** 7 **Page:** 12 of 13

Event Description:
1. Torus leak...continued
2. #1 turbine bypass valve fails open...continued

Time	Position	Applicant's Actions or Behavior
	PRO	Perform T-231 "HPSW Injection Into the Torus" as directed. • Verify 2B and 2D RHR pumps are shutdown. • Verify closed MO-2-10-154B "Outboard Discharge". • Verify 2B and 2D HPSW pumps are shutdown. • Verify MO-2-10-089B and MO-2-10-089D RHR Hx HPSW outlet valves CLOSED. • Verify MO-2-32-2344 (10-186) HPSW loop cross-tie CLOSED. • OPEN MO-2-10-174 and MO-2-10-176 HPSW/RHR cross-tie valves. • OPEN MO-2-10-039B "Torus Header". • Start a HPSW pump. • Throttle MO-2-10-034B to maintain 5,300 gpm flow. • Start a second HPSW pump if needed. • Throttle MO-2-10-034B to maintain 10,600 gpm flow for 2 pump operation.
	PRO	Recognize and report alarm 224 C-5 "Torus Room Flood" and enter corresponding Alarm Response Card.
	CRS	Enter and execute T-103 "Secondary Containment Control". Direct an evacuation of the torus room in accordance with GP-15 "Local Evacuation" (make request to Shift Manager).
	CRS	Direct RPV depressurization using SRVs IAW T-102 T/L-6.
	URO/PRO	Depressurize the RPV using SRVs, as directed.
	URO/PRO	Recognize and report that torus level is approaching 12.5 feet. Recognize and report that torus level is approaching 10.5 feet.

Op Test No.: 1 **Scenario No.:** 1 **Event No.:** 7 **Page:** 13 of 13

Event Description:
1. Torus leak...continued
2. #1 turbine bypass valve fails open...continued

Time		Position	Applicant's Actions or Behavior
	CT	CRS	When torus level cannot be maintained above 10.5 feet, direct an emergency blowdown. Enter and execute T-112 "Emergency Blowdown". • Verify torus level is above 7 feet. • Verify reactor pressure is 50 psig above torus pressure. • Direct 5 ADS SRVs opened.
	CT	PRO	Perform an emergency blowdown by opening 5 ADS SRVs. Report 5 ADS SRVs are open.
		CRS	When torus level drops below 10.5 feet, if any RHR pumps are running, direct all operating RHR pumps secured.
		URO/PRO	Secure all operating RHR pumps, as directed.
		URO/PRO	Recognize and report that torus level is approaching 9.5 feet.
		CRS	Direct RPV level maintained between +5 and +35 inches using HPCI (and/or condensate, depending on reactor pressure).
		URO	Maintain RPV level between +5 and +35 inches using HPCI and/or condensate, as directed.

TERMINATION CRITERIA:
The scenario may be terminated when the RPV is depressurized and HPSW is injecting into the torus.

Simulation Facility Peach Bottom **Scenario No.** #2 (altered bank) **Op Test No.** 2008 NRC

Examiners _____ **Operators** _____ CRS (SRO)

_____ _____ URO (ATC)

_____ _____ PRO (BOP)

Scenario Summary The scenario begins with the reactor at approximately 76% power with power ascension on hold. The crew will perform ST-O-001-200-2 "Turbine Stop Valve Closure and EOC-RPT Functional Test" when an RPS failure will require the crew to make a Tech Spec declaration. This will be followed by a trip of the in-service TBCCW pump with a failure of the standby pump to auto-start. The crew will be required to respond IAW ON-118 "Loss of TBCCW" and place the standby TBCCW pump in service. Following this, the 'A' SRV will inadvertently open, requiring the crew to take actions IAW OT-114 "Inadvertent Opening of a Relief Valve". Power will be reduced in accordance with GP-9-2 "Fast Power Reduction". The crew will be successful in closing the 'A' SRV by directing plant operators to pull fuses for the valve.

A small steam leak inside the primary containment will occur next. The crew will be required to take actions in accordance with OT-101 "High Drywell Pressure". When the reactor is scrammed, a hydraulic ATWS will occur, requiring the crew to enter T-101 "RPV Control" and T-117 "Level/Power Control". A failure of the Standby Liquid Control pump will require the crew to start the other pump in order to successfully lower reactor power.

The crew will also be required to enter T-102 "Primary Containment Control" due to high drywell pressure. After diagnosing the inability to spray the containment due to an instrument failure, the crew will perform T-112 "Emergency Blowdown". One ADS SRV will fail to open, requiring the opening of another SRV. The crew will need to implement T-216 "Control Rod Insertion By Manual Scram Or Individual Scram Test Switches" and T-220 "Driving Control Rods During Failure To Scram" to terminate the ATWS.

Initial Conditions IC-72, 76% power

Turnover See Attached "Shift Turnover" Sheet

Event No.	Malfunction No.	Event Type*		Event Description
1		N TS	PRO CRS	Perform the main turbine stop valve functional test / RPS failure during functional test performance
2		C	URO CRS	TBCCW pump trip w/ failure of standby pump to auto-start
3		C TS	PRO CRS	SRV inadvertently opens, requiring torus cooling to be maximized / SRV closes when control power fuses are removed
4		R	URO CRS	Fast power reduction due to SRV opening
5		M	ALL	Steam leak in the primary containment / hydraulic ATWS / pressure instrument failure prevents using containment sprays
6		C	URO CRS	Standby liquid control pump trips requiring manual start of the alternate pump
7		I	PRO CRS	ADS SRV fails to open during emergency blowdown requiring an additional SRV to be opened

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

SHIFT TURNOVER

PLANT CONDITIONS:

- Approximately 76% power.
- A load drop had been performed for control rod sequence exchange.
- GP-5 "Power Operation" is at step 5.1.2.
- Power ascension is on hold. Power ascension ReMA and rod sequence sheets are being evaluated by Reactor Engineer.

INOPERABLE EQUIPMENT/LCOs:

- The "A" loop of RHR is out of service due to work on RHR valve MO-2-10-154A "Outboard Discharge". Three hours into LCO 3.5.1, with expected return to service in 1 day.

SCHEDULED EVOLUTIONS:

- Perform ST-O-001-200-2 "Turbine Stop Valve Closure and EOC-RPT Functional". It is already completed through step 6.2.1.34.
- A routine Diesel Fuel Oil delivery is expected this shift.

SURVEILLANCES DUE THIS SHIFT:

- Perform ST-O-001-200-2 "Turbine Stop Valve Closure and EOC-RPT Functional". It is already completed through step 6.2.1.34.

ACTIVE CLEARANCES:

- RHR Loop 'A'

GENERAL INFORMATION:

- Complete the Turbine Stop Valve functional test, beginning at step 6.3.1.
- An extra RO is available to perform ST-O-001-200-2, steps 6.3.7.2 though 4 and 6.3.8.1 through 3 ONLY.

CRITICAL TASK LIST

1. **Before torus temperature exceeds the limits of the Heat Capacity Temperature Limit (HCTL) curve, lower reactor power by performing T-240 "Terminating and Preventing Injection" to lower RPV level until:**

   a. **Reactor power is below 4%, OR**

   b. **RPV level reaches –172 inches, OR**

   c. **All SRVs remain closed and drywell pressure is below 2 psig.**

2. **Perform an emergency blowdown in accordance with T-112 "Emergency Blowdown" when drywell bulk average temperature cannot be restored and maintained below 281 degrees F.**

3. **Initiate a reactor shutdown by inserting control rods in accordance with T-216 "Control Rod Insertion by Manual Scram or Individual Scram Test Switches" and/or T-220 "Driving Control Rods During Failure to Scram" and/or shutdown the reactor by initiating Standby Liquid Control before torus temperature exceeds the limits of the Heat Capacity Temperature Limit (HCTL) curve.**

Op Test No.: 1 **Scenario No.:** 2 **Event No.:** 1 **Page:** 1 of 14

Event Description: Perform the turbine stop valve functional test

Cause: N/A

Effects: N/A

Time	Position	Applicant's Actions or Behavior
	CRS	Direct the PRO to perform ST-O-001-200-2 "Turbine Stop Valve Closure and EOC-RPT Functional."
	PRO	Perform ST-O-001-200-2 "Turbine Stop Valve Closure and EOC-RPT Functional": • Review ST • Inform the Unit Reactor Operator that the test is going to be conducted and what indications can be expected (this may be covered during turnover and/or a CRS briefing). • At Panel 20C015 and 20C017: 1. Verify all RPS 'A' and 'B' scram solenoid group 1-4 lights are lit. 2. Verify A1 and B1 TURB STOP VALVE NORMAL lights are lit. • At Panel 20C008B, place the CV/SV test selector switch to "SV TEST". • Verify the lights on all four TSV test buttons are ON. • At Panel 20C015, place the EOC-RPT test switch in "TEST" (Key #18). • Verify alarm 214 D-3 SYSTEM I EOC-RPT LOGIC PWR FAIL/TEST. • At Panel 20C008B, depress and hold TSV-1 test pushbutton. 1. Verify TSV-1 position indicator moves smoothly at low speed to less than 10% open and then fast closes. 2. After 2 to 3 seconds at full close, release the test pushbutton. 3. Verify TSV-1 valve position indicator moves smoothly from closed to full open. • When the RPS relay failure is reported, STOP the functional test. 1. Place the CV/SV test selector switch to "OFF". 2. Verify the lights on all four TSV test buttons are off. 3. Place backup EHC pump to "STOP", then back to "AUTO".
	URO	Monitor plant parameters/assist as directed.

Op Test No.: 1 **Scenario No.:** 2 **Event No.:** 1 **Page:** 2 of 14

Event Description: RPS failure during turbine stop valve functional test

Cause: Turbine stop valve position switch input to RPS logic fails

Effects: RPS instrumentation failure; application of Tech Specs

Time	Position	Applicant's Actions or Behavior
		NOTE: the "Extra RO" at Panels 20C015 and 20C017, role played by the Simulator Operator in the booth, will provide the crew with the following information from ST-O-001-200-2, allowing the CRS to apply Tech Specs: • Step 6.3.7.2 – auxiliary scram relay 5A-K10A **did** de-energize. • Step 6.3.7.3 – auxiliary scram relay 5A-K10B **did not** de-energize. • Step 6.3.7.4 – indicating light 5A-DS26B **is lit**.
	PRO	Stop the functional test when the RPS failure is reported. Perform system restoration IAW ST-O-001-200-2, step 6.7 (see previous page).
	CRS	Direct stopping the functional test and system restoration when the RPS failure is reported. Review Tech Spec 3.3.1.1.A (RPS Function 8 on Table 3.3.1.1-1): • Determine need to place associated trip system in TRIP within 12 hours. Review Tech Spec 3.3.4.2.A: • Determine EOC-RPT instrumentation must be restored, or channel placed in trip, within 72 hours.

Op Test No.: 1 **Scenario No.:** 2 **Event No.:** 2 **Page:** 3 of 14

Event Description: TBCCW pump failure / trip with failure of the standby pump to auto-start

Cause: Overload of 2A TBCCW pump due to excessive motor bearing friction
Failure of PS-2131 to actuate on low TBCCW System pressure

Effects:
1. Alarm: 217 C-5 "TURB BLDG COOLING WATER SUPPLY LO PRESS"
2. Loss of cooling to TBCCW loads

Time	Position	Applicant's Actions or Behavior
	URO	Recognize annunciator 217 C-5 "TURB BLDG COOLING WATER SUPPLY LO PRESS" and report trip of 2A TBCCW pump. Respond IAW Alarm Response Card. Place 2A TBCCW pump control switch to "OFF". Recognize failure of 2B TBCCW pump to auto start after 20 seconds.
	CRS	Enter ON-118 "Loss of TBCCW". Direct starting the 2B TBCCW pump. Direct follow-up use of SO 34.6.A-2 "Placing Standby TBCCW System Pump In Service". Direct troubleshooting.
	URO	Place 2B TBCCW pump control switch to "RUN". Verify placing standby TBCCW pump in service IAW SO 34.6.A-2 "Placing Standby TBCCW System Pump In Service".
	PRO	Monitor plant parameters/assist as necessary.

Op Test No.: 1 **Scenario No.:** 2 **Event No.:** 3 **Page:** 4 of 14

Event Description: SRV 'A' inadvertently opens

Cause: Mechanical failure of relief valve pilot

Effects:

1. Alarms:
   - 210 D-2 "Safety Relief Valve Open"
   - 227 B-4 "Blowdown Relief Valves Hi Temp"
2. Loss of Generator Load, steam flow/feed flow mismatch, heat input to the primary containment.

Time	Position	Applicant's Actions or Behavior
	URO/PRO	Recognize, report, and take actions IAW ARC 210 D-2 "Safety Relief Valve Open" and ARC 227 B-4 "Blowdown Relief Valves Hi Temp".
	CRS	Enter/direct actions IAW OT-114 "Inadvertent Opening of a Relief Valve": • Lead crew in confirming an SRV is open. • Direct the 'B' loop of RHR placed in torus cooling. • Direct attempts to close the 'A' SRV.
	URO/PRO	Confirm the 'A' SRV is open IAW OT-114.
	PRO	Cycle the 'A' SRV control switch when directed. Monitor torus temperature. Place the 'B' loop of RHR in torus cooling IAW RRC 10.1-2 "RHR System Torus Cooling During a Plant Event" when directed. • OPEN MO-2-10-039B • OPEN MO-2-32-89B(D) • START B(D) HPSW pump • START B(D) RHR pump • OPEN MO-2-10-034B • VERIFY 11,500 to 12,200 gpm RHR flow • START remaining HPSW pump in B RHR loop • OPEN MO-2-32-89D(B) • START remaining RHR pump in B RHR loop • VERIFY >20,000 gpm RHR loop flow • Direct Equipment Operator to CLOSE stayfull injection valve HV-2-10-70B.

Op Test No.: 1 **Scenario No.:** 2 **Event No.:** 3 **Page:** 5 of 14

Event Description: SRV 'A' inadvertently opens...continued

Time	Position	Applicant's Actions or Behavior
	URO	Perform a Fast Power Reduction IAW GP-9-2 when directed (Event 4).
	URO/PRO	Coordinate removal of fuses by Equipment Operator and monitor valve status during attempts to close the 'A' SRV. Report to the CRS when the 'A' SRV has closed.
	CRS	Declare the 'A' SRV inoperable and verify compliance with Tech Spec 3.5.1.F. • Determine 'A' SRV must be restored within 72 hours with 'A' loop of RHR also out of service.

Op Test No.: 1 **Scenario No.:** 2 **Event No.:** 4 **Page:** 6 of 14

Event Description: Perform a fast power reduction

Cause: Directed from OT-114 "Inadvertent Opening of a Relief Valve"

Effects: N/A

Time	Position	Applicant's Actions or Behavior
	CRS	Direct a Fast Power Reduction IAW GP-9-2.
	URO	Reduce recirculation flow to 61.5 Mlbs/hr IAW GP-9-2 "Fast Power Reduction."
	CRS	When recirculation flow has been lowered IAW GP-9-2, direct EHC pressure setpoint lowered until PAM pressure is 900 psig.
	URO	Lower EHC pressure setpoint until PAM pressure is 900 psig, as directed.
	PRO	Maintain the main generator auto-manual voltage regulator balanced (when it alarms). Notify the Power System Director of the required power change.

Op Test No.: 1 **Scenario No.:** 2 **Event No.:** 5 **Page:** 7 of 14

Event Description: Steam leak in the primary containment / ATWS

Cause: Steam leak at SRV 'A' mounting boss; steam cutting at break increases size of leak.

Effects:

1. Initial Alarms:
   - 210 F-2 "Drywell Hi-Lo Press"
   - 225 A-4 "Drywell Hi-Lo Press"
2. Drywell pressures and temperatures will rise at an increasing rate, eventually leading to a high drywell pressure alarm and scram if not scrammed manually. ECCS automatic start signals and PCIS isolation signals will be received. Conditions will escalate, requiring containment sprays.

Time	Position	Applicant's Actions or Behavior
	URO/PRO	Recognize and report rising drywell pressure, OT-101 "High Drywell Pressure" entry condition.
	CRS	Enter/direct follow-up actions IAW OT-101: • If drywell pressure cannot be maintained below 1.2 psig, direct a GP-4 "Manual Scram". • Direct placing additional drywell cooling in service as necessary. • Direct isolation of potential leak sources.
	URO	Take scram actions when directed: • Runback recirc to minimum. • Place the mode switch to "SHUTDOWN". • Verify rods are inserting. • Report an ATWS is in progress with reactor power > 4% (T-101 entry condition).
	PRO	Take scram actions when directed: • Transfer 13 KV house loads. • Verify Group II & III isolations and SGTS initiation. • Verify HWC isolated. • Investigate sources of drywell leakage.

Event Description: Steam leak in the primary containment / ATWS...continued

Time	Position	Applicant's Actions or Behavior
	URO/PRO	Recognize drywell pressure/temperature are continuing to rise. Recognize and report 2 psig in the Drywell as a T-101 AND T-102 entry condition. Verify and take action for 2 psig automatic initiations and isolations (HPCI initiation, Diesel Generator auto start, Group II/III isolations).
	CRS	Enter/direct actions for T-101 "RPV Control": • Verify URO/PRO scram actions. • Direct drywell instrument nitrogen restored. • Direct RPV pressure stabilized below 1050 psig. Direct actions for the ATWS condition (see next page).
	PRO	Bypass and restore drywell instrument nitrogen. Stabilize RPV pressure below 1050 psig.
	CRS	Enter/direct actions for T-102 "Primary Containment Control": • Monitor primary containment conditions. • Direct manual isolation of RBCCW and Drywell Chilled Water using GP-8B. • Direct restoration of Drywell cooling IAW T-223 "Drywell Cooler Fan Bypass". • Direct Torus sprays with the 'B' loop of RHR IAW T-204.

Op Test No.: 1 **Scenario No.:** 2 **Event No.:** 5 **Page:** 9 of 14

Event Description: Anticipated transient without scram (hydraulic)

Cause: Scram condition with power above 4% or unknown due to RPS failure

Effects: Requires the crew to take actions to terminate the ATWS, as well as control RPV level/power

Time	Position	Applicant's Actions or Behavior
	CRS	Direct T-101, RC/Q ATWS actions:
		• Initiation of ARI
		• Trip recirc pumps at least 10 seconds apart
CT		• T-216 "Reset Scram, Drain SDV, Insert Rods..."
CT		• T-220 "Drive Rods"
		• Enter T-117 "Level/Power Control"
		• SLC injection
	URO	Perform T-101, RC/Q actions:
		• Initiate ARI; report the scram air header is depressurized.
		• Trip Recirc pumps at least 10 seconds apart.
		• Initiate SLC by starting either SLC pump (see Event #6).
CT		• Direct an Equipment Operator to perform T-216 steps 4.1 and 4.2 (install jumpers in Cable Spreading Room and Main Control Room to defeat ARI Initiation Logic and bypass all RPS Auto Scram signals).
CT		• Per T-216 (on the 20C05A panel)
		o Reset ARI by placing ARI A & B manual pushbutton collars in "Disarm".
		o Depress the A & B ARI reset pushbuttons.
		o Place the Scram Reset switch 5A-S9 to the "Group 1&4" and "Group 2&3" positions.
		o Open Scram Discharge Volume inboard and outboard vents and drains.
CT		• Perform T-220 "Driving Control Rods During Failure To Scram".

Event Description: Anticipated transient without scram...continued

Time	Position	Applicant's Actions or Behavior
	CRS	Direct T-117 actions: • Inhibit ADS. • T-221 "Main Steam Isolation Valve Bypass". • T-240 "Termination And Prevention Of Injection Into The RPV".
CT		
	PRO	Perform T-117 actions: • Inhibit ADS. • Direct Equipment Operator to perform T-221.
CT		• Perform T-240: terminate and prevent injection from all injection sources except RCIC, SLC and CRD; control RPV level below –60 inches and within the specific RPV level band directed by the CRS. o Place HPCI Aux Oil Pump in the "Pull-to-Lock" position. o Press "Emergency Stop" for all reactor feed pumps. o Close reactor feed pump discharge valves MO-2149A, B, C. o Verify closed MO-8090 "C RFP Discharge Bypass".

Op Test No.: 1 **Scenario No.:** 2 **Event No.:** 5 **Page:** 11 of 14

Event Description: Pressure instrument failure prevents using containment sprays

Cause: Drywell pressure input to spray logic permissive not functioning

Effects:
1. Alarm 225 B-3 "System II Drywell Pressure Permit Containment Spray" is NOT received
2. Prevents containment spray

Time	Position	Applicant's Actions or Behavior
	PRO	Recognize the absence of alarm 225 B-3 "System II Drywell Pressure Permit Containment Spray". While attempting to initiate torus sprays, recognize the inability to throttle MO-38B open to obtain 1000 gpm. Report inability to spray the containment.
	CRS	Recognize the inability to maintain drywell bulk average temperature less than 281 degrees F.

Op Test No.: 1 **Scenario No.:** 2 **Event No.:** 6 **Page:** 12 of 14

Event Description: Standby liquid control pump trips

Cause: SLC Pump first placed into service trips on overcurrent

Effects: Standby SLC Pump must be placed into service manually to mitigate ATWS

Time	Position	Applicant's Actions or Behavior
	URO	Recognize the Standby Liquid Control (SLC) pump placed into service has tripped.
CT		Place the standby SLC pump in service using keylock control switch on the 20C05A panel.
CT	CRS	If not already performed, direct placing the standby SLC pump in service.

Op Test No.: 1 **Scenario No.:** 2 **Event No.:** 7 **Page:** 13 of 14

Event Description: 'C' SRV fails to open

Cause: Valve is stuck on its main seat

Effects: Crew must open another SRV

Time	Position	Applicant's Actions or Behavior
	CRS	Direct the PRO to terminate and prevent RPV injection IAW T-240 except for RCIC, SLC and CRD.
		Verify torus level is above 7 feet.
		Verify RPV pressure is 50 psig or more above torus pressure.
CT		Direct the PRO to open all ADS SRVs with the exception of SRV 'A', and another non-ADS SRV, for a total of five SRVs.
	PRO	Perform T-240 when directed.
CT		Place required SRV control switches to the "OPEN" position; recognize and report the 'C' SRV fails to open.
CT	CRS	Direct the PRO to open another SRV so that a total of 5 SRVs are open.
CT	PRO	Open an additional SRV; report 5 SRVs are open.
	CRS	When RPV pressure drops below 270 psig, direct the PRO to slowly raise RPV injection rate to restore and maintain RPV level above –195 inches.
		Re-enter T-102 on high torus temperature.
	URO	Observe control rods inserting into the core and report when all rods are fully inserted.
	CRS	Exit T-117, and enter T-101 at step RC/L-1.
		Direct RPV level restored and maintained between +5 and +35 inches.

Op Test No.: 1 **Scenario No.:** 2 **Event No.:** 7 **Page:** 14 of 14

Event Description: 'C' SRV fails to open...continued

Time	Position	Applicant's Actions or Behavior

TERMINATION CRITERIA:

The scenario may be terminated when:

- 5 SRVS are open,

  and

- The RPV is depressurized,

  and

- RPV level is under control,

  and

- The crew begins draining the Scram Discharge Volume per T-216 "Control Rod Insertion By Manual Scram Or Individual Scram Test Switch" in order to attempt another scram to insert control rods, and/or control rods are being inserted in accordance with T-220 "Driving Control Rods During Failure To Scram".

Simulation Facility Peach Bottom **Scenario No.** #3 (modified bank) **Op Test No.** 2008 NRC

Examiners _____ **Operators** _____ CRS (SRO)

_____ _____ URO (ATC)

_____ _____ PRO (BOP)

Scenario Summary The scenario begins with the reactor at 95% power. Immediately after shift turnover the crew will commence the HPCI functional and in-service test. While the test is in progress, the running Service Water pump will trip on overcurrent, requiring the crew to place the standby pump in service using the system operating procedure. The crew will then receive a report from the field of a HPCI system cooling water leak, requiring HPCI to be shutdown and declared inoperable. Next, a loss of DC power to an in-service RPS MG set output breaker will occur, requiring application of the appropriate Tech Spec. When this is complete, the 'A' Condensate pump will trip without the expected Recirc System runback. Power must be manually reduced using recirc flow to prevent a low-level scram.

When conditions have stabilized, #2 Auxiliary Bus will trip on overcurrent, removing the remaining Condensate pumps from service. An RPS failure will prevent the automatic and manual scrams, requiring entry into T-101 "RPV Control", T-117 "Level/Power Control", and the use of Alternate Rod Insertion (ARI) to shutdown the reactor. The scram discharge volume will fail to completely isolate and must be manually isolated. RCIC will trip when either started manually or automatically, which will remove the final source of high pressure feed. As level deteriorates, the crew should start available low pressure ECCS pumps and when the crew determines level cannot be restored and maintained above -195 inches, the reactor will be depressurized in accordance with T-112 "Emergency Blowdown", after terminating and preventing injection per T-240 (due to the six-rod ATWS). Low pressure ECCS will be available to recover reactor level.

Initial Conditions IC-73, 95% power

Turnover See Attached "Shift Turnover" Sheet

Event No.	Malfunction No.	Event Type*		Event Description
1		N	PRO CRS	Perform HPCI surveillance testing
2		C	URO CRS	Service Water pump trip, requiring manual start of standby pump
3		C TS	PRO CRS	HPCI cooling water leak requires HPCI shutdown
4		TS	CRS	Loss of DC power to RPS MG set output breaker
5		R	URO CRS	Condensate pump trip with recirc runback failure / power reduction
6		M	ALL	Loss of #2 auxiliary bus / loss of condensate & feedwater / RCIC trips on over-speed during startup and cannot be reset
7		C	URO CRS	RPS failure requires ARI initiation to scram the reactor / ATWS (six control rods) requires terminating and preventing injection before emergency depressurization
8		I	PRO CRS	Two in-series scram discharge volume (SDV) vent valves fail to automatically isolate

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

SHIFT TURNOVER

PLANT CONDITIONS:

- Unit 2 is steady at 95% power.
- GP-5 "Power Operations" is in progress, complete through step 5.3.29.

INOPERABLE EQUIPMENT/LCOs:

- None

SCHEDULED EVOLUTIONS:

- Raise power to 100% once Reactor Engineers revise ReMA guidance for returning to full power.
- Complete ST-O-023-301-2 "HPCI Pump, Valve, Flow And Unit Cooler Functional And In-Service Test" that was started last shift. Complete through step 6.4.6; next step is 6.4.7.
- **Step 6.5.11 is N/A** (more than one start has been performed in CST-to-CST mode).

SURVEILLANCES DUE THIS SHIFT:

- ST-O-023-301-2 "HPCI Pump, Valve, Flow And Unit Cooler Functional And In-Service Test"

ACTIVE CLEARANCES:

- None

GENERAL INFORMATION:

- In accordance with GP-5 "Power Operations" power was lowered to 90% under the Reactor Engineers guidance to perform a rod pattern adjustment. Rod manipulations are complete and power has been raised to 95%. The Reactor Engineers are running predictors and will revise ReMA guidance for returning to full power.

CRITICAL TASK LIST

1. **Recognize failure of the Reactor Protection System to shutdown the reactor and initiate Alternate Rod Insertion (ARI) in accordance with T-101 "RPV Control" and RRC 3B.1-2 "Alternate Rod Insertion During A Plant Event".**

2. **Manually isolate the Scram Discharge Volume (SDV) vent valves.**

3. **Perform an emergency blowdown in accordance with T-112 "Emergency Blowdown" when RPV water level cannot be restored and maintained above -195 inches.**

Op Test No.: 1 **Scenario No.:** 3 **Event No.:** 1 **Page:** 1 of 12

Event Description: HPCI surveillance testing IAW ST-O-023-301-2

Cause: N/A

Effects: N/A

Time	Position	Applicant's Actions or Behavior
	CRS	Direct PRO to perform ST-O-023-301-2 "HPCI Pump, Valve, Flow and Unit Cooler Functional and In-service Test" beginning at step 6.4.7.
	PRO	Perform ST-O-023-301-2 beginning at step 6.4.7: • Start 20K002 "HPCI Vac Pump"; request Equipment Operator to record data on Data Sheet 2. • Open MO-2-23-021 "HPCI Full Flow Test" and stop valve movement after approximately 4 seconds. • Verify MO-2-23-017 "HPCI Cond Tank Suction" open; direct Equipment Operator to record local data. • Verify MO-2-23-031 "HPCI Flush to Torus" closed. • Open MO-2-23-024 "HPCI Cond Tank Return". • Perform the following actions simultaneously to initiate a HPCI quick start: o Open MO-2-23-014 "HPCI Supply". o Start 20P026 "HPCI Aux Oil Pump". o Start stopwatch. • During pump start, throttle MO-2-23-021 to obtain desired flow and pressure. Once obtained, stop the stopwatch. • Verify MO-2-23-025 "HPCI Minimum Flow Valve" is closed. • Record required system parameters on Data Sheets 3 and 4. NOTE: the next events will occur once HPCI operation is stable and the PRO is recording system parameter data on Data Sheets 3 and 4.

Op Test No.: 1 **Scenario No.:** 3 **Event No.:** 2 **Page:** 2 of 12

Event Description: 'B' Service Water pump trips on overcurrent

Cause: Motor winding failure

Effects:

1. Alarms:
   - 216 H-1 "'B' Service Water Pump Trip"
   - 216 H-2 "'B' Service Water Pump OVLD"
   - 216 F-1 "Service Water Header Lo Press" (instructor override)
2. Loss of 'B' Service Water pump, requiring manual start of 'C' Service Water pump.

Time	Position	Applicant's Actions or Behavior
	URO/PRO	Recognize and report the following alarms and enter corresponding Alarm Response Cards: • 216 H-1 "'B' Service Water Pump Trip" • 216 H-2 "'B' Service Water Pump OVLD" • 216 F-1 "Service Water Header Lo Press" Recognize and report trip of the 2B Service Water pump. Green flag the 2B Service Water pump control switch. Dispatch an Equipment Operator to investigate the pump and breaker.
	CRS	Enter and direct actions of Alarm Response Cards 216 F-1, 216 H-1 and 216 H-2. Direct placing the 2C Service Water pump in service IAW SO 30.1.A-2 "Unit 2 Service Water System Normal Operations".
	PRO	Place the 2C Service Water pump in service IAW SO 30.1.A-2 as follows: • Direct an Equipment Operator to prepare the 2C Service Water pump for start IAW SO 30.1.A-2, steps 4.2.3 and 4.2.4. • Start the 2C Service Water pump by placing the pump control switch in "Run". • Verify Service Water pump discharge pressure is 65-95 psig (both in the Control Room and locally).
	CRS	Request troubleshooting/technical assistance through the Shift Manager.

Op Test No.: 1 **Scenario No.:** 3 **Event No.:** 3 **Page:** 3 of 12

Event Description: HPCI cooling water leak

Cause: Cooling water pipe rupture at the inlet to the lube oil cooler

Effects:
1. Alarm: 221 B-3 "HPCI Turb Oil Cooler Disch Oil Temp High"
2. Rising HPCI lube oil temperature and cooling water system leak, requiring HPCI shutdown.

Time	Position	Applicant's Actions or Behavior
	PRO	Recognize and report alarm 221 B-3 "HPCI Turb Oil Cooler Disch Oil Temp High" and enter corresponding Alarm Response Card.
	CRS	Enter and direct actions of Alarm Response Card 221 B-3. NOTE: CRS may direct tripping HPCI and following up with SO 23.2.A-2 Direct HPCI System shutdown IAW SO 23.2.A-2 "HPCI System Shutdown".
	PRO	Shutdown the HPCI System IAW SO 23.2.A-2 "HPCI System Shutdown" as follows: • Verify the Aux Oil Pump control switch is in "Start". • Verify the Vacuum Pump control switch is in "Start". • Depress and hold the HPCI System "Remote Trip" pushbutton. • Verify the Aux Oil Pump starts as turbine slows down (1200 – 1500 RPM). • Close MO-2-23-014 "Supply". • Close MO-2-23-019 "To Feed Line". • When MO-2-23-014 is fully closed, release the "Remote Trip" pushbutton. • Close MO-2-23-021 "Full Flow Test". • Close MO-2-23-024 "Cond Tank Return". • After verifying the HPCI turbine shaft is stopped, place the Aux Oil Pump control switch in "Stop". NOTE: the crew should place the AOP in "Pull-to-Lock" to prevent HPCI startup.

Event Description: HPCI cooling water leak...continued

Time	Position	Applicant's Actions or Behavior
	CRS	Direct closing MO-2-23-017 "HPCI Cond Tank Suction" to stop the cooling water leak. Reference Tech Spec. 3.5.1 Condition C and determine that with HPCI inoperable: • RCIC must be verified operable immediately by administrative means AND • HPCI System must be restored to operable status within 14 days OR • The plant must be in MODE 3 within 12 hours and reactor steam dome pressure must be <150 psig within 36 hours.
	PRO	Close MO-2-23-017 "HPCI Cond Tank Suction", as directed. NOTE: the crew may direct an Equipment Operator to open the breaker for MO-2-23-017 at MCC 2DB-R-B.
	CRS	Request troubleshooting/technical assistance through the Shift Manager.

Op Test No.: 1 **Scenario No.:** 3 **Event No.:** 4 **Page:** 5 of 12

Event Description: Loss of DC power to the 'B' RPS MG set output breaker

Cause: Loss of DC power from 2DD25, circuit 19, to breaker BC757

Effects:
1. Alarm: 208 E-2 "RPS 'B' M-G Set Trouble or in Test"
2. Loss of trip capability for one of the two 'B' RPS MG set output breakers

Time	Position	Applicant's Actions or Behavior
	URO	Recognize and report alarm 208 E-2 "RPS 'B' M-G Set Trouble or in Test" and enter corresponding alarm response card. Recognize that RPS 'B' is NOT tripped.
	CRS	Enter and execute ARC 208 E-2: • Recognize that 2BC757 breaker is not tripped since RPS did not trip. • Direct an Equipment Operator dispatched to verify the status of DC control power at 2BD25, circuit 17, and 2DD25, circuit 19.
	PRO	Use the alarm response card to assist in troubleshooting the annunciator, as directed.
	URO	Monitor plant parameters/assist as directed or requested.
	CRS	Reference Tech Spec 3.3.8.2 Condition A to make the following determination: • With DC power and therefore trip capability lost for one of the two 'B' RPS MG set output breakers, the 'B' RPS MG set must be removed from service within 72 hours.

Op Test No.: 1 **Scenario No.:** 3 **Event No.:** 5 **Page:** 6 of 12

Event Description: 'A' Condensate pump trip with automatic Recirc runback failure / power reduction

Cause: 'A' Condensate pump trips on overcurrent / relay failure in the Recirc runback logic

Effects:

1. Alarms:
   - 203 E-1 "A Condensate Pump Overload"
   - 203 E-2 "A Condensate Pump BKR Trip"
2. Recirc automatic runback fails to occur, resulting in lowering RPV level and requiring manual recirc flow reduction to control RPV level.

Time	Position	Applicant's Actions or Behavior
	URO	Recognize and report trip of the 'A' Condensate pump. Recognize and report the 45% Recirc pump runback failed to occur automatically. Recognize the RPV water level drop is caused by a lack of makeup capability, requiring power to be lowered with Recirculation. Recognize and announce entry into the OT-100 "Reactor Low Level": • Reduce power by lowering the 'A' and 'B' Recirc pump speed controllers to a speed demand of 45%. • This must be performed in a controlled manner that does not result in level swell and a high level trip of the Reactor Feed pumps. Monitor for Thermal Hydraulic Instabilities (THI).
	CRS	Enter and direct actions IAW OT-100 "Reactor Low Level". • Direct the URO to lower power by lowering Recirc flow manually to 45% speed. • (May) refer to GP-5 "Power Operations" to determine power must be limited to <80% total feedwater flow with 2 Condensate and 3 Reactor Feedwater pumps. Enter and direct actions IAW OT-112 "Unexpected/Unexplained Change in Core Flow". • Determine position on the PBAPS Power Flow Operation Map. • Direct monitoring for Thermal Hydraulic Instability (THI).
	PRO	Investigate the cause of the 'A' Condensate pump trip using the applicable alarm response cards. Direct an Equipment Operator to investigate the breaker and pump. Green flag the 'A' Condensate pump control switch.

Op Test No.: 1 **Scenario No.:** 3 **Event No.:** 6 **Page:** 7 of 12

Event Description: Loss of #2 Auxiliary Bus / loss of Condensate and Feedwater / RCIC trips on over-speed during startup and cannot be reset

Cause: Failure in the bus work results in an overcurrent condition and a bus lockout / RCIC trip throttle valve failure

Effects:

1. Alarms:
   - 219 A-2 "2 Aux Bus Overcurrent Relays"
   - 219 B-2 "2 Aus Bus Lo Voltage"
2. #2 Auxiliary Bus breakers trip, de-energizing the bus and its loads
3. The immediate impact of loss of #2 Auxiliary Bus is the resultant loss of the remaining Condensate pumps, causing RPV water level to drop rapidly.
4. RCIC will attempt to start and then will trip when it reaches 500 RPM, removing the last source of high-pressure injection to the RPV.

Time	Position	Applicant's Actions or Behavior
	PRO	Recognize and report the loss of #2 Auxiliary Bus.
	URO	Recognize and report Reactor water level is dropping rapidly. Attempt to manually scram the Reactor by placing the Mode Selector Switch in "Shutdown". Attempt to scram 'B' RPS by depressing the manual scram pushbutton
	CRS	Enter and execute T-100 "Scram". Recognize a failure to scram condition exists. NOTE: the CRS will exit T-100 and enter T-101 "RPV Control", or may go directly to T-101.
	PRO	Perform applicable scram actions: • Transfer 13 KV house loads (#1 bus only). • Trip main turbine at approximately 50 MWe. • Verify main generator lockout. • Verify Group II & III isolations and SGTS initiation. • Verify SDV vent and drain valves are closed (see Event #8). • Verify HWC isolated. • Verify recirc pumps are tripped. • Monitor instrument air header pressure and drywell pressure; report instrument air header pressure is greater than drywell pressure. Recognize and report RCIC has tripped and is NOT injecting.

Op Test No.: 1 **Scenario No.:** 3 **Event No.:** 7 **Page:** 8 of 12

Event Description: RPS failure requires ARI initiation to scram the reactor / ATWS (six control rods) requires terminating and preventing injection before emergency blowdown

Cause: RPS 'B' automatic and manual channel failure / six control rods are mechanically stuck in the full out position

Effects:
1. Full Reactor scram does not occur; manual ARI initiation is required.
2. Reactor level drop is greater because more time is spent under power conditions with no high-pressure injection.

Time	Position	Applicant's Actions or Behavior
	URO	Recognize and report an RPS scram has failed to occur. Report entry into T-101 "RPV Control" for the ATWS condition.
	CRS	Enter and execute T-101 "RPV Control".
CT		• Direct initiation of Alternate Rod Insertion (ARI). • Direct instrument nitrogen bypassed and restored IAW GP-8E. • Direct RPV pressure stabilized below 1050 psig.
	URO	Initiate ARI IAW RRC 3B.1-2 "Alternate Rod Insertion During a Plant Event":
CT		• Rotate the "A" and "B" ARI pushbutton collars to "Armed".

CT		• Depress the "A" and "B" ARI pushbuttons.
		• Verify the following ARI solenoid valves open:
		  ○ SV-2-03-141A
		  ○ SV-2-03-142A
		  ○ SV-2-03-141B
		  ○ SV-2-03-142B
		• Verify and report the scram air header is depressurizing.
		• Monitor and report when control rods begin to insert.
		• Verify APRMs are downscale and report to the CRS.
		• Recognize and report six control rods did NOT insert on the scram
		Announce an additional entry condition for T-101 based on Reactor level below -48 inches.

Event Description: RPS failure requires ARI initiation to scram the reactor / ATWS (six control rods) requires terminating and preventing injection before emergency blowdown...continued

Time	Position	Applicant's Actions or Behavior
	PRO	Bypass and restore drywell instrument nitrogen IAW GP-8E, as directed. • Place both instrument nitrogen valve control switches to "Close". • Place both keylock switches in "Bypass". • Place both instrument nitrogen valve control switches to "Open". NOTE: this activity may be coordinated between the URO and the PRO.
	CRS	Enter and direct actions of T-117 "Level/Power Control": • Inhibit ADS. • T-221 "Main Steam Isolation Valve Bypass". • Inject with CRD using T-246 "Maximizing CRD Flow to the Reactor Vessel".
	URO	Maximize CRD flow using T-246 as follows: • Direct an Equipment Operator to bypass the CRD pump suction filter IAW T-246, step 4.3. • Direct an Equipment Operator to check the standby CRD pump for startup IAW T-246, step 4.4. • Start the standby CRD pump by placing the pump control switch to "Start". • Direct an Equipment Operator to slowly open the standby CRD pump discharge valve IAW T-246, step 4.6. • Direct an Equipment Operator to fully open the drive water filter inlet valve IAW T-246, step 4.7. • Direct an Equipment Operator to place the standby drive water filter in service IAW T-246, step 4.8. • Verify MO-2-03-020 "Drive Wtr Press" is fully open. • Close Recirc pump seal purge valves MO-2-2A-8029A and 8029B. • Place the CRD flow controller in "Man" and, while monitoring CRD pump amps, open the flow control valve. • Direct an Equipment Operator to close HV-2-3-56 IAW T-246, step 4.13.

Op Test No.: 1 **Scenario No.:** 3 **Event No.:** 7 **Page:** 10 of 12

Event Description: RPS failure requires ARI initiation to scram the reactor / ATWS (six control rods) requires terminating and preventing injection before emergency blowdown...*continued*

Time	Position	Applicant's Actions or Behavior
	PRO	Perform T-117 actions: • Inhibit ADS by placing keys in both "ADS Auto Inhibit" keylock switches and placing them in the "INHIBIT" position. • Direct Equipment Operator to perform T-221.
	CRS	Request outside assistance (through Shift Manager) in recovering RCIC for injection. Per T-101, direct manual insertion of control rods using T-220 "Driving Control Rods During a Scram".
	URO	Attempt insertion of the control rods IAW T-220: • Bypass the Rod Worth Minimizer. • Attempt to insert control rods using the "Emergency In/Notch Override" switch. • Report to the CRS unable to insert the control rods.
	CRS	Determine that RPV water level cannot be restored and maintained above -195 inches. Direct terminating and preventing injection IAW T-240 (ATT. 1, Fig. 3)
	URO/PRO	When directed, perform T-240 to terminate and prevent injection into the RPV: • Verify HPCI is not injecting. • Verify Condensate / Feedwater is not injecting. • Prevent injection from Core Spray by placing all Core Spray pump control switches in "STOP" (if running). • Prevent injection from RHR/LPCI by placing all RHR/LPCI pump control switches in "STOP" (if running). • Contact the floor operator and direct isolation of Stayfull from RHR and Core Spray. NOTE: this step should be directed but actual isolation does not need to be completed prior to the blowdown.

Op Test No.: 1 **Scenario No.:** 3 **Event No.:** 7 **Page:** 11 of 12

Event Description: RPS failure requires ARI initiation to scram the reactor / ATWS (six control rods) requires terminating and preventing injection before emergency blowdown...continued

Time	Position	Applicant's Actions or Behavior
	CRS	Enter T-112 "Emergency Blowdown".
CT		Direct all five ADS SRVs opened. When Reactor pressure lowers below 270 psig, direct slowly raising RPV injection with RHR and/or Core Spray to control RPV water level between -195 and +35 inches.
CT	PRO	When directed, open ALL five ADS SRVs to perform an Emergency Blowdown. When directed, slowly raise RPV injection with RHR and/or Core Spray to control RPV water level in the band specified by the CRS.

Op Test No.: 1 **Scenario No.:** 3 **Event No.:** 8 **Page:** 12 of 12

Event Description: Two in-series scram discharge volume (SDV) vent valves fail to automatically isolate

Cause: RPS failure in conjunction with an air header malfunction, which prevents air from venting off two SDV vent valves (common air supply).

Effects: A failure of the SDV vent valves is effectively a primary to secondary containment leak. This requires manual isolation of the SDV vent valves.

Time	Position	Applicant's Actions or Behavior
	PRO	Recognize and report failure of two SDV vent valves (AO-032B and AO-035B) to automatically isolate. Upon recognizing failure to isolate, the PRO should:
CT		• Manually isolate the valves by moving the SDV isolation hand-switches counter-clockwise to the "Close" position. • Verify all vent and drain valves are closed. • Inform the CRS as conditions permit.
	CRS	Acknowledge SDV vent valve isolation failure.
CT		Direct manual isolation of the SDV vent valves, if not already isolated.

TERMINATION CRITERIA:

The scenario may be terminated when the RPV has been depressurized and reactor level has been recovered and controlled.

Simulation Facility Peach Bottom **Scenario No.** #4 (altered bank) **Op Test No.** 2008 NRC

Examiners _____ **Operators** _____ CRS (SRO)

_____ _____ URO (ATC)

_____ _____ PRO (BOP)

SPARE Scenario

Scenario Summary The scenario begins with the reactor at 82% power and a plant shutdown in progress. The crew will lower reactor power using reactor recirculation flow and once below 80% power, the crew will secure a condensate pump. Following the condensate pump shutdown, the 2SU-E feeder will trip. The E12 bus will not fast transfer to the other startup feed, causing the E-1 diesel to start and its breaker to automatically close onto the bus. Automatic cooling to the diesel will not occur, requiring the crew to establish cooling manually. The crew will be required to make a Tech Spec declaration for the electrical failure.

This will be followed by a trip of the 'B' recirc pump due to a failed RPT breaker. The crew should carry out the actions of OT-112 "Unexplained/Unexpected Change in Core Flow", which includes establishing single loop operation and consulting Technical Specifications. A loss of offsite power will occur next, requiring entry into SE-11 "Loss of Off-Site Power". The crew should stabilize plant parameters using T-100 "Scram" and should recognize and respond to a failure of the HPCI flow controller to operate in automatic. The E-4 diesel generator will fail to automatically start, and the E-3 diesel generator will not start at all. The crew will be required to manually start the E-4 diesel generator using the quick-start pushbutton in order to spray the Drywell later in the scenario.

Following this event, a steam leak will develop in the drywell, requiring the crew to take actions in accordance with OT-101 "High Drywell Pressure", and execute T-101 "RPV Control" and T-102 "Primary Containment Control". The high drywell pressure condition will prevent HPCI from being used to control reactor pressure, resulting in further challenge to the primary containment.

Initial Conditions IC-74, 82% power

Turnover See Attached "Shift Turnover" Sheet

Event No.	Malfunction No.	Event Type*		Event Description
1		R	URO CRS	Lower reactor power with reactor recirculation flow
2		N	PRO CRS	Secure a condensate pump
3		C TS	PRO CRS	Loss of 2SU-E startup feed with failure of the E12 bus to fast transfer / E1 EDG auto starts with failure of ESW cooling to diesel auxiliaries
4		C TS	URO CRS	Recirc RPT breaker trip / single loop operation
5		M	ALL	Loss of off-site power / steam leak in the drywell
6		C	PRO CRS	E-4 diesel generator fails to auto start
7		I	URO CRS	HPCI flow controller fails in automatic

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

SHIFT TURNOVER

PLANT CONDITIONS:

- Unit 2 at 82% power with a shutdown in progress IAW GP-3 "Normal Plant Shutdown"

INOPERABLE EQUIPMENT/LCOs:

- Breaker E-232 blocked for PM.

SCHEDULED EVOLUTIONS:

- Continue with plant shutdown IAW GP-3 "Normal Plant Shutdown"
- Reduce reactor power to 80%; remove the 'C' condensate pump from service due to excessive bearing oil leakage
- ReMA PB2C17-58.0 in effect at step 1 – reduce to 80% power with recirc flow

SURVEILLANCES DUE THIS SHIFT:

- None

ACTIVE CLEARANCES:

- Breaker E-232

GENERAL INFORMATION:

- GP-3 is complete through step 6.10

CRITICAL TASK LIST

1. **Restore diesel generator cooling prior to diesel generator failure.**

2. **Re-energize the E-42 bus from the respective diesel generator in order to spray the drywell before drywell temperature exceeds 281 degrees F.**

3. **Spray the drywell in accordance with T-204 "Initiation of Containment Sprays Using RHR" when conditions permit, but before drywell temperature exceeds 281 degrees F.**

Op Test No.: 1 **Scenario No.:** 4 **Event No.:** 1 **Page:** 1 of 13

Event Description: Lower reactor power with reactor recirculation flow

Cause: N/A

Effects: N/A

Time	Position	Applicant's Actions or Behavior
	CRS	Direct URO to continue power reduction to ~70 MLB/HR (or as necessary to reduce reactor power to ≤ 80%) IAW GP-3.
	URO	Reduce recirculation pump speeds to reduce total core flow to ~70 MLB/HR (or as necessary to reduce reactor power to ≤ 80%). • Verify both Moore Controllers are set to monitor the 'V' (% output) variable. • Slowly reduce Moore controller demand signals for 'A' and 'B' recirc pumps. • Observe recirc system response for approximately 30 seconds before making additional speed changes.
	PRO	Monitor plant equipment during power reduction.

Op Test No.: 1 **Scenario No.:** 4 **Event No.:** 2 **Page:** 2 of 13

Event Description: Secure a condensate pump

Cause: N/A

Effects: N/A

Time	Position	Applicant's Actions or Behavior
	CRS	When reactor power drops to approximately 80%, direct the PRO to shutdown the 'C' condensate pump in accordance with SO 5.2.A-2 "Condensate System Condensate Pump Shutdown".
	PRO	Review SO 5.2.A-2 and ensure prerequisites are met. Secure the 'C' condensate pump, as directed: • Close discharge valve MO-2098 C. • Stop the selected pump by turning the control switch to "STOP" (within 2 minutes of closing the discharge valve). • Direct an Equipment Operator to close the Seal Water Supply Valve for the 'C' condensate pump.
	URO	Monitor reactor parameters during condensate pump shutdown.

Op Test No.: 1 **Scenario No.:** 4 **Event No.:** 3 **Page:** 3 of 13

Event Description: Loss of 2SU-E startup feed with failure of the E12 bus to fast transfer / E1 EDG auto starts with failure of ESW cooling to diesel generators.

Cause: Various

Effects:
1. Alarms: various
2. Momentary loss of the E12 bus; auto start of the E1 EDG without cooling, requiring the crew to manually start ESW to provide diesel generator cooling.

Time	Position	Applicant's Actions or Behavior
	PRO	Recognize and report alarm 006 J-1 "2SU-E Bkr Trip" and enter the corresponding Alarm Response Card. Dispatch an Equipment Operator to investigate the loss of 2SU-E. Red flag all closed breakers and green flag all tripped breakers. Refer to SO 54.7.A "4KV Fast Transfer Load Shedding and Sequential Loading on Bus Undervoltage". Make a list of affected control room systems/loads (MOV's, etc.).
	CRS	Enter and direct actions of ARC 006 J-1 "2SU-E Bkr Trip". Enter and direct actions of ARC 001 D-1 "E12 Bus Undervoltage". Direct SO 54.7.E "4KV Diesel Generator Auto Start and Loading". Direct reset of Group II/III isolations IAW GP8.C.
	PRO	Recognize and report alarm 001 D-1 "E12 Bus Undervoltage" and enter the corresponding Alarm Response Card. Verify the E-1 diesel output breaker auto closed. Verify the E-12 bus is re-energized. Inform the CRS the E-12 bus has been restored.
	CT	Recognize failure of ESW cooling to automatically start; place the 'A' or 'B' ESW pump in service by placing the pump control switch to "START". Direct an Equipment Operator to perform running inspection of the E-1 diesel generator.

Event Description: Loss of 2SU-E startup feed and associated failures...continued

Time	Position	Applicant's Actions or Behavior
	CRS	Recognize entry into Tech Spec 3.8.1.A. Determine the following are required to meet the LCO: • Perform SR 3.8.1.1 (ST-O-054-950-2) within 1 hour. • Restore the offsite circuit to OPERABLE within 7 days. Recognize entry into Tech Spec 3.8.7.C for E12 bus inoperability (EDG is the only source of power to the bus). Determine the following are required to meet the LCO: • Restore the electrical power distribution subsystem to OPERABLE within 8 hours.
	CRS	May enter OT-104 "Positive Reactivity Insertion" if the feedwater delta-T limit is exceeded. NOTE: the next event should be inserted before the crew reduces power IAW OT-104.

Op Test No.: 1 **Scenario No.:** 4 **Event No.:** 4 **Page:** 5 of 13

Event Description: Recirc RPT breaker trip ('A' recirc pump)

Cause: Failure of breaker control logic

Effects:

1. Alarms:
   - 214 A-3 "A Recirc Pump RPT Trip"
   - 214 B-4 "A Recirc Pump Low Diff Press"
   - 214 C-2 "A Recirc Gen Lockout Trip"
   - 214 C-3 "A Recirc Drive Motor Trip"
2. Trip of the 'A' recirc pump, causing reduction in core flow and reactor power

Time	Position	Applicant's Actions or Behavior
	URO	Recognize and report trip of the 'A' reactor recirc pump and entry into OT-112 "Unexpected/Unexplained Change in Core Flow". Enter the corresponding Alarm Response Cards for alarms 214 A-3 "A Recirc Pump RPT Trip", 214 C-2 "A Recirc Gen Lockout Trip" and 214 C-3 "A Recirc Drive Motor Trip" (as time permits).
	CRS	Enter / execute OT-112 "Unexpected/Unexplained Change in Core Flow". Direct insertion of ALL GP-9-2 control rods. Determine current operating point on Power-Flow Operation Map. Direct monitoring for THI. Direct closing 'A' recirc pump discharge valve MO-053A (or suction valve MO-43A), then re-opening valve after 5 minutes. Direct performing SO 2A.2.A-2 "Recirculation System Shutdown".
	URO	Insert ALL GP-9-2 control rods. Monitor for THI. Close 'A' recirc pump discharge valve MO-053A (or suction valve MO-43A); re-open after 5 minutes. Perform SO 2A.2.A-2 "Recirculation System Shutdown" (as time permits).
	CRS	Perform AO 2A.1-2 "Recirculation System Single Loop Operation". Refer to Tech Spec 3.4.1 and determine requirements for operating in single loop. NOTE: since OT-112 and Tech Spec 3.4.1 allow up to 12 hours for transitioning to single loop, these actions may be assessed as follow-up questions after the scenario is complete.

Op Test No.: 1 **Scenario No.:** 4 **Event No.:** 5 **Page:** 6 of 13

Event Description: Loss of off-site power

Cause: Loss of the grid

Effects: Reactor scrams, emergency diesels receive start signal, emergency buses transfer to the diesels when available

Time	Position	Applicant's Actions or Behavior
	PRO	Recognize and report the loss of off-site power.
	URO	Perform scram actions: • Verify control rods are inserting. • Place the mode switch in "Shutdown". • Verify APRMs are downscale (when power is available). • Report to the CRS that the mode switch is in "Shutdown", control rods are inserting, and the APRMs are downscale (when power is available). • Verify all control rods are fully inserted.
	CRS	Recognize and report the event is an entry condition for T-100 "Scram" Enter and execute T-100: • Direct the URO to maintain RPV level between +5 to +35 inches using RCIC and/or HPCI. • Direct the URO to stabilize RPV pressure below 1050 psig using SRVs and/or HPCI in CST-to-CST mode. Direct placing torus cooling in service.
	PRO	Recognize and report the E-3 and E-4 diesels failed to start (see Event #6 for details).
	CRS	Recognize and report the loss of off-site power as an entry into SE-11 "Loss of Off-Site Power". Enter and execute SE-11.

Event Description: Loss of off-site power...continued

Time	Position	Applicant's Actions or Behavior
	PRO	Perform scram actions: • Verify main turbine trip and generator lockout. • Verify Group I, II, and III isolations and verify SGTS initiation, as applicable. • Verify scram discharge volume vents and drains are closed. • Verify Hydrogen Water Chemistry is isolated. • Verify recirc pumps are tripped. • Monitor Instrument Air header pressure and drywell pressure.
	URO	Maintain RPV level +5 to +35 inches using RCIC. Place RCIC in service IAW RRC 13.1-2 (auto starts at -48 inches): • Arm and depress RCIC Manual Initiation Pushbutton. • Verify MO-131, MO-021, MO-132 open. • Verify AO-034 and AO-035 close. • Verify vacuum pump starts. • Verify RCIC system flow rate is 600 gpm. • Place RCIC Manual Initiation Pushbutton in DISARM.
	URO/PRO	Place torus cooling in service IAW RRC 10.1-2: • Open MO-039A(B). • Open MO-089A(B). • Verify associated diesel load is ≤ 1400 KW. • Start RHR pump. • Open MO-034A(B) while verifying diesel loading. • Verify flow is 11,500-12,200 gpm for one RHR pump in service. • Verify associated diesel load is ≤ 2300 KW. • Start HPSW pump in each loop to be used for torus cooling. • Start additional RHR and HPSW pumps as necessary/directed (verifying diesel generator load as indicated above). • Verify flow is ≥ 20,000 gpm for two RHR pumps in service. • Direct Equipment Operator to close stay full injection valve(s) for the RHR loop(s) in service.

Event Description: Loss of off-site power...continued

Time	Position	Applicant's Actions or Behavior
	URO	Stabilize RPV pressure below 1050 psig using SRVs and/or HPCI in CST to CST mode for pressure control IAW RRC 23.1-2 Section D: • Open MO-2-23-24 "Cond Tank Return". • Verify closed MO-2-23-19 "To Feed Line". • Start Vacuum Pump. • Throttle OPEN MO-2-23-21 "Full Flow Test" for 3 to 4 seconds. • Simultaneously START Aux Oil Pump AND OPEN MO-2-23-14 "Steam Supply". • Verify HPCI system flow rate is 5000 gpm (see Event #7).
	CRS	Direct restoration of instrument nitrogen using either: • Backup Instrument Nitrogen to ADS using SO 16A.7.A-2, or • T-261 "Placing the Backup Instrument Nitrogen Supply From the CAD Tank in Service".
	URO	Restore drywell instrument nitrogen as directed. • If directed to use Backup Instrument Nitrogen to ADS using SO 16A.7.A-2: o Place SV-8130B control switch on panel 20C003-03 to "RESET" and then in "AUTO/OPEN". o Verify open SV-8130B. o Verify PI-8142 "Backup N2" on the 20C003-03 panel is $\geq$ 85 psig. • If directed to perform T-261 "Placing the Backup Instrument Nitrogen Supply From the CAD Tank in Service": o Verify closed AO-2969B on panel 20C003-03. o Dispatch an Equipment Operator to the CAD Building perform step 4.2 (manual valving).

Op Test No.: 1 **Scenario No.:** 4 **Event No.:** 5 **Page:** 9 of 13

Event Description: Steam leak in the primary containment

Cause: Unknown

Effects: Various

Time	Position	Applicant's Actions or Behavior
	URO/PRO	Recognize and report the rise in drywell pressure. Recognize and report the condition as an entry into OT-101 "High Drywell Pressure".
	CRS	Enter and execute OT-101: • Direct maximizing drywell cooling, as necessary.
	URO/PRO	Recognize and report drywell pressure > 2 psig as an entry condition for T-101 "RPV Control" and T-102 "Primary Containment Control".
	CRS	Enter and execute T-101. Enter and execute T-102: For PC/P: • Direct GP-8B "Manual Isol of RBCCW and DWCW". • Direct torus sprays initiated IAW T-204 "Initiation of Containment Sprays Using RHR". For DW/T: • Direct drywell cooling maximized by performing T-223 "DW Cooler Fan Bypass". • Before drywell temperature reaches 281 degrees F, and when drywell pressure and temperature plot within the safe region of the Drywell Spray Initiation Limit Curve, direct (verify) drywell fans shut down and drywell sprays initiated IAW T-204 "Initiation of Containment Sprays Using RHR". For PC/G: • Direct CAD placed in service.
	CT	

Event Description: Steam leak in the primary containment...continued

Time	Position	Applicant's Actions or Behavior
	URO/PRO	Monitor T-102 parameters (torus temperature, torus level, drywell pressure, torus pressure, drywell temperature) and provide trends to the CRS, as appropriate. Perform GP-8B "Manual Isolation of RBCCW and DWCW" (no isolation actions are required, however the Operator may modify system flow paths due to RBCCW system pressure/flow oscillations).
	URO/PRO	Spray the torus in accordance with T-204 "Initiation of Containment Sprays using RHR": • Verify System 1 and 2 Drywell Pressure Permits Containment Spray annunciators (224 D-3, 225 B-3) are lit. • Place keylock switch 10A-S18B in "MANUAL OVERRIDE". • Momentarily place switch 10A-S17B in "MANUAL". • Open or verify open MO-2-10-39B "Torus Header". • Open or verify open MO-2-10-89B(D) HPSW Hx Outlet". • Verify load on EDG supplying selected pumps is below 1400 KW. • Start B(D) RHR Pump. • Start B(D) HPSW Pump. • Close or verify closed MO-2-10-34B "Full Flow Test". • Throttle open MO-2-10-38B "Torus Spray" to obtain 1,000 gpm on FI-2-10-136B.
	URO/PRO	Maximize drywell cooling by performing T-223 "DW Cooler Fan Bypass". • Verify operation on safe side of Figure 1 "DWCW Saturation Curve". • Place all Drywell Cooler Fan control switches to "OFF" at panel 20C012. • Momentarily place DW Cooler Fans control switch 43-S-J165 in "BYPASS" and let it spring return to "NORMAL" at panel 20C05A. • Direct Equipment Operator to place Drywell Cooler Fan speed control switches to "SLOW" at their respective MCC in the Reactor Building. • Operate Drywell Cooler Fans to reduce Drywell temperature and pressure.

Event Description: Steam leak in the primary containment...continued

Time	Position	Applicant's Actions or Behavior
	URO/PRO	When directed, shutdown the drywell cooler fans by placing all fan control switches in "OFF".
	URO/PRO	Spray the drywell in accordance with T-204 "Initiation of Containment Sprays Using RHR". • Verify Recirc Pumps are tripped. • Verify all Drywell coolers are OFF.
CT		• Open MO-2-10-31B "DW Spray Inboard".
CT		• Open MO-2-10-26B "DW Spray Outboard".
CT		• Close or verify closed MO-2-10-34B "Full Flow Test".
		• Monitor containment pressure. • Adjust spray flow rate by throttling MO-2-10-26B as necessary to maintain drywell pressure > 2 psig.
	URO/PRO	Place CAD in service when directed.

Op Test No.: 1 **Scenario No.:** 4 **Event No.:** 6 **Page:** 12 of 13

Event Description: E-3 diesel generator start failure
E-4 diesel generator auto start failure

Cause: Various

Effects: E-3 diesel generator cannot be started.
E-4 diesel generator fails to start automatically but can be manually started.

Time	Position	Applicant's Actions or Behavior
	PRO	Recognize the E-3 diesel generator failed to start.
		Attempt a quick start of the E-3 diesel by depressing the QUICK START pushbutton.
		Report the E-3 diesel failed to start from the control room.
		Dispatch an Equipment Operator to the E-3 diesel generator.
		Perform SE-11, Attachment B "Responding to a Diesel Generator Trip or Failure to Start".
	PRO	Recognize the E-4 diesel generator failed to start.
CT		Attempt a quick start of the E-4 diesel by depressing the QUICK START pushbutton.
		Recognize E-4 diesel starts and loads its busses.
		Verify ESW pump is supplying cooling water to the diesel generators.
		Direct an Equipment Operator to perform running inspection of the E-2 and E-4 diesel generators.
	CRS	Direct the E-3 diesel quick started, if not done.
CT		Direct the E-4 diesel quick started, if not done.

Op Test No.: 1 **Scenario No.:** 4 **Event No.:** 7 **Page:** 13 of 13

Event Description: HPCI flow controller fails in automatic

Cause: Instrument failure

Effects: When HPCI is initiated, it will not reach sufficient speed to inject water into the reactor due to the flow controller failure. Operator action will be required in order to inject and/or control RPV pressure with HPCI.

Time	Position	Applicant's Actions or Behavior
	URO	Recognize HPCI is not injecting after system startup.
		Respond to the failure by taking manual control of the HPCI flow controller and raising turbine speed.
		Manually control HPCI turbine speed as necessary to establish and control HPCI injection/RPV level.
		Report the HPCI flow control failure and current status of HPCI to CRS.

TERMINATION CRITERIA:

The scenario may be terminated when all Primary Containment parameters, RPV pressure and level, are stable and under control.