Simulation Facility: Braidwood

Scenario No.: **NRC 1**

Operating Test No.: **19-1 NRC**

Examiners: _____ Applicant: _____ SRO

_____ _____ ATC

_____ _____ BOP

Initial Conditions: IC-22

Turnover: Unit 1 is at 100%, steady state, Equilibrium Xenon, MOL. On-line risk is Green. Automatic rod control failed last shift, control rods are in MANUAL. 1BwOA ROD-2 was completed. Troubleshooting is being developed. Manual rod control is available. Following turnover, swap WS pumps per BwOP WS-1 & 3 to allow for an oil change next shift on the 0A WS pump and place the 0A WS pump in standby. EOs are briefed and standing by at the LSH.

Event No.	Malf. No.	Event Type*	Event Description
Preload	IMF RX17A FALSE IMF RX17B FALSE IRF RP35 OUT IRF RP61 OUT IOR ZDI1SI8801A CLS IRF RP75 OUT		Automatic rod withdrawal fails Automatic rod insertion fails Prevent auto MSLI (train A) Prevent auto MSLI (train B) Prevent 1SI8801A from opening on SI Prevent train B CV/SI valves from auto opening/closing on SI
1	None	N-BOP N-SRO	Swap WS pumps (start 0B WS pump, shutdown 0A WS pump)
2	IMF CV16 100	I-ATC I-SRO	VCT level channel, 1LT-112, fails high
3	IMF CV01A	C-ATC/BOP C, T-SRO	1A CV pump trip-ATC Restore Letdown-BOP
4	IMF TC14D 0 IMF RX17A FALSE (preload) IMF RX17B FALSE (preload)	R-ATC N-SRO	Governor Valve #4 fails closed with rods in manual control
5	IMF RX18A 630	T-SRO	Loop 1A Tave channel fails high
6	IMF TP19A RAISE	I-BOP I-SRO	Main Generator H2 temperature controller, 1TK-HY001, setpoint fails high
7	IMF TH03D 450 30 IMF FW19D 2	M-ALL	SGTR on 1D SG 1D SG feedline break (faulted/ruptured SG)
8	IRF RP35 OUT (preload) IRF RP61 OUT (preload)	C-ATC C-SRO	Prevent auto MSLI (train A) Prevent auto MSLI (train B)
9	IRF RP75 OUT (preload) IOR ZDI1SI8801A CLS (preload)	C-ATC C-SRO	Prevent train B CV/SI valves from auto opening/closing on SI Prevent 1SI8801A from opening on SI

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

SCENARIO OVERVIEW

Unit 1 is at 100%, steady state, Equilibrium Xenon, MOL. On-line risk is Green. Automatic rod control failed last shift, control rods are in MANUAL. Following turnover, swap WS pumps per BwOP WS-1 & 3 to allow for an oil change next shift on the 0A WS pump and place the 0A WS pump in standby. EOs are briefed and standing by at the LSH.

After completing shift turnover, the crew will swap WS pumps. The crew will start the 0B WS pump per BwOP WS-1 and then shutdown the 0A WS pump and place it in standby per BwOP WS-3.

After the WS pumps have been swapped, VCT level channel, 1LT-112, will fail high. Letdown flow will divert to the HUT and the ATC must reposition 1CV112A to restore letdown flow to the CV demineralizers. The SRO will enter 1BwOA INST-2.

After the actions for the VCT level channel failure are complete, the 1A CV pump will trip. The ATC will use 1BwPR 1-9-A3 to isolate letdown. The crew will use 1BwOA PRI-15 to start the 1B CV pump and then use 1BwOA ESP-2 to restore letdown. The SRO will enter Tech Spec 3.5.2 Condition A and TRM 3.1.d Condition A.

After the SRO has evaluated Tech Specs for the 1A CV pump trip, Governor Valve (GV) #4 will fail closed with control rods in MANUAL. Turbine load will lower approximately 60 MWe. The ATC will borate the RCS as necessary and/or manually move control rods to restore RCS Tave and Delta I to within their normal band.

After the GV #4 reactivity change is adequately evaluated, the loop 1A Tave channel will fail high (Tcold RTD failure). The SRO will enter 1BwOA INST-2 and enter Tech Spec 3.3.1 Conditions A and E.

After the SRO has evaluated Tech Specs for the loop 1A Tave channel failure, the Main Generator H2 temperature controller, 1TK-HY001, setpoint will fail high. The BOP will take manual control of 1TK-HY001 and will throttle H2 cooling valve, 1WS106, open to lower the Main Generator H2 temperature to a normal value.

After the plant is stabilized from the Main Generator H2 temperature controller failure, a SGTR will occur on the 1D SG followed by a 1D SG feedline break. The BOP will respond to the main steamline rad monitor alarm. The ATC will determine that PZR level is lowering > 2% per minute. The SRO will direct the ATC to manually trip the reactor, verify reactor trip and then insert a manual SI. The SRO will enter 1BwEP-0. One minute after the SGTR, a feedline break inside containment will occur on the 1D SG feedline. After SI actuates, high head SI does NOT automatically align, the ATC must manually open 1SI8801B. The MSIVs will NOT auto close and must be manually closed. The crew will transition to 1BwEP-3. The crew will transition to 1BwEP-2 and isolate AF to the 1D SG. The crew will then transition to 1BwCA-3.1 and perform actions through step 8, check if RH pumps should be stopped.

Scenario completion criteria is when the crew places both RH pumps in standby in 1BwCA-3.1.

Critical Tasks:

1. Manually open 1SI8801B to establish high head SI flow before transitioning out of 1BwEP-0. (Westinghouse – CT-7) (K/A number – 013 A4.01, Importance – 4.5/4.8)
2. Isolate the 1D SG before transitioning out of 1BwEP-2. (Westinghouse – CT-17) (K/A Number – APE040 AA1.10, Importance – 4.1/4.1)

SIMULATOR SETUP GUIDE

- Verify/perform TQ-BR-201-0113, BRAIDWOOD TRAINING DEPARTMENT SIMULATOR EXAMINATION SECURITY ACTIONS CHECKLIST.
- Reset to IC-22, 100% power, steady state, equilibrium Xenon, MOL OR use the IC written below.
- Open SmartScenario file **19-1 NRC 1.ssf** from the thumb drive and place the ssf in run.
- Release the **SETUP** command box.
- Complete items on Simulator Ready for Training Checklist.
- Ensure the simulator is in RUN (allow simulator to run during board walk down and turnover).
- Verify page 1 PRELOAD items are inserted.
- Place control rods in MANUAL. Place a STOP SIGN placard (RODS in MANUAL) near the Rod Bank Select Switch. Also, place a CRITICAL PARAMETER placard for the RO to maintain Tave within 3ºF of Tref.
- Verify 0A & 0C VA plenums in-service, 0B VA plenum in standby.
- Verify/remove any Equipment Status Tags and Danger Tags not applicable to the scenario.
- Verify SER printer is clear of data.
- If desired, write an IC after all the set-up actions are completed (snap to 0). This IC may be used for running the scenario on additional simulator groups.
- Provide students with turnover sheets and copy of BwOP WS-1 and WS-3.
- Provide a turnover of unit status to oncoming crew.

Event 1: Swap WS pumps (start 0B WS pump, shutdown 0A WS pump)

When asked as an EO, **0B WS pump:** report proper pump bearing oil levels, flushed Y-Strainer per Attachment A, 0WS002B is open, good start of the 0B WS pump with normal pump parameters, 0CFX401 is open, 0WS362B is open and verified proper operation of the Purate skids.

When asked as an EO, **0A WS pump:** A ladder is staged to close the discharge valve if needed, report 0CFX400 is closed, pump rotation has stopped, good shutdown of the 0A WS pump, proper pump bearing oil levels, 0WS002A is open, motor & pump cooling water flow has stopped, 0WS362A is closed and verified proper operation of the Purate skids.

As SM, acknowledge the WS pump swap completion.

Event 2: VCT level channel, 1LT-112, fails high

Release ssf command box **Event 2**.

Ensure **MF CV16 100** is inserted to fail VCT level channel 1LT-112 high.

As SM, acknowledge the failure and requests for risk evaluation, IR initiation and notification request.

If dispatched, EO reports NO issues found at 1LT-112 (5 minute delay).

Event 3: 1A CV pump trip

Release ssf command box **Event 3**.

Ensure **MF CV01A** is inserted to trip the 1A CV pump.

If dispatched, EO reports 1A CV pump appears normal with a Phase A overcurrent flag at the breaker (4 minute delay).

If dispatched as EO for a good start on the 1B CV pump, report that the 1B CV pump had a good start (3 minute delay).

As SM, acknowledge the failure and requests for risk evaluation, IR initiation and notification request.

Event 4: Governor Valve #4 fails closed with rods in manual control

Release ssf command box **Event 4**.

Ensure **MF TC14D 0** is inserted to close Governor Valve #4.

If dispatched as EO to investigate GV #4 failure, report GV #4 is closed with no visible damage present and NO EH leaks present (2 minute delay). If asked, there are NO other issues with the TVs/GVs.

As Power Team, acknowledge loss of load due to GV #4 failure.

As SM, acknowledge the GV #4 failure and requests for risk evaluation, maintenance support, and IR initiation. If asked about isolating EH to GV #4 to prevent further valve movement, agree with SRO recommendation.

As Power Team, acknowledge the load reduction and estimated duration of derate.

Event 5: Loop 1A Tave channel fails high

Release ssf command box **Event 5**.

Ensure **MF RX18A 630** is inserted to fail the loop 1A Tave channel high.

As SM, acknowledge the failure and requests for risk evaluation, IR initiation and notification request. If asked for personnel to bypass bistables, inform the SRO that 2 NSOs will be available in 1 hour. The SRO will enter Tech Specs 3.3.1 Conditions A and E.

Event 6: Main Generator H2 temperature controller, 1TK-HY001, setpoint fails high

Release ssf command box **Event 6**.

Ensure **MF TP19A RAISE** is inserted to fail Main Generator H2 temperature controller, 1TK-HY001, setpoint high.

As SM, acknowledge the failure and requests for risk evaluation, IR initiation and notification request.

If asked as an EO, report that 1WS106 is responding normally to its controller signal. If asked to reset the H2/Stator Cooling Panel Trouble alarm, use RF below. Local alarm was due to high H_2 temperature.

- **IRF TP15 ACK**

Events 7, 8, 9: SGTR on 1D SG/1D SG feedline break (faulted/ruptured SG)/auto MSLI failure/1SI8801B fails to auto open

Release ssf command box **Events 7, 8, 9**.

Ensure **MF TH03D 450 30 and MF FW19D 2** are inserted to cause a 1D SGTR followed 1 minute later by a 1D SG feedline break. Remaining MFs are preloaded.

As SM, acknowledge procedure transitions, EAL evaluation request and STA request. If asked as TSC/SM concerning a recommended minimum indicated PZR water level that will ensure PZR heaters are covered, inform the crew that the TSC will determine the minimum level within the next 30 minutes.

When requested to monitor DG operation, release ssf command box **DG Check**.

Ensure **RF EG06 RESET** is inserted to reset 1A DG alarm.
Ensure **RF EG12 RESET** is inserted to reset 1B DG alarm.

When requested to open 0/1SX007 to obtain **8000 GPM**, release ssf command box **0/1SX007 Throttling – 8000 gpm**.

Ensure **RF SW01 60** is inserted to open 0SX007 to 60%.
Ensure **RF SW02 60** is inserted to open 1SX007 to 60%.

After the STA is requested, as STA report CSF status – Yellow on heat sink with 1D SG faulted, Yellow on inventory when PZR level is < 17%.

If dispatched as an EO to locally open 1SI8801A, use the following to de-energize 1SI8801A, report 1SI8801A is stuck closed (5 minute delay).

- **IRF ED053I OPEN** to de-energize 1SI8801A (MCC 131X1:F4).

Scenario No: **19-1 NRC 1** Event No. 1		
Event Description: Swap WS pumps (start 0B WS pump, shutdown 0A WS pump)		
Time	Position	Applicant's Actions or Behavior
	CUE	• From turnover, swap WS pumps per BwOP WS-1 & 3 to allow for an oil change on the 0A WS pump and place the 0A WS pump in standby. • EOs are briefed and standing by at the LSH.
	SRO	• Brief the BOP for the WS pump swap (may have been performed earlier). • Direct the BOP to swap WS pumps per BwOP WS-1 & 3 (start 0B WS pump, shutdown 0A WS pump).
	BOP	Refer to BwOP WS-1, step 3 (start 0B WS pump). • Direct EO to verify proper 0B WS pump bearing oil levels. • Direct EO to perform Att. A to flush/clean 0B WS pump strainer. • Direct EO to verify/open 0WS002B, 0B WS pump discharge valve. • Start 0B WS pump at 0PM01J. • Check for normal pump parameters. • Direct EO to open 0CFX401, 0B WS pump chem injection isolation valve. • Direct EO to verify/open 0WS362B, 0B WS pump cooling water supply isolation valve. • Direct EO to verify proper operation of the Purate skids. Refer to BwOP WS-3 (ALL 3 WS pumps are initially running). • Direct EO to close 0CFX400, 0A WS pump chem injection isolation valve. • Place the 0A WS pump control switch in PULL OUT at 0PM01J. • Direct EO to verify that the 0A WS pump shaft stops rotating. • Direct EO to verify proper 0A WS pump bearing oil levels. • Direct EO to verify/open 0WS002A, 0A WS pump discharge valve. • Place the 0A WS pump control switch in AFTER TRIP. • Check 0A WS pump stop light is ON. • Direct EO to verify motor & pump cooling water flow has stopped. • Direct EO to verify/close 0WS362A, 0A WS pump cooling water supply isolation valve. • Direct EO to verify proper operation of the Purate skids. • Inform SRO that the WS pump swap is complete.
	SRO	• Acknowledge report that WS pump swap is complete. ○ Notify SM that WS pump swap is complete.
	ATC	• Monitor remainder of MCBs.
		EXAMINER'S NOTE: After the WS pump swap is complete and with Lead Examiner's concurrence, enter next event.

Scenario No: **19-1 NRC 1** Event No. 2		
Event Description: VCT level channel, 1LT-112, fails high		
Time	Position	Applicant's Actions or Behavior
	CUE	• Annunciator 1-10-E4, OVATION SYSTEM TROUBLE, alarms. • VCT level meter, 1LI-112, fails to 100%. • 1CV112A diverts to HUT. • VCT level lowering on 1LR-0185/Ovation VCT Level 2. • Annunciator 1-9-A2, VCT LEVEL HIGH-HIGH LOW, alarms. • Automatic VCT makeup does NOT actuate at 37% VCT level.
	ATC	• Determine VCT level channel, 1LT-112, has failed high. • Report VCT level channel failure to SRO.
	SRO	• Identify entry conditions for 1BwOA INST-2, OPERATION WITH A FAILED INSTRUMENT CHANNEL.
	SRO	• Notify SM of plant status and procedure entry. • Request SM evaluation of Emergency Plan conditions. • Enter 1BwOA INST-2 and direct the following operator actions of 1BwOA INST-2 Attachment V:

	ATC	• Check VCT level normal.
		  • Take manual control and maintain VCT level between 37% and 70% at 1PM05J.
		  • Place 1CV112A control switch to the VCT position or take manual control of controller, 1LK-0112, to close 1CV112A (BwAR 1-9-A2 also repositions 1CV112A).

	SRO	○ May establish a critical parameter for VCT level.

	ATC/BOP	• Select an operable VCT level channel in Ovation.
		  • Select Ovation Graphic 6003.
		  • In Signal Selectors box, SELECT VCT LEVEL 1 and enable the window.
		  • Select operable VCT level channel (CV-LT-0185), then exit window.
		EXAMINER'S NOTE: In Ovation, if VCT level 2 is < 37% (1LT-185 value), automatic VCT makeup will start after selecting CV-LT-0185 in the above step.
		  • In Signal Selectors box, SELECT VCT LEVEL 2 and enable the window.
		  • Verify/select operable VCT level channel (CV-LT-0185), then exit window.
		• Return VCT level control to auto (1CV112A/1LK-0112).

	BOP	○ Dispatch EO to investigate 1LT-112. • Monitor remainder of MCBs.
	SRO	• Refer to Tech Spec 3.3.9 (applicable in MODES 3-5). • Notify SM to perform risk evaluation, initiate IR and make notifications as appropriate.
		EXAMINER'S NOTE: After the actions for the VCT level channel failure are complete and with Lead Examiner's concurrence, insert next event.

Scenario No: **19-1 NRC 1** Event No. 3		
Event Description: 1A CV pump trip		
Time	Position	Applicant's Actions or Behavior
	CUE	• 1A CV pump trip light lit. • Annunciator 1-9-A3, CHG PUMP TRIP, alarms. • Annunciator 1-9-D3, CHG LINE FLOW HIGH LOW, alarms. • Annunciator 1-7-B2, RCP SEAL WATER INJ FLOW LOW, alarms. • PZR level lowering.

	ATC	• Identify 1A CV pump has tripped at 1PM05J.
		  • Report 1A CV pump trip to SRO.
		  • Perform 1BwPR 1-9-A3, CV PUMP TRIP PROMPT RESPONSE.
		  • Verify/close 1CV8149A, B & C, Letdown Orifice Valves.
		  • Verify/close 1CV459 & 1CV460, Letdown Isolation Valves.
		  • GO TO BwAR 1-9-A3 (GO TO 1BwOA PRI-15, LOSS OF NORMAL CHARGING).

	CREW	• Refer to BwARs, as time permits. • Dispatch operator(s) to investigate cause of 1A CV pump trip.
	SRO	• Identify entry conditions for 1BwOA PRI-15. • Notify Shift Manager of plant status and procedure entry. • Request SM evaluation of Emergency Plan conditions. • Enter/implement 1BwOA PRI-15 and direct the following operator actions of 1BwOA PRI-15:

	ATC	Perform the following at 1PM05J:
		• Check RCP seal cooling:
		  ○ Seal injection flow to all RCPs – IN SERVICE (NO – NO CV pumps running).
		- OR -
		  ○ RCP THERM BARR CC WTR FLOW LOW alarms (1-7-_4) – NOT LIT.
		• Check status of CV pump:
		  • Identify NO CV pumps are running.
		  • Place 1A CV pump C/S in PULL OUT.
		• Isolate normal letdown (previously performed per 1BwPR 1-9-A3):
		  • Close 1CV8149A, B, & C, Letdown Orifice Isolation Valves.
		  • Close 1CV459 & 1CV460, Letdown Isolation Valves.
		• Check VCT status:
		  • Check 1CV112B & 1CV112C, VCT suction valves, OPEN.
		  • Maintain VCT level greater than 20% (1LT-185).
		  • Annunciator 1-9-C2, VCT TEMP HIGH – NOT LIT.

	ATC/ BOP	○ Acknowledge RMS alarm caused by isolating flow to 1PR06J, Gross Failed Fuel Monitor.
		• Check for gas binding of previously running CV pump by verifying the following trends NOT fluctuating prior to pump trip (PPC trends exist for 1st 3 items):
		  • RCP #1 seal leakoff flows (MCB recorder).
		  • CV pump flow (F0128).
		  • CV pump discharge pressure (P0103).
		  • CV pump amps.

Scenario No: **19-1 NRC 1** Event No. 3		
Event Description: 1A CV pump trip		
Time	Position	Applicant's Actions or Behavior

		• Restore charging flow:
		  • Check 1CV8110 & 1CV8116, 1B CV Pump Miniflow Isolation Valves – OPEN.
		  • Check RCS pressure approximately 2235 psig (NOP).
		  • Start 1B CV pump.
		• Check CV System Alignment:
		  • Either 1CV8146/7, Charging to RC Loop 1B/A Isolation Valve – OPEN.
		  • 1CV8324A, Charging to Regen HX 1A Isolation Valve – OPEN.
		  • 1CV8105 & 1CV8106, Charging Line CNMT Isolation Valves – OPEN.
		  • Check charging flow established (Charging flow may be at minimum for RCP seal injection due to letdown isolation).
		  • Determine normal letdown is isolated (will be restored per 1BwOA ESP-2 – see below).
		○ Monitor RMCS during VCT auto makeup:
		  ○ Proper flow indicated for PW/Total Flow (1FT-0111) and Boric Acid Flow (1FT-0110) on recorder 1FR-0110.

	SRO	• Identify entry conditions for 1BwOA ESP-2, REESTABLISHING CV LETDOWN DURING ABNORMAL CONDITIONS.
	SRO	○ Notify Shift Manager of plant status and procedure entry. • Direct BOP/ATC to perform 1BwOA ESP-2.

	BOP/ATC	Perform the following at 1PM05J **(1BwOA ESP-2)**:
		• Check letdown isolated:
		  • 1CV8149A, B, & C, Letdown Orifice Isolation Valves – CLOSED.
		  • 1CV459 & 1CV460, Letdown Line Isolation Valves – CLOSED.
		
		• Check letdown flow path:
		  • 1CV8401A, Letdown HX 1A Isolation Valve – OPEN.
		  • 1CV8324A, Charging to Regen HX 1A Isolation Valve – OPEN.
		  • 1CV8389A, Letdown to Regen HX 1A Isolation Valve – OPEN.
		  • 1CV8152 & 1CV8160, Letdown Line CNMT Isolation Valves – OPEN.
		  • BTRS mode selector switch OFF light - LIT.
		
		• Align letdown controllers:
		  • Place 1PK-0131, Letdown Line Pressure Controller, in MANUAL and raise demand to 40%.
		  • Place 1TK-0130, Letdown HX Outlet Temperature Controller, in MANUAL and raise demand to 60%.
		
		• Verify charging flow established:
		  • Check 1CV8105 and 1CV8106, Charging Line CNMT Isolation Valves – OPEN (if closed, place 1CV182 controller = 0% demand, then open 1CV8105/8106).
		  • Adjust 1CV182, Charging Header Backpressure Control Valve, to establish 8-13 gpm RCP seal injection flow per RCP.
		  • Place 1FK-0121 in manual and establish 100 gpm charging flow on 1FI-121A.

Scenario No: **19-1 NRC 1** Event No. 3		
Event Description: 1A CV pump trip		
Time	Position	Applicant's Actions or Behavior

		• Establish letdown flow:
		  • OPEN 1CV459 & 1CV460.
		  • OPEN 1CV8149A & B or C to establish 120 gpm letdown flow.
		  • Lower demand on 1PK-0131 to raise letdown pressure to ~ 360 psig on 1PI-131.
		  • Operate 1FK-0121 in manual to restore PZR level to normal operating band and maintain 8-13 gpm RCP seal injection flow per RCP.
		  • Lower demand on 1TK-0130 to control letdown temperature between 90° F to 115°F on 1TI-130.
		  • Place 1PK-0131 controller in AUTO.
		  • Place 1TK-0130 controller in AUTO.
		  • At RMS, verify 1PR06J cursor is GREEN (in-service).

	SRO	• Notify SM to perform risk evaluation, initiate IR and make notifications as appropriate. • Enter Tech Spec 3.5.2 Condition A. • Enter TRM 3.1.d Condition A.
		EXAMINER'S NOTE: After the actions for 1A CV pump trip are complete and with Lead Examiner's concurrence, enter next event.

Scenario No: **19-1 NRC 1** Event No. 4		
Event Description: Governor Valve #4 fails closed with rods in manual control		
Time	Position	Applicant's Actions or Behavior
	CUE	• GV #4 closed indication on Ovation. • Generator MWe lowering at 1PM01J/Ovation. • RCS Tave rising at 1PM05J. • Annunciator 1-14-D1, TAVE CONT DEV HIGH, alarms.
	ATC/ BOP	• Determine that a turbine load drop has occurred from 1PM01J or Ovation. • Refer to BwARs, as time permits. • Dispatch an EO to investigate GV #4 failure.
	SRO	• Notify SM of GV #4 failure. • Direct ATC to restore Tave/Delta I to their normal band. ○ May establish a critical parameter for RCS Tave. ○ May refer to 1BwOA PWR-1, POWER REDUCTION.
	ATC	• Move control rods to restore Tave-Tref deviation and maintain Delta I as required per 1BwGP 100-8 Attachment A. ○ May refer to Load Swings ReMA (Operator Aid). • Initiate RCS boration per BwOP CV-6. ○ **Batch boration (BwOP CV-6 Attachment A, step 1):** ○ Turn on PZR backup heaters. ○ If desired to reset the BORIC ACID TOTALIZER to 0, select soft button RESET for the BORIC ACID BLENDER PREDETERMINED SETPOINT. ○ Open 1CV110B, Boric Acid Blender to Chg Pumps Valve. ○ Open 1CV110A, Boric Acid to Blender Valve. ○ Start the BA Transfer Pump. ○ If desired, control VCT level by adjusting the 1LK-0112 setpoint to the desired value. ○ When desired amount of BA has been added, stop BA Transfer Pump. ○ Close 1CV110A. ○ Close 1CV110B. ○ Verify VCT level or pressure at desired value and adjust 1LK-0112 to the desired level setpoint. ○ Verify/place 1CV110A and 1CV110B in the AUTO position. ○ Record time and amount of BA that was added in Unit log or appropriate journal. ○ Perform the appropriate step of BwOP CV-7 to return RMCS to automatic alignment following the final boration. - OR - ○ **Borate in Automatic (BwOP CV-6 Attachment A, step 2):** ○ Turn on PZR backup heaters. ○ Set the BORIC ACID TOTALIZER to desired value. ○ Place MAKE-UP CONT switch in the STOP position. ○ Place MODE SELECT switch in the BORATE position. ○ Place MAKE-UP CONT switch to the START position to commence the boration. ○ Verify the following occurs: ○ 1CV110B, Boric Acid Blender to Chg Pumps Valve, opens ○ 1CV110A, Boric Acid to Blender Valve, modulates open. ○ BA Transfer Pump starts. ○ Proper BA flow on 1FR-0110.

Scenario No: **19-1 NRC 1** Event No. 4		
Event Description: Governor Valve #4 fails closed with rods in manual control		
Time	Position	Applicant's Actions or Behavior
		○ If desired, control VCT level by adjusting the 1LK-0112 setpoint to the desired value. ○ When desired amount of BA has been added, place MAKE-UP CONT switch to the STOP position. ○ Verify the following occurs: ○ 1CV110B closes. ○ 1CV110A closes. ○ BA Transfer Pump stops. ○ Record time and amount of BA that was added in Unit log or appropriate journal. ○ Perform the appropriate step of BwOP CV-7 to return RMCS to automatic alignment following the final boration.
	BOP	• Monitor remainder of MCBs.
	SRO	• Notify SM to perform risk assessment, initiate IR and contact maintenance/OAD to investigate/correct GV #4 failure. ○ Check reactor power change < 15% in one hour (NO). ○ Contact Power Team and inform Power Team of load reduction and estimated duration of power derate. ○ Review Tech Spec 3.4.1 for applicability. ○ Review RIL per COLR.
		EXAMINER'S NOTE: After the GV #4 reactivity change is adequately evaluated and with Lead Examiner's concurrence, enter next event.

Scenario No: **19-1 NRC 1** Event No. 5		
Event Description: Loop 1A Tave channel fails high		
Time	Position	Applicant's Actions or Behavior
	CUE	• Annunciator 1-14-A2, LOOP 1A TAVE DEV HIGH, alarms. • Annunciator 1-14-A5, LOOP 1A ΔT DEV LOW, alarms. • Loop 1A Tave meter, 1TI-412, fails high. • Loop 1A ΔT meter, 1TI-411A, fails low.
	ATC/ BOP	• Determine loop 1A Tave has failed. • Report Tave failure to SRO. • Refer to BwARs, as time permits.
	SRO	• Identify entry conditions for 1BwOA INST-2, OPERATION WITH A FAILED INSTRUMENT CHANNEL.
	SRO	• Notify SM of plant status and procedure entry. • Request SM evaluation of Emergency Plan conditions. • Enter/implement 1BwOA INST-2 and direct the following operator actions of 1BwOA INST-2 Attachment A:
	ATC	• Check rod control status – RODS NOT MOVING (rods in MANUAL). • Check Rx power < 100%. • Check PZR level – NORMAL AND STABLE. • Check P-12 interlock. • With Tave > 550ºF; P-12 Bypass perm light (1-BP-4.5) – NOT LIT.

	BOP	• Remove the failed Tave and ΔT channels from service.
		  • Select OWS graphic 6020.
		  • In Signal Selectors box, select T-AVG and enable the window.
		  • Select PLACE OUT OF SERVICE for loop 1A Tave (RC-TY-0412C), then exit window.
		  • In Signal Selectors box, select DELTA-T and enable the window.
		  • Select PLACE OUT OF SERVICE for loop 1A ΔT (RC-TY-0411D), then exit window.
		  • In Signal Selectors box, select OP DELTA-T and enable the window.
		  • Select PLACE OUT OF SERVICE for loop 1A OPΔT (RC-TY-0411F), then exit window.
		  • In Signal Selectors box, select OT DELTA-T and enable the window.
		  • Select PLACE OUT OF SERVICE for loop 1A OTΔT (RC-TY-0411G), then exit window.

	ATC	• Check if rod control can be placed in auto (rods in MANUAL; auto rod motion is failed).
		  • Rod bank select switch in – MANUAL.
		  • Check C-5 (1-BP-5.7) – NOT LIT.
		  • Check Tave-Tref deviation – STABLE & WITHIN 1ºF.
		  • Rod control remains in MANUAL.

	BOP	• Select an operable RTD channel to the ΔT recorder.
		  • Select OWS graphic 6020.
		  • Select DELTA-T, OPΔT, OTΔT RECORDER and enable the window.
		  • Select an operable channel – LOOP B, C or D, then exit window.

Scenario No: **19-1 NRC 1** Event No. 5		
Event Description: Loop 1A Tave channel fails high		
Time	Position	Applicant's Actions or Behavior

	BOP	• Remove SPDS inputs on PPC PDMS Test Mode page.
		  • Place computer point T0402A – IN TEST.
		  • Delete computer point T0400 from SCAN.

	SRO	• Locally bypass loop 1A Tave channel bistables (will be delayed).
	SRO	• Enter Tech Spec 3.3.1 Conditions A and E. • Notify SM to perform risk evaluation, initiate IR, evaluate reactivity screening, perform overpower assessment and make notifications as appropriate.
		EXAMINER'S NOTE: After the failed Tave channel Tech Specs are determined and with Lead Examiner's concurrence, insert next event.

Scenario No: **19-1 NRC 1** Event No. 6		
Event Description: Main Generator H2 temperature controller, 1TK-HY001, setpoint fails high		
Time	Position	Applicant's Actions or Behavior
	CUE	• Annunciator 1-18-D13, H2/STATOR CLG PANEL TROUBLE, alarms. • Main Generator H2 temperature meter, 1TI-HY001, rising. • Annunciator 1-19-E8, TGTMS GEN TEMP ALARM STPT EXCEEDED, alarms. • Annunciator 1-18-C14, GEN H2 TEMP HIGH LOW, alarms.
	BOP	• Determine that Main Generator H2 temperature controller, 1TK-HY001, has failed. • Report H2 temperature controller failure to SRO.

	BOP	• Refer to BwAR 1-18-C14.
		  • Determine Main Generator H2 temperature is high.
		  • Place 1TK-HY001, Main Generator H2 temperature controller, in manual.
		  • Adjust 1TK-HY001 to maintain desired H2 temperature (1TI-HY001 or PPC point T2099).

	ATC	• Dispatch EO to investigate high Main Generator H2 temperature. • Monitor remainder of MCBs.
	SRO	• Direct/ensure BOP to take manual control of 1TK-HY001 and restore Main Generator H2 temperature to normal. ○ May establish a critical parameter for Main Generator H2 temperature. ○ May refer to 1BwOA TG-2, TGTMS TROUBLE. ○ May refer to 1BwOA INST-2 Attachment W.
		EXAMINER'S NOTE: 1BwOA INST-2 Attachment W was written for a Main Generator H2 Temperature <u>channel</u> failure (not a controller failure). Attachment W lists various H2 cold gas temperature indications, appropriate H2 temperature band to maintain in manual control and verifies that both generator H2 temperature channels are operable.
	SRO	• Notify SM to perform risk evaluation, initiate IR and contact maintenance to investigate/correct failure.
		EXAMINER'S NOTE: After the actions for the 1TK-HY001 failure are complete and with Lead Examiner's concurrence, insert next event.

Scenario No: **19-1 NRC 1** Event No. 7, 8, 9		
Event Description: SGTR on 1D SG / 1D SG feedline break (faulted/ruptured SG) / auto MSLI failure / 1SI8801B fails to auto open		
Time	Position	Applicant's Actions or Behavior

	CUE	• RMS Secondary rad monitor alarms/rad levels rising:
		  • SJAE/GLAND STEAM EXHAUSTER – 1PR027J.
		  • 1A/1D MAIN STEAM LINE – 1AR022J/23J.
		• PZR level dropping > 2%/minute.
		• PZR pressure dropping.
		• Charging/letdown mismatch.
		• 1D SG level rapidly lowering.

	SRO	• Direct ATC to trip reactor, verify reactor trip, then insert an SI.
	ATC	• Initiate a manual reactor trip, verify reactor trip, then insert an SI.
	SRO	• Identify entry conditions for 1BwEP-0, REACTOR TRIP OR SAFETY INJECTION.
	SRO	• Notify SM of plant status and procedure entry. • Request SM evaluation of Emergency Plan conditions. • Enter/implement 1BwEP-0 and direct operator actions of 1BwEP-0 to establish the following conditions:

	ATC	Perform immediate operator actions of 1BwEP-0 at 1PM05J.
		• Verify reactor trip:
		  • Rod bottom lights – ALL LIT.
		  • Reactor trip & bypass breakers – OPEN.
		  • Neutron flux – DROPPING.

	BOP	Perform immediate operator actions of 1BwEP-0 at OWS drop 210.
		• Verify turbine trip:
		  • All Turbine throttle valves – CLOSED.
		  • All Turbine governor valves – CLOSED.

	BOP	Perform immediate operator actions of 1BwEP-0 at 1PM01J. • Verify power to 4KV ESF busses: • ESF busses – BOTH ENERGIZED (141 & 142).

	ATC	Perform immediate operator actions of 1BwEP-0 at 1PM05J.
		• Check SI Status:
		  • SI First OUT annunciator – LIT.
		  • SI ACTUATED Permissive Light – LIT.
		  • SI Equipment – AUTOMATICALLY ACTUATED:
		  ○ Either SI pump – RUNNING.
		  ○ Either CV pump to cold leg isolation valve OPEN – 1SI8801A/B (NO, both closed).
		  • Manually actuate SI at 1PM05J & 1PM06J.

	SRO	• Direct BOP to perform Attachment B of 1BwEP-0.

Scenario No: **19-1 NRC 1** Event No. 7, 8, 9		
Event Description: SGTR on 1D SG / 1D SG feedline break (faulted/ruptured SG) / auto MSLI failure / 1SI8801B fails to auto open		
Time	Position	Applicant's Actions or Behavior
		EXAMINER'S NOTE: The SRO and ATC will continue in 1BwEP-0 while the BOP is performing Attachment B.

	BOP	**1BwEP-0 ATTACHMENT B:**
		• Verify FW isolation at 1PM04J:
		  • FW pumps – TRIPPED.
		  • FW isolation monitor lights – LIT.
		  • FW pumps discharge valves (1FW002A-C) – CLOSED (or going closed).
		• Verify DGs running at 1PM01J:
		  • DGs – BOTH RUNNING.
		  • 1SX169A/B – OPEN.
		  • Dispatch operator to monitor DGs operation.
		• Verify Generator trip at 1PM01J:
		  • OCB 1-8 and 7-8 – OPEN.
		  • PMG output breaker – OPEN.
		• Verify SX pumps running:
		  • Check Unit 0 CC HX aligned to Unit 1:
		  • 1CC9473A&B – OPEN.
		  • Unit 1 SX pumps – BOTH RUNNING.
		  • Dispatch an operator to energize and open 0/1SX007 to 8000 GPM flow to the Unit 0/1 CC HX, then open the disconnects.
		• Verify Control Room ventilation aligned for emergency operations at 0PM02J:
		  • VC Rad Monitors – LESS THAN HIGH ALARM SETPOINT.
		  • Operating VC train equipment – RUNNING.
		  • 0B Supply fan
		  • 0B Return fan
		  • 0B M/U fan
		  • 0B Chilled water pump
		  • 0B Chiller
		  • Operating VC train dampers aligned for train 0B.
		  • M/U fan outlet damper – 0VC08Y – NOT FULLY CLOSED.
		  • 0B VC train M/U filter light – LIT.
		  • 0VC09Y – OPEN.
		  • 0VC313Y – CLOSED.
		  • Operating VC train Charcoal Absorber aligned for train 0B.
		  • 0VC44Y – CLOSED.
		  • 0VC05Y – OPEN.
		  • 0VC06Y – OPEN.
		  • Control Room pressure greater than +0.125 inches water on 0PDI-VC038.
		• Verify Auxiliary Building ventilation aligned for emergency operation at 0PM02J:
		  • Two inaccessible filter plenums aligned.
		  • Plenum A:
		  • 0VA03CB – RUNNING.
		  • 0VA023Y – OPEN (not fully closed).
		  • 0VA436Y – CLOSED.

Scenario No: **19-1 NRC 1** Event No. 7, 8, 9		
Event Description: SGTR on 1D SG / 1D SG feedline break (faulted/ruptured SG) / auto MSLI failure / 1SI8801B fails to auto open		
Time	Position	Applicant's Actions or Behavior

		• Plenum C:
		  • 0VA03CF – RUNNING.
		  • 0VA072Y – OPEN (not fully closed).
		  • 0VA438Y – CLOSED.
		• Verify FHB ventilation aligned for emergency operation at 0PM02J:
		  o 0VA04CB – RUNNING.
		  o 0VA055Y – OPEN.
		  o 0VA062Y – OPEN (not fully closed).
		  o 0VA435Y – CLOSED.
		• Shutdown unnecessary plant equipment.
		  o Trip all running HD pumps.
		• Initiate periodic monitoring of Spent Fuel Cooling.
		• Notify SRO of manual actions taken, failed equipment status & Attachment B complete.

	ATC	• Verify ECCS pumps running at 1PM05J/1PM06J:
		  o BOTH CV pumps – 1B CV PUMP only (1A CV pump C/S in PULL OUT).
		  o BOTH RH pumps – RUNNING.
		  o BOTH SI pumps – RUNNING.

	ATC	• Verify the following at 1PM06J:
		  o RCFCs running in accident mode:
		  • Group 2 RCFC accident mode status lights – LIT.
		  o CNMT Phase A valves closed:
		  • Group 3 Cnmt Isol monitor lights – LIT.

	ATC	• Perform the following at 1PM06J:
		  o Verify Cnmt Vent isolation:
		  • Group 6 Cnmt Vent Isol monitor lights – LIT.
		  o Verify AF system:
		  • AF pumps – BOTH RUNNING.
		  • AF isolation valves – 1AF013A-H OPEN.
		  • AF flow control valves – 1AF005A-H THROTTLED.
		  o Verify CC pumps – BOTH RUNNING.
		  o Verify SX pumps – BOTH RUNNING.

		EXAMINER'S NOTE: If an automatic MSLI signal is NOT present, the MSIVs are NOT required to be manually closed at the step below. See 1BwEP-2 CT-17. However, the MSIVs may be manually closed based on steam flow from the intact SGs to the faulted SG.

	ATC	• Check if Main Steamlines should be isolated:
		  o Any S/G pressure < 640 psig at 1PM04J (pressure dropping, 1D SG feedline break).
		  o CNMT pressure > 8.2 psig at 1PM06J.
		  o If NO, GO TO **Check if CS is required** step (next page).
		  o If YES, verify MSIVs and MSIV bypass valves closed (NO – MSIVs open).

Scenario No: **19-1 NRC 1** Event No. 7, 8, 9		
Event Description: SGTR on 1D SG / 1D SG feedline break (faulted/ruptured SG) / auto MSLI failure / 1SI8801B fails to auto open		
Time	Position	Applicant's Actions or Behavior
	[CT-17]	**Isolate the 1D SG before transitioning out of 1BwEP-2. (Westinghouse – CT-17) (K/A Number – APE040 AA1.10, Importance – 4.1/4.1) (AF is isolated in 1BwEP-2)** • **Manually actuate Main Steamline Isolation/close all MSIVs.** • Verify MSIVs and MSIV bypass valves closed.
		EXAMINER'S NOTE: The crew may also recognize steam flow from the 1A-1C SGs feeding the 1D SG feedline break and may manually close the MSIVs anytime in 1BwEP-0.
	ATC	• **Check if CS is required**: o CNMT pressure has remained < 20 psig.
	ATC	• Verify total AF flow: o AF flow > 500 gpm. o Check SG NR levels – NOT RISING IN AN UNCONTROLLED MANNER.
	ATC **[CT-7]**	• Verify ECCS valve alignment: o Group 2 cold leg injection monitor lights lit – NO. **Manually open 1SI8801B to establish high head SI flow before transitioning out of 1BwEP-0. (Westinghouse – CT-7) (K/A number – 013 A4.01, Importance – 4.5/4.8)** • **Open 1SI8801B.** • Attempt to open 1SI8801A (stuck closed). • Open 1CV112E. • Close 1CV8105 and 1CV112C. • Verify ECCS flow: o High head SI flow > 100 gpm (1FI-917). o RCS pressure > 1700 psig.
	ATC	• Check PZR PORVs and spray valves at 1PM05J: o PORVs – CLOSED. o PORV isolation valves – BOTH ENERGIZED. o PORV relief paths – both PORVs in AUTO, both PORV isolation valves OPEN. o Normal PZR spray valves – CLOSED.
	ATC	• Check RCS temperatures at 1PM05J: o With RCPs running, RCS Tave – STABLE AT OR TRENDING TO 557°F (NO). o With RCPs stopped, RCS Tcold – STABLE AT OR TRENDING TO 557°F (NO). • With temperature < 557°F and dropping: • Stop dumping steam. • Control AF flow (maintain total feed flow > 500 gpm until SG NR level > 10% (31%) in at least one SG).

Scenario No: **19-1 NRC 1** Event No. 7, 8, 9		
Event Description: SGTR on 1D SG / 1D SG feedline break (faulted/ruptured SG) / auto MSLI failure / 1SI8801B fails to auto open		
Time	Position	Applicant's Actions or Behavior

	ATC	• Check status of RCPs at 1PM05J:
		  • All RCPs – RUNNING (may already be stopped).
		  • Check RCP trip criteria:
		  • High head SI flow (1FI-917) > 100 gpm.
		  • RCS pressure < 1425 psig.
		  • Stop all RCPs.

	BOP	• Check if SG secondary pressure boundaries are intact at 1PM04J: • Verify NO SG depressurizing in an uncontrolled manner or completely depressurized (NO – 1D SG faulted).
	SRO	Transition to 1BwEP-2, FAULTED SG ISOLATION.
		1BwEP-2, FAULTED SG ISOLATION
	SRO	• Notify SM of plant status and procedure entry. • Request SM evaluation of Emergency Plan conditions. • Request STA evaluation of status trees.
	SRO	• Enter/implement 1BwEP-2 and direct operator actions of 1BwEP-2 to establish the following conditions:

	BOP
	
	[CT-17]
		• Check Main Steamline Isolation.
		  • All MSIVs and MSIV bypass valves closed. If NO, perform the following:
		Isolate the 1D SG before transitioning out of 1BwEP-2. (Westinghouse – CT-17) (K/A Number – APE040 AA1.10, Importance – 4.1/4.1) (May have been previously closed)
		  • **Manually actuate Main Steamline Isolation/close all MSIVs.**

	BOP	• Check if any SG secondary pressure boundary is intact. • Check pressure in all SGs – ANY SG PRESSURE STABLE OR RISING.
	BOP	• Identify faulted SG. • Any SG pressure dropping in an uncontrolled manner OR any SG completely depressurized (YES – 1D SG).

	BOP
	
	[CT-17]
	[CT-17]
		• Isolate the faulted SG.
		  • Close AF isolation valves on faulted SG.
		
		Isolate the 1D SG before transitioning out of 1BwEP-2. (Westinghouse – CT-17) (K/A Number – APE040 AA1.10, Importance – 4.1/4.1) (1D MSIV previously closed)
		  • **Close 1AF013D.**
		  • **Close 1AF013H.**
		• Check FW to faulted SG isolated.
		  • Associated row on FW ISOLATION MONITOR LIGHTS – LIT.
		• Verify SG PORV, 1MS018D – CLOSED.
		• Verify SG blowdown isolation valves, 1SD002C/D – CLOSED.
		• Verify SG blowdown sample isolation valve, 1SD005B – CLOSED.
		• Verify 1D MSIV and bypass valve – CLOSED.

Scenario No: **19-1 NRC 1** Event No. 7, 8, 9		
Event Description: SGTR on 1D SG / 1D SG feedline break (faulted/ruptured SG) / auto MSLI failure / 1SI8801B fails to auto open		
Time	Position	Applicant's Actions or Behavior
	BOP	• Check AF pump suction pressure. • Annunciator 1-3-E7 – NOT LIT.

	BOP
	
	SRO
		• Check secondary radiation.
		  • Reset Phase A.
		  • Open 1SD005A-D, SG Blowdown Sample Isolation valves, at 1PM11J.
		  • Contact Chemistry to sample ALL SGs for activity.

	BOP	• Check secondary radiation trends – NORMAL FOR PLANT CONDITIONS (NO).
	SRO	Transition to 1BwEP-3, STEAM GENERATOR TUBE RUPTURE.
		1BwEP-3, STEAM GENERATOR TUBE RUPTURE
	SRO	• Notify SM of plant status and procedure entry. • Request SM evaluation of Emergency Plan conditions.
	SRO	• Enter/implement 1BwEP-3 and direct operator actions of 1BwEP-3 to establish the following conditions:
	ATC	• Check if RCPs should be stopped. • RCPS – ANY RUNNING (NO).

	BOP	• Identify ruptured SG 1D.
		  • 1D Main steamline rad monitor – ABNORMAL FOR PLANT CONDITIONS.
		• Isolate flow from ruptured SG:
		  • Verify 1D SG PORV – CLOSED and controller in – AUTO.
		  • Verify 1SD002C & D – CLOSED.
		• Close 1D MSIV and MSIV bypass valve (previously performed in 1BwEP-0).
		• Check 1D SG NR level > 10% (31%) (NO – DO NOT FEED 1D SG PER CAUTION ABOVE STEP 4 IN 1BwEP-3).
		  o Close 1AF013D/H (previously performed in 1BwEP-2).
		  o Set 1AF005D and 1AF005H pots to 0% demand.

	BOP	• Check ruptured SG pressure (1D SG): o 1D SG pressure > 330 psig (NO).
	SRO	• Transition to 1BwCA-3.1, SGTR WITH LOSS OF REACTOR COOLANT – SUBCOOLED RECOVERY DESIRED.

Scenario No: **19-1 NRC 1** Event No. 7, 8, 9		
Event Description: SGTR on 1D SG / 1D SG feedline break (faulted/ruptured SG) / auto MSLI failure / 1SI8801B fails to auto open		
Time	Position	Applicant's Actions or Behavior
		1BwCA-3.1, SGTR WITH LOSS OF REACTOR COOLANT – SUBCOOLED RECOVERY DESIRED
	SRO	• Notify SM of plant status and procedure entry. • Request SM evaluation of Emergency Plan conditions.
	SRO	• Enter 1BwCA-3.1 and direct operator actions of 1BwCA-3.1 to establish the following conditions:
	BOP	• Reset SI at 1PM06J. • Reset Phase A (previously performed in 1BwEP-2). • Reset Phase B (did NOT actuate). • Establish IA to Cnmt. o Check a station air compressor (SAC) is running at 0PM01J. o Open 1IA065 and 1IA066 at 1PM11J.
	BOP	• Verify all AC busses energized by offsite power. o Busses 141-144 (4KV busses). o Busses 156-159 (6.9KV busses).
	ATC	• Deenergize PZR heaters. o Place backup heater contactors in – OFF. o Place variable heater control switch in – AFTER TRIP.
	SRO	• Consult with TSC for a recommended minimum indicated PZR water level that will ensure PZR heaters are covered.
	BOP	• Check if CS should be stopped (No CS pumps running).
	BOP	• Check 1D SG NR level > 10% (31%) (NO – DO NOT FEED 1D SG PER CAUTION ABOVE STEP 7 IN 1BwCA-3.1).
	BOP	• Check if RH pumps should be stopped. o RH pumps – ANY RUNNING WITH SUCTION ALIGNED TO RWST. o RCS pressure > 325 psig and stable or rising. o If YES, stop both RH pumps.
		EXAMINER'S NOTE: At this point in the scenario, all Critical Tasks are complete, and the scenario stop criteria has been reached, with Lead Examiner's concurrence, STOP the scenario.

Simulation Facility: Braidwood		Scenario No.: **NRC 2**	Operating Test No.: **19-1 NRC**
Examiners:		Applicant:	SRO
			ATC
			BOP

Initial Conditions: IC-16

Turnover: Unit 1 is at 53%, steady state, Equilibrium Xenon, MOL. On-line risk is Green. Following turnover, lower reactive load by 1 KV per TSO direction received just prior to turnover. The BOP will lower reactive load per BwOP MP-23. Unit 2 is in a refueling outage. Early this shift, the load ascension to full power is expected to commence (recent grid emergency conditions have been resolved).

Event No.	Malf. No.	Event Type*	Event Description
Preload	IMF RH01A IMF CS01A IRF RP63 OUT		1A RH pump trip 1A CS pump trip 1B CS pump auto-start failure
1	None	N-BOP N-SRO	Lower reactive load by 1 KV
2	IMF RH05D 100	T-SRO	RWST level channel, 1LT-933, fails high
3	IMF CV44A RAISE	I-ATC I-SRO	Letdown HX temperature controller, 1TK-0130, setpoint fails high
4	IMF RX17B FALSE IMF RX17A TRUE	C-ATC C-SRO	Uncontrolled rod withdrawal
5	IMF NI09B 0	I-BOP T-SRO	PRNI channel N-42 fails low, Bypass N42 and Ovation Defeat
6	None	R-ATC R-SRO	Ramp unit to 1120 MWe at 1.6 MWe/minute with rods in manual
7	IMF EG03 90 96 180	C-BOP C-SRO	Main Generator voltage regulator failure
8 9	IMF TH06C 540000 30 IMF RH01A (preload)	M-ALL	Large break RCS LOCA/ 1A RH pump trip
10	IMF CS01A (preload) IRF RP63 OUT (preload)	C-BOP C-SRO	1A CS pump trip 1B CS pump auto-start failure

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

SCENARIO OVERVIEW

Unit 1 is at 53%, steady state, Equilibrium Xenon, MOL. On-line risk is Green. Following turnover, lower reactive load by 1 KV per TSO direction received just prior to turnover. The BOP will lower reactive load per BwOP MP-23. Unit 2 is in a refueling outage. Early this shift, the load ascension to full power is expected to commence (recent grid emergency conditions have been resolved). TSO will contact station when ramp is to commence.

After completing shift turnover, the crew will lower reactive load by 1 KV. The crew will lower reactive load by 1 KV per BwOP MP-23.

After lowering reactive load, RWST level channel, 1LT-933, will fail high. The SRO will enter 1BwOA INST-2 and enter Tech Spec 3.3.2 Conditions A and K.

After the SRO has evaluated Tech Specs for the RWST level channel failure, the Letdown HX temperature controller, 1TK-0130, setpoint will fail high. This will cause a high letdown temperature and the crew will respond using BwAR 1-8-C5. The ATC will place 1TK-0130 in manual and restore letdown temperature to normal.

After the Letdown HX temperature controller setpoint failure actions are completed, uncontrolled rod withdrawal will occur. The ATC to respond per 1BwPR 1-10-RD and will place rods in manual to stop the rod withdrawal. The SRO will enter 1BwOA ROD-1. Rods will remain in Manual control for the remainder of the scenario.

After the uncontrolled rod withdrawal actions are completed, PRNI channel N-42 will fail low. The crew will respond to the failure and the SRO enter 1BwOA INST-1. The SRO will enter Tech Spec 3.3.1 Conditions A, D & E. The BOP will bypass the failed PRNI and remove N42 from service in Ovation. Bistables will not be tripped or bypassed for 2 hours due to a callout to obtain additional NSO support.

After the SRO has evaluated Tech Specs for the PRNI channel failure, the load dispatcher will request that the crew starts the load ramp to full power. The BOP will initially program the turbine to ramp to 1120 MWe at 1.6 MWe/minute per 1BwGP 100-3. The ATC will dilute the RCS to support the load ramp per BwOP CV-5 and/or reposition control rods as required.

After the load ramp reactivity change is adequately evaluated, a Main Generator voltage regulator failure will occur. The BOP will use 1BwPR 1-19-B6 and take the voltage regulator to off and adjust the base adjuster to lower exciter field current. The BOP will then review BwAR 1-19-B6 for subsequent operator actions (i.e., inform TSO, NDO, etc.). NOTE: If the crew takes no action for this failure, a main generator/turbine trip will occur in ~ 3 minutes.

After the plant is stabilized from the Main Generator voltage regulator failure, a large break RCS LOCA will occur. A reactor trip and SI will automatically occur. The SRO will enter 1BwEP-0. The 1A RH pump will trip and neither train of CS will start; the 1B CS pump can be manually started. The crew will transition to 1BwEP-1. Once the RWST level LO-2 annunciator alarms, the crew will transition to 1BwEP ES-1.3 and will align the 1B RH train for cold leg recirculation.

Scenario completion criteria is when the crew aligns 1B RH train for cold leg recirculation.

Critical Tasks:

1. Manually start the 1B CS pump prior to completion of step 20 of 1BwEP-0.
   (Westinghouse – CT-3) (K/A number – 026 A4.01, Importance – 4.5/4.3)
2. Transfer to cold leg recirculation and establish ECCS recirculation flow before RWST level drops to < 9%.
   (Westinghouse – CT-36) (K/A number – EPE011 EA1.11, Importance – 4.2/4.2)

Potential Critical Tasks:

1. Manually lower main generator exciter field current to prevent a main generator/turbine trip.
   (K/A number – 045 GEN2.1.7, Importance – 4.4/4.7)

SIMULATOR SETUP GUIDE

- Verify/perform TQ-BR-201-0113, BRAIDWOOD TRAINING DEPARTMENT SIMULATOR EXAMINATION SECURITY ACTIONS CHECKLIST.
- Reset to IC-16, 53% power, steady state, equilibrium Xenon, MOL OR use the IC written below.
- Open SmartScenario file **19-1 NRC 2.ssf** from the thumb drive and place the ssf in run.
- Release the **SETUP** command box.
- Complete items on Simulator Ready for Training Checklist.
- Ensure the simulator is in RUN (allow simulator to run during board walk down and turnover).
- Verify page 1 PRELOAD items are inserted.
- Ensure U-2 MPT disconnect is open on the 0PM03J mimic.
- Verify 0A & 0C VA plenums in-service, 0B VA plenum in standby.
- Verify main generator MVARs are 200 MVARs OUT.
- Verify/remove any Equipment Status Tags and Danger Tags not applicable to the scenario.
- Verify SER printer is clear of data.
- If desired, write an IC after all the set-up actions are completed (snap to 0). This IC may be used for running the scenario on additional simulator groups.
- Provide students with turnover sheets and copy of BwOP MP-23, load ramp ReMA and a blank 1BwGP 100-3T1.
- Provide a turnover of unit status to oncoming crew.

Event 1: Lower reactive load by 1 KV

As Shift Manager, acknowledge the completion of BwOP MP-23.

If asked, the Nuclear eGPM Voltage Monitor Program, is not functioning.

If asked, lowering reactive load has been logged per BwOP MP-23.

If contacted as Generation Dispatcher (Brett Warren), acknowledge the completion of reactive load adjustment.

Event 2: RWST level channel, 1LT-933, fails high

Release ssf command box **Event 2**.

Ensure **MF RH05D 100** is inserted to fail RWST level channel, 1LT-933, high.

As SM, acknowledge the failure and requests for risk evaluation, IR initiation and notification request. If asked for personnel to bypass bistables, inform the SRO that 2 NSOs will be available in 1 hour. The SRO will enter Tech Specs 3.3.2 Conditions A and K.

Event 3: Letdown HX temperature controller, 1TK-0130, setpoint fails high

Release ssf command box **Event 3**.

Ensure **MF CV44A RAISE** is inserted to fail the 1TK-0130 setpoint high.

As SM, acknowledge requests for risk evaluation, IR initiation and maintenance support.

If dispatched as EO to 1CC130A/B, report valve position using variables CCV1CC130A/B.

As Chemistry (if called), report that the in-service mixed bed demin should remain off-line until it can be sampled.

Event 4: Uncontrolled rod withdrawal

Release ssf command box **Event 4**.

Ensure **MF RX17B FALSE** and **MF RX17A TRUE** are inserted to cause uncontrolled rod withdrawal.

If dispatched as an EO to the Rod Control cabinets, report no abnormal conditions are present.

As Chemistry, acknowledge request to initiate RCS boron sampling.

As SM, acknowledge the failure and requests for risk evaluation, IR initiation and notification request. If consulted for status of manual or auto rod control, report that manual rod control is available, auto rod control requires IMD troubleshooting.

Event 5: PRNI channel N-42 fails low

Release ssf command box **Event 5**.

Ensure **MF NI09B 0** is inserted to fail PRNI channel N-42 low.

As SM, acknowledge the failure and requests for risk evaluation, IR initiation and notification request. If asked for personnel to bypass bistables, inform the SRO that 2 NSOs will be available in 2 hours. The SRO will enter Tech Spec 3.3.1 Conditions A, D & E.

Event 6: Ramp unit to 1120 MWe at 1.6 MWe/minute with rods in manual

Call the crew as the TSO and request that the crew start the load ramp to full power.

As SM, acknowledge the power ascension to full power. If asked, this is NOT a power ascension following a refueling outage.

Event 7: Main Generator voltage regulator failure

Release ssf command box **Event 7**.

Ensure **MF EG03 90 96 180** (start malfunction severity at 90 and ramp to 96 over 180 seconds) is inserted for the main generator voltage regulator failure.

As SM, acknowledge the generator voltage regulator failure, risk evaluation, IR initiation and requests for maintenance and OAD support.

As Generation Dispatch, acknowledge the generator voltage regulator failure and request that MVARs be restored to 150 MVARs out.

Event 8, 9: Large break RCS LOCA/1A RH pump trip/

Release ssf command box **Event 8**.

Ensure **MF TH06C 540000 30** is inserted to cause a large break 1C loop RCS LOCA.

As SM, acknowledge procedure transitions, EAL evaluation request and STA request.

If dispatched as EO to 1A RH pump, report ground overcurrent relay flag at its breaker (4 minute delay).

Event 10: 1A CS pump trip with 1B CS pump auto-start failure (preloaded MFs)

When requested to monitor DG operation, release ssf command box **DG Check**.

Ensure **RF EG06 RESET** is inserted to reset 1A DG alarm.
Ensure **RF EG12 RESET** is inserted to reset 1B DG alarm.

When requested to open 0/1SX007 to obtain **8000 GPM**, release ssf command box **0/1SX007 Throttling – 8000 gpm**.

Ensure **RF SW01 60** is inserted to open 0SX007 to 60%.
Ensure **RF SW02 60** is inserted to open 1SX007 to 60%.

After the STA is requested, as STA report CSF status – Yellow on Inventory with PZR level < 17%, Yellow on Integrity.

If dispatched as EO to 1A RH pump or 1A CS pump, report ground overcurrent relay flag at each breaker (4 minute delay).

If requested to place H2 Monitors in service per BwOP PS-9, wait 9 minutes, then verify 1PS228A/B/229A/B/230A/B valves are open, then release ssf command box **H2 Monitors**.

Ensure **RF CH01 LOW** is inserted to energize train 1A H2 Monitor.
Ensure **RF CH06remf LOW** is inserted to energize train 1B H2 Monitor.

Scenario No: **19-1 NRC 2** Event No. 1		
Event Description:		Lower reactive load by 1 KV
Time	Position	Applicant's Actions or Behavior
	CUE	• From turnover, lower total station reactive load 1 KV in accordance with BwOP MP-23.
	SRO	• Brief the BOP for lowering reactive load 1KV (may have been performed earlier).
		EXAMINER'S NOTE: Adjusting the reactive load 1 KV correlates to 50 MVARS on PPC point Q2801/1VI-MP006.

	BOP	• Refer to BwOP MP-23.
		• Verify MVAR change will not exceed Generator Capability Curve in 1BwGP 100-3A6.
		• Monitor PPC point Q2801 (preferred), 1VI-MP006, main generator output VARS at 1PM01J during the MVARs adjustment. Switchyard bus voltage at 0PM03J does NOT require monitoring per NOTE in BwOP MP-23.
		○ Contact Unit 2 and coordinate lowering total station reactive load by 1 KV (NOTE: N/A since Unit 2 is in an outage).
		• Perform the following at 1PM01J:
		  • Momentarily place Volt Adjuster C/S to lower (may be done intermittently).
		  • Stop MVAR adjustment when PPC point Q2801 has dropped ~50 MVARS (1 KV).
		  • Monitor main generator output voltage on all 3 phases.
		  • Monitor main generator amps (output current on 1II-MP001).
		• Inform SRO that BwOP MP-23 is complete.

	SRO	• Acknowledge report that reactive load was lowered 1 KV. • Notify Generation Dispatch that BwOP MP-23 is complete. ○ Notify SM that BwOP MP-23 is complete.
	ATC	• Peer check actions of BOP. • Monitor remainder of MCBs.
		EXAMINER'S NOTE: After BwOP MP-23 is complete and with Lead Examiner's concurrence, enter next event.

Scenario No: **19-1 NRC 2** Event No. 2		
Event Description: RWST level channel, 1LT-933, fails high		
Time	Position	Applicant's Actions or Behavior
	CUE	• Annunciator 1-6-A6, RWST LEVEL HIGH, alarms. • RWST level meter, 1LI-933, fails high.
	BOP	• Determine 1LT-933 has failed high. • Refer to BwARs, as time permits.
	SRO	• Identify entry conditions for 1BwOA INST-2, OPERATION WITH A FAILED INSTRUMENT CHANNEL.
	SRO	• Notify SM of plant status and procedure entry. • Request SM evaluation of Emergency Plan conditions. • Enter/implement 1BwOA INST-2 and direct operator actions of 1BwOA INST-2 ATTACHMENT K to establish the following conditions:
	SRO	• Locally bypass RWST level channel 933 bistables (will be delayed). • Enter Tech Spec 3.3.2 Conditions A and K. • Notify SM to perform risk evaluation, initiate IR and make notifications as appropriate.
	ATC	• Monitor remainder of MCBs. ○ Dispatch EO to investigate 1LT-933.
		EXAMINER'S NOTE: After the RWST level channel failure Tech Specs are determined and with Lead Examiner's concurrence, insert next event.

Scenario No: **19-1 NRC 2** Event No. 3		
Event Description:		Letdown HX temperature controller, 1TK-0130, setpoint fails high
Time	Position	Applicant's Actions or Behavior
	CUE	• Annunciator 1-9-E2, LTDWN TEMP HIGH, alarms. • Annunciator 1-8-C5, LTDWN HX OUTLT TEMP HIGH, alarms. • Letdown HX outlet temperature meter, 1TI-130, rises. • 1CV129, demin high temp letdown divert valve, diverts to the VCT position.

	ATC	• Determine that the 1TK-0130 controller has failed.
		• Report letdown temperature controller failure to SRO.
		• Refer to BwARs 1-8-C5/1-9-E2. Per BwAR 1-8-C5:
		  • Place 1TK-0130 in manual.
		  • Adjust 1TK-0130 to maintain desired letdown temperature (1TI-130).

	BOP	• Monitor remainder of MCBs. • Refer to BwARs, as time permits.
	SRO	• Direct/ensure ATC to take manual control of 1TK-0130 and restore letdown temperature to normal. • Notify SM to perform risk evaluation, initiate IR and contact maintenance to investigate/correct failure. ○ May establish a critical parameter for letdown temperature.
	ATC	• Inform SRO of 1CV129 valve status (diverted to VCT).
	SRO	○ After letdown temperature is restored, may direct the ATC to reposition 1CV129 to the DEMIN position. ○ May contact Chemistry to determine if demin should be returned to service. If Chemistry is contacted, direction will be provided to leave demin bypassed pending sampling results.
		EXAMINER'S NOTE: The crew may elect to isolate letdown based on elevated letdown temperature. Following letdown isolation, the crew may elect to establish excess letdown or re-establish normal letdown. The steps for restoring normal letdown are in italics below.
	ATC/BOP	***Establish normal letdown per BwOP CV-17, ESTABLISHING AND SECURING NORMAL AND RH LETDOWN:*** ○ *Verify/close 1CV8149A/B/C.* ○ *Verify CC aligned to letdown HX (was previously aligned).* ○ *Place 1PK-0131 in manual at 40% demand.* ○ *Place 1TK-0130 in manual at 60% demand.* ○ *Verify/open 1CV8152/8160.* ○ *Open 1CV459/460.* ○ *Verify/open 1CV8324A & 1CV8389A.* ○ *Verify 1CV381A/B are open; OFF light is lit above BTRS Mode Selector switch.* ○ *Verify/open 1CV8401A.* ○ *Verify/close 1CV8145.* ○ *Verify/open 1CV8146 or 1CV8147.* ○ *Open 1CV8105/8106.*

Scenario No: **19-1 NRC 2** Event No. 3		
Event Description:		Letdown HX temperature controller, 1TK-0130, setpoint fails high
Time	Position	Applicant's Actions or Behavior
		○ *Adjust 1FK-0121, CV pumps flow control valve, in manual to raise charging flow to 100 gpm while concurrently adjusting 1CV182, charging header backpressure control valve, to control RCP seal injection 8-10 gpm per RCP.* ○ *Open 1CV8149A/B/C and adjust 1PK-0131 in manual to maintain letdown pressure 360-380 psig.* ○ *Adjust 1TK-0130 in MANUAL to maintain letdown temperature 90-115°F.* ○ *Place 1FK-0121, 1LK-0459 & 1PK-0131 in AUTO (1TK-0130 remains in MANUAL).* ○ *At RMS, verify 1PR06J cursor is GREEN (in-service).* ○ *Verify proper operation of RMCS during VCT auto makeup.* ○ *Proper flow indicated on PW/Total Flow (1FT-0111) and Boric Acid Flow (1FT-0110) on recorder 1FR-0110.*
		EXAMINER'S NOTE: The steps for establishing excess letdown are in italics below.
	ATC/BOP	***Establish excess letdown per BwOP CV-15, EXCESS LETDOWN OPERATIONS:*** ○ *VERIFY reactor power is maintained less than or equal to 99.8% power.* ○ *Verify/open 1CV8100 & 1CV8112, seal water return CNMT isolation valves, at 1PM05J.* ○ *Open 1CC9437A & 1CC9437B, CC to excess letdown HX isolation valves, at 1PM06J.* ○ *Verify/close (at 0% demand) 1HCV-CV123, excess letdown HX flow control valve, at 1PM05J.* ○ *Verify/place 1CV8143, excess letdown to seal filter or RCDT valve, in VCT position at 1PM05J.* ○ *Open 1RC8037A, B, C, & D, RCS loop drain valves, at 1PM05J.* ○ *Open 1CV8153A & 1CV8153B, excess letdown HX 1A & 1B inlet isolation valves, at 1PM05J.* ○ *Raise demand on 1HCV-CV123, excess letdown HX flow control valve, while maintaining excess letdown outlet temperature < 165°F on Ovation graphic 6005.*
		EXAMINER'S NOTE: After the actions for 1TK-0130 controller failure are complete and with Lead Examiner's concurrence, enter next event.

Scenario No: **19-1 NRC 2** Event No. 4		
Event Description: Uncontrolled rod withdrawal		
Time	Position	Applicant's Actions or Behavior
	CUE	• Unexpected control bank D outward motion. • RODS OUT light lit at 1PM05J.

	ATC	• Identify control rods stepping out with no valid reason.
		• Report failure to SRO.
		• Perform actions per 1BwPR 1-10-RD, ROD CONTROL MALFUNCTION PROMPT RESPONSE:
		  • Check turbine power stable.
		  • Place rod bank select switch in MANUAL at 1PM05J.
		  • Check if rods are still moving (NO).
		  • Inform SRO to GO TO 1BwOA ROD-1, as required.

	SRO	• Notify SM of plant status and procedure entry. • Request SM evaluation of Emergency Plan conditions. • Enter/implement 1BwOA ROD-1, UNCONTROLLED ROD MOTION, and direct operator actions of 1BwOA ROD-1 to establish the following conditions:
	BOP	• Check turbine power stable. • Refer to BwARs, as time permits.

	ATC	• Check rod control status at 1PM05J:
		  • Rod bank select switch in MANUAL (previously performed).
		  • Check rods moving (NO).
		• Check rod control inputs – OPERABLE (PRNI, RCS loop Tave, turbine 1st stage pressure, DEH impulse pressure, Tref).
		• Check for unexplained reactivity addition – none identified.

	SRO	• Consult with Shift Manager for status of manual rod control (available). ○ May establish a critical parameter for RCS Tave.
	ATC	• Check manual rod control operable: • Step rods IN 7 steps, then OUT 7 steps (rod withdrawal – no more than 3 steps at a time). • Restore Tave - Tref deviation to within 1°F by adjusting rod position, turbine load or boron concentration.
	SRO	• Consult with Shift Manager for status of automatic rod control (NOT available). • Refer to Tech Specs (none are applicable).
	SRO	• Notify SM to perform risk evaluation, initiate IR and contact maintenance to investigate/correct rod control failure.
		EXAMINER'S NOTE: After the actions for the uncontrolled rod withdrawal are complete and with Lead Examiner's concurrence, insert next event.

Scenario No: **19-1 NRC 2** Event No. 5		
Event Description: PRNI channel N-42 fails low		
Time	Position	Applicant's Actions or Behavior
	CUE	• Annunciator 1-10-C4, PWR RNG CHANNEL DEV, alarms. • Annunciator 1-10-E4, OVATION SYSTEM TROUBLE, alarms (reflashes). • PRNI channel N-42 meter, 1NI-42B, fails low.
	ATC	• Determine PR channel N-42 has failed low. • Refer to BwARs, as time permits.
	CREW	• Identify entry conditions for 1BwOA INST-1, NI MALFUNCTION.
	SRO	• Notify SM of plant status and procedure entry. • Request SM evaluation of Emergency Plan conditions. • Enter/implement 1BwOA INST-1 and direct operator actions of 1BwOA INST-1 ATTACHMENT A to establish the following conditions:
	ATC	• Check rod control status – RODS NOT MOVING. • Check for rod stop: • Annunciator 1-10-B5 – NOT LIT. • Check Tave-Tref deviation – STABLE AND WITHIN 1°F.

	BOP	• Check SG levels – NORMAL AND STABLE.
		• Bypass/Defeat PR channel functions at 1PM07J. Select affected channel (N-42) for following functions on 1PM07J:
		  • Detector Current Comparator section:
		  ▪ UPPER SECTION.
		  ▪ LOWER SECTION.
		  • Miscellaneous Control and Indication section:
		  ▪ POWER MISMATCH BYPASS.
		  ▪ ROD STOP BYPASS.
		  • Comparator and Rate panel:
		  ▪ COMPARATOR CHANNEL DEFEAT.

	ATC	• Check annunciator 1-10-C3 – NOT LIT.

	BOP	• Place computer points in test/delete from scan for N-42.
		  • N0043, N0044, U1142 – IN TEST.
		  • N0050A delete from SCAN.
		  • NIS input (OWS Graphic 5515) – IN TEST.
		
		• Remove N-42 from service in Ovation.
		  • Select OWS graphic 6020.
		  • Select NI POWER in the signal selectors box.
		  • Select the NI power graphic to enable the window.
		  • Select PLACE OUT OF SERVICE for NR N-42.
		  • Exit the window.

Scenario No: **19-1 NRC 2** Event No. 5		
Event Description: PRNI channel N-42 fails low		
Time	Position	Applicant's Actions or Behavior
	SRO	• Locally bypass PRNI channel N-42 bistables (will be delayed). • Check if rod control can be placed in automatic (NO – due to previous rod control failure). • Enter Tech Spec 3.3.1 Conditions A, D, and E. • Notify SM to perform risk evaluation, initiate IR, evaluate reactivity screening, make notifications and contact maintenance to investigate/correct the PR channel failure.
		EXAMINER'S NOTE: After the PRNI channel N-42 Tech Specs are determined and with Lead Examiner's concurrence, enter next event.

Scenario No: **19-1 NRC 2** Event No. 6		
Event Description: Ramp unit to 1120 MWe at 1.6 MWe/minute with rods in manual		
Time	Position	Applicant's Actions or Behavior
	CUE	• Phone call to the crew requesting a load ramp to full power.
	SRO	• Perform pre-job brief per HU-AA-1211 for load ramp (may have been performed in PJB prior to starting scenario). • Perform applicable actions of 1BwGP 100-3.
	SRO	• Direct raising load to 1120 MWe at 1.6 MWe/min. • Initiate 1BwGP 100-3T1, POWER ASCENSION FLOWCHART (may have been performed in PJB prior to starting scenario).
	CREW	• Review applicable Precautions, & Limitations and Actions (may have been performed in PJB prior to starting scenario).

	ATC	○ May energize PZR heaters.
		• Verify rod position and boron concentration.
		• During load ramp, take periodic control rod steps to maintain Tave and Delta I within limits.
		• Initiate dilution per BwOP CV-5, OPERATION OF RMCS IN THE DILUTE MODE/ALTERNATE DILUTE MODE/BATCH DILUTION METHOD.
		• Determine desired amount of PW from ReMA (OP-AA-300-1004 is NOT required).
		• **DILUTE in AUTOMATIC - perform the following at 1PM05J/Ovation:**
		  • Place MAKEUP CONT SWITCH in the STOP position.
		  • Place MODE SELECT SWITCH in DIL position.
		  • Determine desired PW flowrate.
		  • Note the AS FOUND setpoint on 1FK-0111, PW/Total Flow Controller.
		  • Adjust the setpoint on 1FK-0111 to the desired flowrate.
		  • Set the PW/MAKEUP TOTALIZER as follows:
		  • SELECT OWS graphic (6003) RMCS.
		  • SELECT soft button SETPOINT ADJUST & RESET for the PW/MAKEUP TOTALIZER.
		  • SELECT the header for the PW/MAKEUP PREDETERMINED SETPOINT (cornsilk).
		  • SELECT the RESET soft button to set TOTALIZED field to 0.
		  • VERIFY the TOTALIZED field displayed on the PW/MAKEUP TOTALIZER = 0.
		  • ENTER the desired volume in the PW/MAKEUP PREDETERMINED SETPOINT field (right most digit is gallons).
		  • SELECT ENTER soft button.
		  • VERIFY that the correct volume entered is displayed in PREDETERMINED field of the PW/MAKEUP TOTALIZER and THEN SELECT the EXIT soft button.
		  • Control VCT level, if desired:
		  ○ VERIFY/PLACE 1LK-0112 in AUTO and ADJUST the setpoint to desired value;
		  - OR -
		  ○ PLACE 1LK-0112 in MANUAL & depress RAISE pushbutton to desired demand.
		  • Place MAKEUP CONT SWITCH to START.

Scenario No: **19-1 NRC 2** Event No. 6		
Event Description: Ramp unit to 1120 MWe at 1.6 MWe/minute with rods in manual		
Time	Position	Applicant's Actions or Behavior

		• Verify proper operation of valves and PW makeup pump (1CV111B open, 1CV111A throttled, 1CV110B open (ALT DIL only), PW pump running, proper PW flow on recorder 1FR-0110).
		• When desired amount of primary water added:
		  • Place MAKEUP CONT SWITCH to STOP.
		  • Verify/close 1CV111A.
		  • Verify/close 1CV111B.
		  • Verify/close 1CV110B.
		• If desired, verify/restore 1LK-0112 to AUTO.
		• Verify/set 1FK-0111 to the as-found setpoint or as directed by the SM or designee.
		• If desired, RESET the PW/MAKEUP TOTALIZER to 0.
		- OR -
		• **BATCH DILUTE - perform the following at 1PM05J/Ovation:**
		  • Control VCT level by one of the following methods:
		  o VERIFY/PLACE 1LK-0112 in AUTO and ADJUST the setpoint to desired value;
		  - OR -
		  o PLACE 1LK-0112 in MANUAL & depress RAISE pushbutton to desired demand.
		  • Perform the following to reset the PW/MAKEUP TOTALIZER to 0:
		  • SELECT OWS graphic (6003) RMCS.
		  • SELECT soft button SETPOINT ADJUST & RESET for the PW/MAKEUP TOTALIZER.
		  • SELECT the header for the PW/MAKEUP PREDET SETPOINT (cornsilk).
		  • SELECT the RESET soft button to set TOTALIZED field to 0.
		  • VERIFY the TOTALIZED field displayed on the PW/MAKEUP TOTALIZER = 0.
		  • ENTER the desired volume in the PW/MAKEUP PREDETERMINED SETPOINT field (right most digit is gallons).
		  • SELECT the EXIT soft button.
		  • Open 1CV110B.
		  • Open 1CV111A.
		  • When desired amount of primary water added:
		  • Close 1CV111A (switch in AUTO).
		  • Close 1CV110B (switch in AUTO).
		  • Close 1CV111B (switch in AUTO).
		  • If desired, verify/restore 1LK-0112 to AUTO.
		  • Verify/set 1FK-0111 to the as-found setpoint or as directed by the SM or designee.
		  • If desired, RESET the PW/MAKEUP TOTALIZER to 0.

Scenario No: **19-1 NRC 2** Event No. 6		
Event Description: Ramp unit to 1120 MWe at 1.6 MWe/minute with rods in manual		
Time	Position	Applicant's Actions or Behavior

	BOP	• Raise turbine load from Ovation by performing the following:
		  • Select SETPOINT.
		  • Enter desired MW (1120) into REF DEMAND window.
		  • Select left ENTER.
		  • Verify correct value appears in REFERENCE DEMAND window (5501).
		  • Enter 1.6 MW/min into the RATE window.
		  • Select right ENTER.
		  • Verify correct value appears in RATE window (5501).
		  • Select EXIT.
		  • Notify SRO and ATC of pending ramp.
		  • Select GO/HOLD.
		  • Verify GO/HOLD illuminates orange.
		  • Verify HOLD illuminates RED.
		  • Select GO.
		  • Verify GO illuminates RED while the turbine ramps.
		  • Verify main turbine load begins to rise.

	ATC/
	BOP
		• Monitor reactor power, Tave, control rod position and ΔI at 1PM05J or PPC.
		• Monitor MWe and DEHC system response on Ovation.
		• During each dilution, monitor the following at 1PM05J, PPC or Ovation:
		  • VCT level.
		  • RCS Tave.
		  • Verify dilution auto stops at predetermined value.
		• Verify/enable the 1A MFP Auto Start feature per 1BwGP 100-3 step 60.

		EXAMINER'S NOTE: After the load ramp reactivity change is adequately evaluated and with Lead Examiner's concurrence, enter next event.

Scenario No: **19-1 NRC 2** Event No. 7		
Event Description: Main Generator voltage regulator failure		
Time	Position	Applicant's Actions or Behavior
	CUE	• Annunciator 1-19-B6, GENERATOR FIELD FORCING, alarms. • Exciter Field Current meter, 1II-MP023, rising/pegged high. • Main Generator Output VARS meter, 1VI-MP006, rising.
	BOP Potential C/T	• Determine generator voltage regulator has failed. • Perform actions per 1BwPR 1-19-B6, GENERATOR FIELD FORCING MALFUNCTION PROMPT RESPONSE with exciter field current > 100.5 amps: • Manually lower main generator exciter field current to prevent a main generator/turbine trip. (K/A number – 045 GEN2.1.7, Importance – 4.4/4.7) • Shift voltage regulator to OFF. • Place base adjuster to LOWER to reduce exciter field current until annunciator 1-19-B6 clears. • GO TO BwAR 1-19-B6.
	SRO	• Direct/ensure BOP takes manual control of generator voltage regulator and lowers exciter field current per 1BwPR 1-19-B6. • Inform SM of voltage regulator failure. ○ Direct BOP/ATC to stop load ramp.
	CREW	• Refer to 1BwGP 100-3A7 for generator MW and generator VARS limits with voltage regulator failure. • Determine if the transient exceeded BwAR 1-19-B6 criteria.
	BOP	• Maintain exciter field current, generator MW and generator VARS within limits by operating the base adjuster. • Ensure the voltage regulator failure is logged.
	SRO	• Contact SM to perform risk evaluation, initiate IR and contact maintenance personnel to investigate/correct instrument failure. • Request SM inform TSO, NDO, Power Team Generation Dispatcher and OAD of voltage regulator failure.
		EXAMINER'S NOTE: After the actions for generator voltage regulator failure are complete and with Lead Examiner concurrence, enter next event.

Scenario No: **19-1 NRC 2** Event No. 8, 9, 10		
Event Description:	Large break RCS LOCA/1A RH pump trip/1A CS pump trip with 1B CS pump auto-start failure	
Time	Position	Applicant's Actions or Behavior
	CUE	• PZR level lowering rapidly. • PZR pressure lowering rapidly. • Annunciator 1-11-C1, PZR PRESS LOW SI/RX TRIP, alarms.
	SRO	• Identify entry conditions for 1BwEP-0, REACTOR TRIP OR SAFETY INJECTION.
	SRO	• Notify SM of plant status and procedure entry. • Request SM evaluation of Emergency Plan conditions. • Enter/implement 1BwEP-0 and direct operator actions of 1BwEP-0 to establish the following conditions:

	ATC	Perform immediate operator actions of 1BwEP-0 at 1PM05J.
		• Verify reactor trip:
		  • Rod bottom lights – ALL LIT.
		  • Reactor trip & bypass breakers – OPEN.
		  • Neutron flux – DROPPING.

	BOP	Perform immediate operator actions of 1BwEP-0 at OWS drop 210.
		• Verify turbine trip:
		  • All Turbine throttle valves – CLOSED.
		  • All Turbine governor valves – CLOSED.

	BOP	Perform immediate operator actions of 1BwEP-0 at 1PM01J. • Verify power to 4KV busses: • ESF busses – BOTH ENERGIZED (141 & 142).

	CREW	Perform immediate operator actions of 1BwEP-0 at 1PM05J.
		• Check SI Status:
		  • SI First OUT annunciator – LIT.
		  • SI ACTUATED Permissive Light – LIT.
		  • SI Equipment – AUTOMATICALLY ACTUATED:
		  ○ Either SI pump – RUNNING.
		  ○ Either CV pump to cold leg isolation valve OPEN – 1SI8801A/B.
		  • Manually actuate SI at 1PM05J & 1PM06J.

Scenario No: **19-1 NRC 2** Event No. 8, 9, 10		
Event Description:	Large break RCS LOCA/1A RH pump trip/1A CS pump trip with 1B CS pump auto-start failure	
Time	Position	Applicant's Actions or Behavior
	ATC	• Determine if RCP trip criteria are met: o CNMT Phase B actuated. o RCS pressure < 1425 psig & High head SI flow (1FI-917) > 100 gpm. • Trip ALL RCPs.
	SRO	• Direct BOP to perform Attachment B of 1BwEP-0.
		EXAMINER'S NOTE: The SRO and ATC will continue in 1BwEP-0 while the BOP is performing Attachment B.
	BOP	**1BwEP-0 ATTACHMENT B:** • Verify FW isolation at 1PM04J: • FW pumps – TRIPPED. • FW isolation monitor lights – LIT. • FW pumps discharge valves (1FW002A-C) – CLOSED (or going closed). • Verify DGs running at 1PM01J: • DGs – BOTH RUNNING. • 1SX169A/B – OPEN. • Dispatch operator to monitor DGs operation. • Verify Generator trip at 1PM01J: • OCB 1-8 and 7-8 – OPEN. • PMG output breaker – OPEN. • Verify SX pumps running: • Check Unit 0 CC HX aligned to Unit 1: • 1CC9473A&B – OPEN. • Unit 1 SX pumps – BOTH RUNNING. • Dispatch an operator to energize and open 0/1SX007 to 8000 GPM flow to the Unit 0/1 CC HX, then open the disconnects. • Verify Control Room ventilation aligned for emergency operations at 0PM02J: • VC Rad Monitors – LESS THAN HIGH ALARM SETPOINT. • Operating VC train equipment – RUNNING. • 0B Supply fan • 0B Return fan • 0B M/U fan • 0B Chilled water pump • 0B Chiller • Operating VC train dampers aligned for train 0B. • M/U fan outlet damper – 0VC08Y – NOT FULLY CLOSED. • 0B VC train M/U filter light – LIT. • 0VC09Y – OPEN. • 0VC313Y – CLOSED. • Operating VC train Charcoal Absorber aligned for train 0B. • 0VC44Y – CLOSED. • 0VC05Y – OPEN. • 0VC06Y – OPEN. • Control Room pressure greater than +0.125 inches water on 0PDI-VC038.

Scenario No: **19-1 NRC 2** Event No. 8, 9, 10		
Event Description: Large break RCS LOCA/1A RH pump trip/1A CS pump trip with 1B CS pump auto-start failure		
Time	Position	Applicant's Actions or Behavior

		• Verify Auxiliary Building ventilation aligned for emergency operation at 0PM02J:
		  • Two inaccessible filter plenums aligned.
		  • Plenum A:
		  • 0VA03CB – RUNNING.
		  • 0VA023Y – OPEN (not fully closed).
		  • 0VA436Y – CLOSED.
		  • Plenum C:
		  • 0VA03CF – RUNNING.
		  • 0VA072Y – OPEN (not fully closed).
		  • 0VA438Y – CLOSED.
		• Verify FHB ventilation aligned for emergency operation at 0PM02J:
		  • 0VA04CB – RUNNING.
		  • 0VA055Y – OPEN.
		  • 0VA062Y – OPEN (not fully closed).
		  • 0VA435Y – CLOSED.
		• Shutdown unnecessary plant equipment.
		  • Trip all running HD pumps.
		• Initiate periodic monitoring of Spent Fuel Cooling.
		• Notify SRO of manual actions taken, failed equipment status & Attachment B complete.

	ATC	• Verify ECCS pumps running at 1PM05J/1PM06J:
		  • BOTH CV pumps – RUNNING.
		  • BOTH RH pumps – 1B RH pump RUNNING, 1A RH pump tripped.
		  • BOTH SI pumps – RUNNING.

	ATC	• Verify the following at 1PM06J:
		  • RCFCs running in accident mode:
		  • Group 2 RCFC accident mode status lights – LIT.
		  • CNMT Phase A valves closed:
		  • Group 3 Cnmt Isol monitor lights – LIT.
		  • Verify Cnmt Vent isolation:
		  • Group 6 Cnmt Vent Isol monitor lights – LIT.
		  • Verify AF system:
		  • AF pumps – BOTH RUNNING.
		  • AF isolation valves – 1AF013A-H OPEN.
		  • AF flow control valves – 1AF005A-H THROTTLED.
		  • Verify CC pumps – BOTH RUNNING.
		  • Verify SX pumps – BOTH RUNNING.

	ATC/
	BOP
		• Check if Main Steamlines should be isolated:
		  • All S/G pressures > 640 psig (at 1PM04J).
		  • CNMT pressure > 8.2 psig.
		• Verify MSIVs & MSIV bypass valves – CLOSED.

Scenario No: **19-1 NRC 2** Event No. 8, 9, 10		
Event Description: Large break RCS LOCA/1A RH pump trip/1A CS pump trip with 1B CS pump auto-start failure		
Time	Position	Applicant's Actions or Behavior
	BOP **[CT-3]** **[CT-3]**	• Check if CS is required: • CNMT pressure has risen > 20 psig. • Group 6 CS monitor lights – ALL NOT LIT (manually actuate CS/Phase B – NO change in monitor light status). • GO TO ATTACHMENT C. **Manually start the 1B CS pump prior to completion of step 20 of 1BwEP-0. (Westinghouse – CT-3) (K/A number – 026 A4.01, Importance – 4.5/4.3)** • Check CS valve alignment: • 1CS001A/B OPEN. • 1CS007A OPEN, 1CS007B CLOSED – **Manually open 1CS007B**. • 1CS019A OPEN, 1CS019B CLOSED – **Place 1B CS Test Switch to TEST, Manually open 1CS019B,** place Test Switch to NORMAL. • 1CS010A/B OPEN. • Check CS pumps RUNNING – 1B CS pump ONLY (return to main body, step 14.c). • Group 6 Phase B Isolation monitor lights – LIT. • Verify/stop ALL RCPs (at 1PM05J). • CS eductor suction flow > 15 gpm on 1FI-CS014. • CS eductor additive flow > 5 gpm on 1FI-CS016.
	BOP/ ATC	• Verify total AF flow: • AF flow > 500 gpm. • S/G NR levels – NOT RISING IN AN UNCONTROLLED MANNER.
	ATC/ BOP	• Verify ECCS valve alignment • Group 2 Cold Leg Injection monitor lights required for injection – LIT.
	ATC/ BOP	• Verify ECCS flow • High head SI flow > 100 gpm (1FI-917). • RCS pressure < 1700 psig. • SI pumps discharge flow > 200 gpm. • RCS pressure < 325 psig. • 1B RH pump discharge flow > 1000 gpm.
	ATC	• Check PZR PORVs and spray valves at 1PM05J: • PORVs – CLOSED. • PORV isolation valves – BOTH ENERGIZED. • PORV relief paths – both PORVs in AUTO, both PORV isolation valves OPEN. • Normal PZR spray valves – CLOSED.
	ATC	• Check RCS temperatures at 1PM05J: • NO RCPs running. • RCS cold leg temperature - STABLE AT OR TRENDING TO 557°F (NO). • Control AF flow (maintain total feed flow > 500 gpm until SG NR level > 10% (31%) in at least one SG).

Scenario No: **19-1 NRC 2** Event No. 8, 9, 10		
Event Description:	Large break RCS LOCA/1A RH pump trip/1A CS pump trip with 1B CS pump auto-start failure	
Time	Position	Applicant's Actions or Behavior
	ATC	• Check status of RCPs at 1PM05J: • RCPs – NONE RUNNING.

	BOP/ ATC	• Check if SG secondary pressure boundaries are intact at 1PM04J:
		  • Check pressure in all SGs:
		  • NO SG pressure dropping in an uncontrolled manner.
		  • NO SG completely depressurized.

	BOP/ ATC	• Check if SG tubes are intact.
		  • SG NR levels – NOT RISING IN AN UNCONTROLLED MANNER.
		  • Check that the following have remained < alert/alarm setpoint at RMS:
		  • 1PR08J, SG Blowdown.
		  • 1PR27J, SJAE/GS Exhaust.
		  • 1AR022/23A-D, 1A-D Main Steam Lines.

	CREW	• Determine RCS in NOT intact:
		  • CNMT area rad monitors > alert alarm setpoint at RMS.
		  • CNMT pressure > 3.4 psig (1PI-CS-934-937) at 1PM06J.
		  • CNMT floor drain sump level > 46 inches (1LI-PC002/003) at 1PM06J.

	SRO	Transition to 1BwEP-1, LOSS OF REACTOR OR SECONDARY COOLANT.
		1BwEP-1, LOSS OF REACTOR OR SECONDARY COOLANT
	SRO	• Notify SM of plant status and procedure entry. • Request SM evaluation of Emergency Plan conditions. • Request STA evaluation of status trees. • Enter/implement 1BwEP-1 and direct operator actions of 1BwEP-1 to establish the following conditions:
		EXAMINER'S NOTE: When RWST level reaches the LO-2 setpoint, the crew will transition to 1BwEP ES-1.3 to align ECCS for cold leg recirc. 1BwEP ES-1.3 actions begin on page 24.
	ATC	• Check if RCPs should be stopped at 1PM05J: • ALL RCPs – STOPPED.

	BOP	• Check if SGs secondary pressure boundaries are intact at 1PM04J:
		  • Check pressure in all SGs:
		  • NO SG pressure dropping in an uncontrolled manner.
		  • NO SG completely depressurized.

	BOP	• Check intact SG levels at 1PM04J:
		  • SG NR levels > 10% (31%).
		  • Control feed flow to maintain SG NR levels between 10% (31%) and 50%.

	BOP	• Check secondary radiation normal.
		  • Reset Phase A.
		  • Open 1SD005A-D, SG Blowdown Sample Isolation valves, at 1PM11J.

Scenario No: **19-1 NRC 2** Event No. 8, 9, 10		
Event Description:	Large break RCS LOCA/1A RH pump trip/1A CS pump trip with 1B CS pump auto-start failure	
Time	Position	Applicant's Actions or Behavior

	SRO
	BOP
		• Contact Chemistry to sample ALL SGs for activity.
		• Check secondary radiation trends at RMS or PPC – NORMAL FOR PLANT CONDITIONS:
		  • 1PR27J, SJAE/GS Exhaust.
		  • 1PR08J, SG Blowdown.
		  • 1AR022/23A-D, 1A-D Main Steam Lines.
		• Secondary activity levels – NORMAL (when available).

	ATC	• Check PZR PORVs and isolation valves at 1PM05J:
		  • PORV isolation valves – BOTH ENERGIZED.
		  • PORVs – BOTH CLOSED.
		  • PORV isolation valves – BOTH OPEN.

Scenario No: **19-1 NRC 2** Event No. 8, 9, 10		
Event Description:	Large break RCS LOCA/1A RH pump trip/1A CS pump trip with 1B CS pump auto-start failure	
Time	Position	Applicant's Actions or Behavior

	CREW	• Check if ECCS flow should be reduced at 1PM05J:
		  • RCS subcooling – NOT ACCEPTABLE.
		• Check if CS should be stopped:
		  • CS pumps – 1A CS pump tripped, 1B CS pump RUNNING.
		  • Determine number of CS pumps required – 0 or 1 depending on Cnmt pressure.
		  • CS pumps running > number required (1 running and 1 required) – **GO TO step 8.** If 1 running and 0 required – continue with next step below.
		  • Check CS pumps – BOTH RUNNING (NO).
		  • CS termination requirements achieved:
		  • CNMT pressure < 15 psig.
		  • Spray operating time ≥ 8 hours & spray add tank LO-2 level lights – LIT (8 hours criteria NOT met).
		• Check if RH pumps should be stopped **(step 8)**:
		  • Reset SI:
		  • Depress BOTH SI Reset pushbuttons.
		  • Verify SI ACTUATED permissive light – NOT LIT.
		  • Verify AUTO SI BLOCKED permissive light – LIT.
		  • RCS pressure < 325 psig – GO TO step 10.

		EXAMINER'S NOTE: Depending on timing of the LO-2 RWST level being reached, some steps of 1BwEP-1 may not be performed prior to transition to 1BwEP ES-1.3.

	CREW	• Check if DGs should be stopped:
		  • 4 KV busses – ENERGIZED BY OFFSITE POWER.
		  • Stop unloaded DGs and place in standby per BwOP DG-12.
		• Initiate evaluation of plant status (step 11):
		  • Check cold leg recirculation capability – ONLY 1B RH train available.
		  • Check Aux Building radiation trends (PPC or RMS) – ALL NORMAL FOR PLANT CONDITIONS.
		  • Obtain samples – place H2 monitors in-service and consult TSC for obtaining samples.
		  • Evaluate plant equipment for long term recovery (shutdown 0A VC chiller).
		  • Start additional plant equipment to assist in recovery as directed by SRO.
		  • Check if Source Range detectors should be energized.
		• Check if RCS cooldown & depressurization is required (NO). GO TO step 13, then return to step 11 (initiate evaluation of plant status) until RWST level LO-2 is reached.

	CUE	• Annunciator 1-6-B7, RWST LEVEL LO-2, alarms. • RWST level < 46%.
	SRO	Transition to 1BwEP ES-1.3, TRANSFER TO COLD LEG RECIRCULATION.

Scenario No: **19-1 NRC 2** Event No. 8, 9, 10		
Event Description:	Large break RCS LOCA/1A RH pump trip/1A CS pump trip with 1B CS pump auto-start failure	
Time	Position	Applicant's Actions or Behavior
		1BwEP ES-1.3, TRANSFER TO COLD LEG RECIRCULATION
	SRO	• Notify SM of plant status and procedure entry. • Request SM evaluation of Emergency Plan conditions. • NOTE – BwFRs should not be implemented prior to completion of step 6 of 1BwEP ES-1.3. • Enter/implement 1BwEP ES-1.3 and direct operator actions of 1BwEP ES-1.3 to establish the following conditions:

	ATC/ BOP
	
	[CT-36]
	
	[CT-36]
		• Establish CC flow to RH HXs:
		  • Check 1CC9473A & B – OPEN.
		  • Check CC pumps – TWO RUNNING.
		Transfer to cold leg recirculation and establish ECCS recirculation flow before RWST level drops to < 9%. (Westinghouse – CT-36) (K/A number – EPE011 EA1.11, Importance – 4.2/4.2)
		  • **Open 1CC9412A & B.**
		  • Check CC to RH HX flows – 1FI-0689 & 1FI-0688 > 5000 gpm.
		• Check CNMT sump level – 1LI-PC006 & 1LI-PC007 > 8 inches (13 inches Adverse).
		• Align RH pumps suction to CNMT sumps.
		  • **Place SVAG valve C/Ss to close.**
		  • Check RH pumps:
		  • 1A RH pump tripped (C/S in PULL OUT).
		  • 1B RH pump – RUNNING.
		• Check CNMT sump isolation valves:
		  • 1SI8811A – FULL OPEN.
		  • 1SI8811B – FULL OPEN.

		EXAMINER'S NOTE: Any pump with a suction flowpath from the RWST should be stopped if level drops to 9% unless a suction has been lined up to the discharge of a running RH pump.
	ATC/ BOP	• Close 1SI8812A/B.

	ATC/ BOP	• Check SI and CV pumps in ECCS Injection Mode:
		  ○ SI pumps – BOTH RUNNING.
		  ○ Cent Chg pumps to cold legs injection isolation valves – 1SI8801A & B – OPEN.

	ATC/ BOP
	
	[CT-36]
	[CT-36]
		• Align SI and Cent Chg Pumps for Cold Leg Recirculation:
		  • Verify CENT CHG pump miniflow isolation valves:
		  • 1CV8111 – CLOSED.
		  • 1CV8114 – CLOSED.
		  • 1CV8110 – CLOSED.
		  • 1CV8116 – CLOSED.
		  • Close SI pump miniflow isol valves:
		  • **1SI8814 & 1SI8920 <u>or</u>**
		  • **1SI8813.**

Scenario No: **19-1 NRC 2** Event No. 8, 9, 10		
Event Description:		Large break RCS LOCA/1A RH pump trip/1A CS pump trip with 1B CS pump auto-start failure
Time	Position	Applicant's Actions or Behavior

	[CT-36]
	[CT-36]
	
	[CT-36]
	
	[CT-36]
		• Close RH HX discharge crosstie valves:
		  • **1RH8716A <u>or</u>**
		  • **1RH8716B.**
		• Open SI and CENT CHG pumps suction header crosstie valves:
		  • **1SI8807A and/or B.**
		  o 1SI8924 (already OPEN).
		• Check RH pump 1A – RUNNING (NO – TRIPPED).
		• Check RH pump 1B – RUNNING.
		  • **Open 1SI8804B.**

	BOP	• Start ECCS pumps as necessary. o CV and SI pumps.
		EXAMINER'S NOTE: At this point in the scenario, all Critical Tasks are complete, and the scenario stop criteria has been reached, with Lead Examiner's concurrence, STOP the scenario.

Simulation Facility	Braidwood	Scenario No.: **NRC 3**	Operating Test No.: **19-1 NRC**
Examiners:	_____	Applicant:	_____ ____
	_____		_____ ____
	_____		_____ ____

Initial Conditions: IC-18

Turnover: Unit 1 is at 75%, steady state, Equilibrium Xenon, MOL. On-line risk is Green. Following turnover, swap 75 gpm letdown orifices per BwOP CV-9 for a PMT after a cracked fuse holder was replaced on 1CV8149C.

Event No.	Malf. No.	Event Type*	Event Description
Preload	IMF CC02B 151 IMF FW35B IMF RP02A/B IMF RD09 8		Fail 1B CC pump discharge pressure switch 1B HD pump trip Fail RTA & RTB closed Fail auto rod speed at 8 steps/min
1	None	N-ATC N-SRO	Swap 75 gpm letdown orifices (close 1CV8149B, open 1CV8149C)
2	IMF CC01B IMF CC02B 151 (preload)	C-BOP C, T-SRO	1A CC pump trip with 1B CC pump failure to auto-start
3	IOR ZDI1CV181 OPEN DOR ZDI1CV181	C-ATC C-SRO	RCP 1A Standpipe PW Supply Valve, 1CV181, fails open (manual closure available)
4	IMF FW35A IMF FW35B (preload)	R-ATC N-SRO	1A HD pump trip with 1B HD pump tripped (turbine runback)
5	IMF d9mod4127c2f UNBLKD IMF d9mod4131c2f UNBLKD IMF d8mod131c3f OPEN IMF d8mod142c3f OPEN	I-ATC I, T-SRO	PZR PORV 1RY456 inadvertently opens (manual closure available)
6	IMF RP02A/B (preload) IMF TH16C	M-ALL	1C RCP trip/ATWS
7	IMF RD09 8 (preload)	I-ATC I-SRO	Fail auto rod speed at 8 steps/min
8	IMF MS07C 4 20	M-ALL	1C SG steam break inside Cnmt

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

SCENARIO OVERVIEW

Unit 1 is at 75%, steady state, Equilibrium Xenon, MOL. On-line risk is Green. Following turnover, swap 75 gpm letdown orifices per BwOP CV-9 for a PMT after a cracked fuse holder was replaced on 1CV8149C.

After completing shift turnover, the crew will swap 75 gpm letdown orifices. The BOP will close 1CV8149B, then open 1CV8149C per BwOP CV-9.

After swapping 75 gpm letdown orifices, 1A CC pump will trip with a 1B CC pump failure to auto-start (failed discharge pressure switch). The BOP will respond per BwAR 1-2-A4 and will manually start the 1B CC pump. The SRO will enter Tech Spec 3.7.7 Condition B (entry is initially made, then exited once the control switch for the 1A CC pump is placed in PULL OUT).

After the SRO has evaluated Tech Specs for the 1A CC pump trip, the RCP 1A Standpipe PW Supply Valve, 1CV181, fails open (manual closure available). The ATC will respond per BwAR 1-7-A6 and will close 1CV181 to stop filling the RCP 1A standpipe.

After the RCP 1A Standpipe PW Supply Valve, 1CV181, actions are completed, a 1A HD pump trip with the 1B HD pump tripped will occur. The standby 1B HD pump will not start and a HD runback will be initiated by the BOP per 1BwPR 1-17-D2. The ATC will borate the RCS during the HD runback. The SRO will enter 1BwOA SEC-1.

After the HD pump trip reactivity change is adequately evaluated, PZR PORV 1RY456 will inadvertently open. The ATC will respond per 1BwPR 1-12-RY and will manually close 1RY456 (or close block valve 1RY8000B). The SRO will enter Tech Spec 3.4.1 Condition A when PZR pressure drops below 2209 psig.

After the SRO has evaluated Tech Specs for the PZR PORV failing open, a 1C RCP trip/ATWS/1C SG steam break inside Cnmt will occur. The 1C RCP will trip and the reactor will not trip manually or automatically. The SRO will initially enter 1BwEP-0, then transition to 1BwFR-S.1. The ATC must manually insert rods with rod speed failed at 8 steps/min and the BOP will initiate an emergency boration. After the reactor is locally tripped and 1BwFR-S.1 is completed, the crew will transition back to 1BwEP-0 and a 1C SG steam break will occur. After determining that the 1C SG secondary pressure boundary is not intact, the crew will transition to 1BwEP-2 and isolate AF to the 1C SG. The crew will transition to 1BwEP ES-1.1 based on meeting the criteria for reducing ECCS flow.

Scenario completion criteria is the crew establishing charging flow in 1BwEP ES-1.1.

Critical Tasks:

1. Insert negative reactivity into the core by at least manually inserting control rods or initiating emergency boration before completing step 4 of 1BwFR-S.1. (Westinghouse – CT-52) (K/A number – EPE029 EA1.14, Importance – 4.2/3.9)
2. Isolate 1C Steam Generator before transitioning out of 1BwEP-2. (Westinghouse – CT-17) (K/A number – APE040 AA1.10, Importance - 4.1/4.1)

Potential Critical Tasks:

1. Close PZR PORV 1RY456 (or close 1RY456 isolation valve 1RY8000B) prior to a reactor trip. (K/A number – 010 A4.03, Importance – 4.0/3.8)

SIMULATOR SETUP GUIDE

- Verify/perform TQ-BR-201-0113, BRAIDWOOD TRAINING DEPARTMENT SIMULATOR EXAMINATION SECURITY ACTIONS CHECKLIST.
- Reset to IC-18, 75% power, steady state, equilibrium Xenon, MOL OR use the IC written below.
- Open SmartScenario file **19-1 NRC 3.ssf** from the thumb drive and place the ssf in run.
- Release the **SETUP** command box.
- Complete items on Simulator Ready for Training Checklist.
- Ensure the simulator is in RUN (allow simulator to run during board walk down and turnover).
- Verify page 1 PRELOAD items are inserted.
- Verify 120 gpm letdown with 1CV8149A & B open and 1CV8149C closed.
- Verify 0A & 0C VA plenums in-service, 0B VA plenum in standby.
- Verify/remove any Equipment Status Tags and Danger Tags not applicable to the scenario.
- Verify SER printer is clear of data.
- If desired, write an IC after all the set-up actions are completed (snap to 0). This IC may be used for running the scenario on additional simulator groups.
- Provide students with turnover sheets and copy of BwOP CV-9.
- Provide a turnover of unit status to oncoming crew.

Event 1: Swap 75 gpm letdown orifices

As SM, acknowledge the completion of BwOP CV-9.

Event 2: 1A CC pump trip with 1B CC pump failure to auto-start

Release ssf command box **Event 2**.

Ensure **MF CC01B** is inserted to trip the 1A CC pump (1B CC pump auto-start failure is a preloaded MF).

If dispatched as an EO to the 1A CC pump and/or breaker, report a Phase A overcurrent at pump breaker/no visible damage to pump locally (5 minute delay).

If dispatched as an EO to 1B or 0 CC pump, report pump parameters are normal (4 minute delay).

If dispatched as an EO to 1PS-CC673B (failed pressure switch), report no visible damage to pressure switch (3 minute delay).

As SM, acknowledge the failure and requests for risk evaluation, IR initiation and notification request. The SRO will enter Tech Spec 3.7.7 Condition B.

Event 3: RCP 1A Standpipe PW Supply Valve, 1CV181, fails open (manual closure available)

Release ssf command box **Event 3**.

Ensure **OR ZDI1CV181 OPEN** is inserted to cause 1CV181 to fail open.
Ensure the override is deleted (**DOR ZDI1CV181**) when the 1CV181 C/S is placed in CLOSE.

As SM, acknowledge the failure and requests for risk evaluation, IR initiation and notification request.

Event 4: 1A HD pump trip with 1B HD pump tripped (turbine runback)

Release ssf command box **Event 4**.

Ensure **MF FW35A** is inserted to trip the 1A HD pump (1B HD pump trip is a preloaded MF).

As SM, acknowledge the failure and requests for risk evaluation, IR initiation and notification request. Acknowledge HD runback actions.

If requested as the EO, report that a ground overcurrent flag at the 1A HD pump breaker. There are no abnormal conditions at the 1B HD pump breaker. If requested to inspect the 1A and/or 1B HD pumps locally, report no abnormal conditions exist (3 minute delay on each item).

As Chemistry and RP, acknowledge the sampling requests.

If the crew inquires about Ovation System Trouble alarm, report that the alarm is an expected alarm when steam flow drops below 58% of total flow. The alarm is indication that the 1A FW pump auto start feature is disabled below 58% steam flow.

Event 5: PZR PORV 1RY456 inadvertently opens (manual closure available)

Release ssf command box **Event 5**.

Ensure **MFs d9mod4127c2f UNBLKD, d9mod4131c2f UNBLKD, d8mod131c3f OPEN & d8mod142c3f OPEN** are inserted to fail PZR PORV 1RY456 open.

As SM, acknowledge the failure, risk evaluation, IR initiation and request for maintenance support. The SRO will enter Tech Spec 3.4.1 Condition A.

Events 6, 7: ATWS due to 1C RCP trip with rod speed failed at 8 steps/minute

Release ssf command box **Events 6, 7**.

Ensure **MF TH16C** is inserted to cause a 1C RCP trip/ATWS (Rx trip breaker failures & rod speed failure are preloaded MFs).

NOTE: Locally trip the reactor after emergency boration is started AND the crew has requested a local Rx trip (2 minute delay). Use the following to locally trip the Rx after using a First Check:

Release ssf command box **DELETE RX TRIP**.

Ensure **MFs RP02A & RP02B** are deleted.
Ensure **RFs RP01remf TRIP & RF RP02 TRIP** are inserted to open RTA & RTB.

As SM, acknowledge procedure transitions, EAL evaluation request and STA request.

After the STA is requested, as STA report CSF status – Yellow on Inventory with PZR level < 17%, Yellow on Integrity.

Event 8: 1C SG steam break inside Cnmt

When the crew enters 1BwEP-0 from 1BwFR-S.1, release ssf command box **Event 8**.

Ensure **MF MS07C 4 20** is inserted to cause a large 1C SG steam break inside Cnmt.

When requested to monitor DG operation, release ssf command box **DG Check**.

Ensure **RF EG06 RESET** is inserted to reset 1A DG alarm.
Ensure **RF EG12 RESET** is inserted to reset 1B DG alarm.

When requested to open 0/1SX007 to obtain **8000 GPM**, release ssf command box **0/1SX007 Throttling – 8000 gpm**.

Ensure **RF SW01 60** is inserted to open 0SX007 to 60%.
Ensure **RF SW02 60** is inserted to open 1SX007 to 60%.

Scenario No: **19-1 NRC 3** Event No. 1		
Event Description: Swap 75 gpm letdown orifices		
Time	Position	Applicant's Actions or Behavior
	CUE	• Turnover requests swapping 75 gpm orifices (close 1CV8149B, open 1CV8149C).
	SRO	• Brief the BOP for the letdown orifice swap (may have been performed earlier).

	BOP	• Refer to BwOP CV-9.
		• Determine BwOP CV-9, step F.3 is required to be performed.
		• Lower letdown pressure:
		  • Place 1PK-0131, Letdown Line Press Cont Vlv 1CV131, to MANUAL.
		  • Raise demand on 1PK-0131 to lower letdown pressure to ~ 180 psig (1PI-131).
		• Remove on-line 75 gpm letdown orifice from operation:
		  • Close 1CV8149B.
		• Place standby 75 gpm letdown orifice on-line (simultaneous operation):
		  • Open 1CV8149C.
		  • Adjust 1CV131 to maintain 370 psig.
		• Restore automatic letdown pressure control:
		  • Verify letdown pressure stable at ~370 psig (1PI-131).
		  • Place 1PK-0131 to AUTO.
		• Verify 1TK-0130 is maintaining letdown temperature between 90°F - 115°F (1TI-130).
		• Verify normal PZR level is being maintained.
		• Inform the SRO that the 75 gpm letdown orifices were swapped.

	ATC	• Monitor remainder of MCBs.
	SRO	• Acknowledge report that BwOP CV-9 is completed. ○ Notify SM that the 75 gpm letdown orifices were swapped from 1CV8149B to 1CV8149C.
		EXAMINER'S NOTE: After the actions for swapping letdown orifices are complete and with Lead Examiner's concurrence, enter next event.

Scenario No: **19-1 NRC 3** Event No. 2		
Event Description: 1A CC pump trip with 1B CC pump failure to auto-start		
Time	Position	Applicant's Actions or Behavior
	CUE	• Annunciator 1-2-A4, CC PUMP TRIP, alarms. • Annunciator 1-2-B5, CC PUMP DSCH PRESS LOW, alarms. • Annunciators 1-7-A4/B4/C4/D4, RCP 1A/B/C/D THERM BARR CC WTR FLOW LOW, alarm. • 1A CC pump trip light lit at 1PM06J. • CC pump discharge pressure meter, 1PI-CC107, drops to ~30 psig.
	BOP	• Determine 1A CC pump has tripped. ○ Place 1A CC pump control switch in PULL OUT. • Report 1A CC pump trip to SRO. • Refer to BwAR 1-2-A4.
	SRO	• Direct BOP to start 1B or 0 CC pump.
	BOP	Per BwAR 1-2-A4, perform the following: • Start 1B or 0 CC pump at 1PM06J. • Verify voltage on ALL 3 phases of 4KV bus > 3900 volts. • Place 1A CC pump control switch in PULL OUT. • Dispatch EOs to 1A CC pump/breaker. • Verify adequate CC flow for plant conditions. • Refer to BwOP CC-1 and BwOP CC-2 for CC pump start/stop follow-up actions.
	ATC	• Monitor RCP operation with CC system in an abnormal condition. • Refer to BwARs, as time permits.
	SRO	• Enter Tech Spec 3.7.7 Condition B (until the 1A CC pump control switch is placed in PULL OUT). • Notify SM to perform risk evaluation, initiate IR and contact maintenance to investigate/correct 1A CC pump trip/1B CC pump auto-start failure.
		EXAMINER'S NOTE: The SRO may elect to implement 1BwOA PRI-6, COMPONENT COOLING MALFUNCTION, based on initial CC system response. 1BwOA PRI-6 steps are in italics below.
	SRO	○ *Identify entry conditions for 1BwOA PRI-6, COMPONENT COOLING MALFUNCTION.*
	SRO	○ *Notify SM of plant status and procedure entry.* ○ *Request evaluation of Emergency Plan conditions.* ○ *Enter/implement 1BwOA PRI-6 and direct operator actions of 1BwOA PRI-6 to establish the following conditions:*
	BOP	○ *Monitor RCP seal cooling.* ○ *Check CC surge tank level at 1PM06J:* ○ *1LI-670 and 1LI-676 greater than 13% and stable.* ○ *Check CC pumps at 1PM06J:* ○ *CC pumps – AT LEAST ONE RUNNING.* ○ *Check annunciator 1-2-B5, CC PUMP DSCH PRESS LOW – NOT LIT.*

Scenario No: **19-1 NRC 3** Event No. 2		
Event Description: 1A CC pump trip with 1B CC pump failure to auto-start		
Time	Position	Applicant's Actions or Behavior
		○ *Check CC system temperature at 1PM06J:* ○ *Annunciator 1-2-D5, CC PUMP SUCT TEMP HIGH – NOT LIT.* ○ *CC HX Outlet temperature (1TI-674 and 0TI-675) – LESS THAN 120/105°F.* ○ *Check RCP cooling:* ○ *RCPs – ALL RUNNING.* ○ *All block 7 annunciators clear.* ○ *1PR09J and 0PR09J trends at RMS/PPC – NORMAL.* ○ *1CC685, RCP thermal barrier isolation valve – OPEN.* ○ *Check RCP temperatures acceptable for RCP operation.* ○ *Check letdown temperature:* ○ *Letdown – IN SERVICE.* ○ *Annunciator 1-8-C5, LTDWN HX OUTLT TEMP HIGH – NOT LIT.* ○ *Annunciator 1-9-E2, LTDWN TEMP HIGH – NOT LIT.* ○ *Check CC surge tank level.* ○ *1LI-670 and 1LI-676 between 50% and 65%.*
	SRO	○ *Notify SM to perform risk evaluation, initiate IR and make notifications as appropriate.* ○ *Enter Tech Spec 3.7.7 Condition B (until the 1A CC pump control switch is placed in PULL OUT).*
		EXAMINER'S NOTE: After the actions for CC pump trip are complete and with Lead Examiner's concurrence, enter next event.

Scenario No: **19-1 NRC 3** Event No. 3		
Event Description:		RCP 1A Standpipe PW Supply Valve, 1CV181, fails open (manual closure available)
Time	Position	Applicant's Actions or Behavior
	CUE	• Annunciator 1-7-A6, RCP 1A STANDPIPE LEVEL HIGH, alarms. • 1CV181, RCP 1A STANDPIPE PW SUPPLY VALVE, is open.
	ATC	Perform the following actions per BwAR 1-7-A6: • CLOSE 1CV181. • Notify SRO to refer to 1BwOA RCP-1, RCP SEAL FAILURE.
	BOP	• Monitor remainder of MCBs.
	SRO	• Acknowledge report from ATC. • Refer to 1BwOA RCP-1 (no actions are required).
	SRO	• Notify SM to perform risk evaluation, initiate IR and make notifications as appropriate.
		EXAMINER'S NOTE: After the actions for the 1CV181 failure are complete and with Lead Examiner's concurrence, insert next event.

Scenario No: **19-1 NRC 3** Event No. 4		
Event Description: 1A HD pump trip with 1B HD pump tripped (turbine runback)		
Time	Position	Applicant's Actions or Behavior
	CUE	• Annunciator 1-17-D2, HD PUMP TRIP, alarms. • 1A HD pump trip light lit. • HD tank level rising. • HD pump discharge valves, 1HD046A/B, opening.

	BOP	• Recognize 1A HD pump tripped.
		• Perform actions per 1BwPR 1-17-D2, HD PUMP TRIP PROMPT RESPONSE:
		  • Start the standby 1B HD pump (fails to start).
		  • Check HD pumps – AT LEAST ONE RUNNING.
		  • Check HD pumps – TWO RUNNING (NO).
		  • Initiate HD runback on OWS graphic 5512.
		  • Notify SRO to GO TO 1BwOA SEC-1, SECONDARY PUMP TRIP.

	BOP	• Refer to BwARs, as time permits. • Report 1A/B HD pump trips/HD turbine runback to SRO. ○ Place 1A/B HD pump control switches in PULL OUT.
	ATC	• Dispatch EOs to the 1A/B HD pumps.
	SRO	• Acknowledge 1A/B HD pump trips. • Identify entry conditions for 1BwOA SEC-1.
	SRO	• Notify SM of plant status and procedure entry. • Request SM evaluation of Emergency Plan conditions. • Enter/implement 1BwOA SEC-1 ATTACHMENT D – HD PUMP TRIP and direct operator actions of 1BwOA SEC-1 to establish the following conditions:

	BOP	• Restore HD pump flow – 1B HD pump will NOT start.
		• Check HD pump status:
		  • ONLY 1C HD pump running.
		  • With power > 780 MWe, initiate HD runback (previously performed).
		  • Verify turbine load dropping.

	BOP	• Check HD tank level:
		  • Level > 76% and stable.
		  • Maintain HD tank level between 28-76%:
		  ○ Verify 1HD046A&B opening in AUTO.
		  ○ Open 1CB113A/B/C/D to lower CB discharge header pressure.
		  ○ Manually adjust 1HD117, HD tank overflow valve.
		• Check 1HD117 in – AUTO AND CLOSED.
		  ○ Lower turbine load at 20 MWe/min as necessary to close 1HD117 (initial load ramp may still be in progress).
		• Check 1C HD pump parameters:
		  • 1C HD pump amps < 168 amps.
		  • 1C HD pump flow < 2950 KLB/HR.
		• Deactivate turbine runback (when 1HD117 is closed in auto).

Scenario No: **19-1 NRC 3** Event No. 4		
Event Description: 1A HD pump trip with 1B HD pump tripped (turbine runback)		
Time	Position	Applicant's Actions or Behavior

	ATC	• Check Delta I – WITHIN LIMITS OF BwCB-1 FIGURE 19.
		• Check PDMS – OPERABLE:
		  • Annunciator 1-10-E8, PDMS INOPERABLE, not lit.
		  • 1BwOS PDMS-1a – NOT IMPLEMENTED.
		  • Annunciator 1-10-D7, PDMS LIMIT EXCEEDED, not lit.

	ATC	• Control ΔI near target.
		  • Reposition control rods to restore ΔI near target.
		• Monitor RCS parameters.
		  ○ If PZR pressure lowers < 2209 psig, notify SRO to evaluate Tech Spec 3.4.1.

	ATC	• Initiate RCS boration per BwOP CV-6.
		• Determine required boric acid volume.
		  • Determine from Op Aid (ramp starts from 75%).
		○ **Batch boration (BwOP CV-6 Attachment A, step 1):**
		  ○ Turn on PZR backup heaters.
		  ○ If desired to reset the BORIC ACID TOTALIZER to 0, select soft button RESET for the BORIC ACID BLENDER PREDETERMINED SETPOINT.
		  ○ Open 1CV110B, Boric Acid Blender to Chg Pumps Valve.
		  ○ Open 1CV110A, Boric Acid to Blender Valve.
		  ○ Start the BA Transfer Pump.
		  ○ If desired, control VCT level by adjusting the 1LK-0112 setpoint to the desired value.
		  ○ When desired amount of BA has been added, stop BA Transfer Pump.
		  ○ Close 1CV110A.
		  ○ Close 1CV110B.
		  ○ Verify VCT level or pressure at desired value and adjust 1LK-0112 to the desired level setpoint.
		  ○ Verify/place 1CV110A and 1CV110B in the AUTO position.
		  ○ Record time and amount of BA that was added in Unit log or appropriate journal.
		  ○ Perform the appropriate step of BwOP CV-7 to return RMCS to automatic alignment following the final boration.
		- OR -
		○ **Borate in Automatic (BwOP CV-6 Attachment A, step 2):**
		  ○ Turn on PZR backup heaters.
		  ○ Set the BORIC ACID TOTALIZER to desired value.
		  ○ Place MAKE-UP CONT switch in the STOP position.
		  ○ Place MODE SELECT switch in the BORATE position.
		  ○ Place MAKE-UP CONT switch to the START position to commence the boration.
		  ○ Verify the following occurs:
		  ○ 1CV110B, Boric Acid Blender to Chg Pumps Valve, opens
		  ○ 1CV110A, Boric Acid to Blender Valve, modulates open.
		  ○ BA Transfer Pump starts.
		  ○ Proper BA flow on 1FR-0110.
		  ○ If desired, control VCT level by adjusting the 1LK-0112 setpoint to the desired value.

Scenario No: **19-1 NRC 3**		Event No. 4
Event Description:		1A HD pump trip with 1B HD pump tripped (turbine runback)
Time	Position	Applicant's Actions or Behavior
		○ When desired amount of BA has been added, place MAKE-UP CONT switch to the STOP position. ○ Verify the following occurs: ○ 1CV110B closes. ○ 1CV110A closes. ○ BA Transfer Pump stops. ○ Record time and amount of BA that was added in Unit log or appropriate journal. ○ Perform the appropriate step of BwOP CV-7 to return RMCS to automatic alignment following the final boration.
	BOP	• Verify running CB pump recirc valves in – AUTO. • 1CB113A-D on running pumps. • Dispatch EOs to perform BwOP HD-2 for 1A HD pump. • Shutdown 4th CD/CB pump (if started during procedure performance).
	SRO	• Notify Chemistry to monitor secondary plant chemistry. • Check reactor power change – GREATER THAN 15% IN ONE HOUR, if YES: • Notify Chemistry to perform Tech Spec 3.4.16 required sampling. • Notify Rad Protection to perform RETS 12.4.1.A required sampling. ○ Determine Tech Spec 3.1.6 Condition A entry required if control rods below LO-2 rod insertion limit. ○ Evaluate Tech Spec 3.4.1 Condition A entry if PZR pressure lowers < 2209 psig. • Notify SM to perform risk evaluation, initiate IR, evaluate reactivity screening, make notifications and evaluate for the restoration of full power operation.
		EXAMINER'S NOTE: **Prior to initiating the next event, the crew should make a subsequent ramp down (after the initial turbine runback) to demonstrate attempt to control HDT level in normal range. After the HD pump trip reactivity change is adequately evaluated, a boration is NOT currently in progress and with Lead Examiner's concurrence, insert next event.** **If crew makes inquiries about Ovation Trouble alarm, refer to the Event 4 Instructor/Simulator Run Aide Guide for explanation.**

Scenario No: **19-1 NRC 3** Event No. 5		
Event Description:		PZR PORV 1RY456 inadvertently opens (manual closure available)
Time	Position	Applicant's Actions or Behavior
	CUE	• Annunciator 1-12-B2, PZR PORV OR SAF VLV OPEN, alarms. • Annunciator 1-12-B7, PRT PRESS HIGH, alarms. • Annunciator 1-12-C1, PZR PRESS CONT DEV LOW HTRS ON, alarms. • PZR PORV 1RY456 is open below normal operating pressure. • PZR pressure dropping rapidly.

	ATC
	
	Potential C/T
		Perform the following at 1PM05J:
		• Determine PZR PORV 1RY456 has opened prior to reaching its auto open setpoint.
		• Report 1RY456 failure to SRO.
		• Perform actions per 1BwPR 1-12-RY, PZR CONTROL MALFUNCTION PROMPT RESPONSE:
		• Close PZR PORV 1RY456 (or close 1RY456 isolation valve 1RY8000B) prior to a reactor trip occurring. (K/A number – 010 A4.03, Importance – 4.0/3.8)
		  • Close 1RY456 (place 1RY456 control switch in CLOSE).
		  • Close 1RY8000B (only required if 1RY456 is NOT closed).

		EXAMINER'S NOTE: (1) If the 1RY456 control switch is placed in the ARM LOW TEMP position, 1RY456 will remain open. (2) 1BwOA INST-2 entry is NOT required.
	ATC	• Verify PZR pressure is at 2235 psig or trending to normal operating pressure after 1RY456 is closed. • Recognize/report DNB LCO 3.4.1 pressure threshold exceeded (< 2209 psig).
	BOP	• Refer to BwARs, as time permits.
	SRO	• Acknowledge PZR PORV failure report. • Enter Tech Spec 3.4.1 Condition A (DNB Tech Spec – PZR pressure < 2209 psig). ○ Refer to Tech Spec 3.4.11 (no entry required). *(May miss this and enter.)* • Contact SM to perform risk evaluation, initiate IR and contact maintenance to investigate/correct failure.
		EXAMINER'S NOTE: (1) The crew may attempt to restore PRT parameters per BwOP RY-4, this is not a required action for the scenario. **(2) After the actions for the PZR PORV failure are complete and with Lead Examiner's concurrence, insert next event.**

Scenario No: **19-1 NRC 3** Event No. 6, 7, 8		
Event Description: 1C RCP trip/ATWS with rod speed failed at 8 steps/minute/1C SG steam break		
Time	Position	Applicant's Actions or Behavior
	CUE	• Annunciator 1-11-C5, RCP LOW FLOW ABOVE P8 RX TRIP, alarms. • 1C RCP trip light lit. • BOTH reactor trip breakers remain closed. • NO rod bottom lights lit.
	ATC	• Identify/report ATWS conditions are present. • Attempt a manual reactor trip (NOT successful).
	SRO	• Enter/implement 1BwFR-S.1, RESPONSE TO NUCLEAR POWER GENERATION/ATWS, and direct operator actions of 1BwFR-S.1 to establish the following conditions:

	ATC	Perform immediate operator actions of 1BwFR-S.1.
		• Verify reactor trip:
		  • Rod bottom lights – NOT LIT.
		  • Reactor trip & Bypass breakers – NOT OPEN.
		  • Neutron flux – NOT DROPPING.
		  • Manually trip the reactor.
		  • 1PM05J.
		  • 1PM06J.
		  • Determine control rods NOT inserting automatically at required speed (after main turbine is tripped).

	ATC Emergency boration actions listed below. **[CT-52]**	**Insert negative reactivity into the core by at least manually inserting control rods or initiating emergency boration before completing step 4 of 1BwFR-S.1. (Westinghouse – CT-52) (K/A number – EPE029 EA1.14, Importance – 4.2/3.9)** • **Manually insert control rods.**

	BOP	Perform immediate operator actions of 1BwFR-S.1.
		• Verify turbine trip – manually trip the main turbine:
		  • All Turbine throttle valves – CLOSED.
		  • All Turbine governor valves – CLOSED.

	BOP	Perform immediate operator actions of 1BwFR-S.1. • Check AF pumps running – manually start BOTH AF pumps: • AF pump run lights – LIT.

	ATC/BOP
	Rod insertion actions listed above.
	[CT-52]
	[CT-52]
		• Initiate emergency boration of the RCS:
		  • Check at least 1 CV pump – RUNNING.
		Insert negative reactivity into the core by at least manually inserting control rods or initiating emergency boration before completing step 4 of 1BwFR-S.1. (Westinghouse – CT-52) (K/A number – EPE029EA1.14 importance – 4.2/3.9)
		  • **Open 1CV8104.**
		  • **Start boric acid transfer pump.**

Scenario No: **19-1 NRC 3** Event No. 6, 7, 8		
Event Description: 1C RCP trip/ATWS with rod speed failed at 8 steps/minute/1C SG steam break		
Time	Position	Applicant's Actions or Behavior
	ATC/BOP	• Check emergency boration flow > 30 gpm (1FI-183A). • Verify charging flow > 30 gpm (1FI-121A). • Check PZR pressure < 2335 psig.
	BOP	• Verify CNMT vent isolation: • Group 6 CNMT vent isolation monitor lights – LIT.

	ATC	• Check if the following trips have occurred:
		  • Reactor trip has NOT occurred.
		  • Dispatch EO to locally trip reactor.
		  • Turbine trip:
		  • All Turbine throttle valves – CLOSED.
		  • All Turbine governor valves – CLOSED.

	ATC	• Check if reactor subcritical:
		  • PR channels > 5%.
		  • IR channels – NEGATIVE STARTUP RATE.
		EXAMINER'S NOTE: Depending on crew timing, PRNIs may be < 5% with a negative SUR at this step.

		EXAMINER'S NOTE: The reactor will be locally tripped after emergency boration is started <u>AND</u> the crew has requested a local Rx trip. When this occurs, the crew will transition to 1BwFR-S.1 step 16 (see below), then back to 1BwEP-0. Therefore, several of the following steps *(italicized below)* in 1BwFR-S.1 may NOT be performed.

	ATC/BOP	• *Check SG levels:*
		  • *At least one SG NR level > 10% (31%).*
		  • *Control feed flow to maintain SG NR levels between 10% (31%) and 50%.*
		  • *Check 1SD002A-H – CLOSED.*
		• *Verify all dilution paths isolated:*
		  • *Check 1CV111A & B – CLOSED.*
		  • *Verify BTRS MODE SELECTOR switch – OFF.*
		  • *Dispatch EOs to locally verify dilution paths isolated.*
		• *Check for reactivity insertion from uncontrolled RCS cooldown:*
		  • *RCS temperature – DROPPING IN AN UNCONTROLLED MANNER (NO).*
		  • *Any SG pressure – DROPPING IN AN UNCONTROLLED MANNER (NO).*
		• *Check CETCs – LESS THAN 1200°F.*
		• *Verify reactor subcritical:*
		  • *PR channels – LESS THAN 5%.*
		  • *IR channels – NEGATIVE STARTUP RATE.*

	SRO	**1BwFR-S.1 step 16:** • Return to procedure and step in effect.
	SRO	Transition to 1BwEP-0, REACTOR TRIP OR SAFETY INJECTION.

Scenario No: **19-1 NRC 3** Event No. 6, 7, 8		
Event Description: 1C RCP trip/ATWS with rod speed failed at 8 steps/minute/1C SG steam break		
Time	Position	Applicant's Actions or Behavior
		EXAMINER'S NOTE: The 1C SG steam break will be inserted when 1BwEP-0 is entered from 1BwFR-S.1.
		1BwEP-0, REACTOR TRIP OR SAFETY INJECTION
	SRO	• Notify SM of plant status and procedure entry. • Request SM evaluation of Emergency Plan conditions. • Request STA evaluation of Status Trees. • Enter/implement 1BwEP-0 and direct operator actions of 1BwEP-0 to establish the following conditions:

	ATC	Perform immediate operator actions of 1BwEP-0 at 1PM05J.
		• Verify reactor trip:
		  • Rod bottom lights – ALL LIT.
		  • Reactor trip & bypass breakers – OPEN.
		  • Neutron flux – DROPPING.

	BOP	Perform immediate operator actions of 1BwEP-0 at OWS drop 210.
		• Verify turbine trip:
		  • All Turbine throttle valves – CLOSED.
		  • All Turbine governor valves – CLOSED.

	BOP	Perform immediate operator actions of 1BwEP-0 at 1PM01J: • Verify power to 4 KV busses: • ESF Busses – BOTH ENERGIZED (141 & 142).

	CREW	Perform immediate operator actions of 1BwEP-0 at 1PM05J.
		• Check SI Status:
		  • SI First OUT annunciator – LIT.
		  • SI ACTUATED Permissive Light – LIT.
		  • SI Equipment – AUTOMATICALLY ACTUATED.
		  ○ Either SI pump – RUNNING.
		  ○ Either CV pump to cold leg isolation valve OPEN – 1SI8801A/B.
		• Manually actuate SI from 1PM05J and 1PM06J.

	SRO	• Direct BOP to perform Attachment B of 1BwEP-0.
		EXAMINER'S NOTE: The SRO and ATC will continue in 1BwEP-0 while the BOP is performing Attachment B.

	BOP	**1BwEP-0 ATTACHMENT B:**
		• Verify FW isolation at 1PM04J:
		  • FW pumps – TRIPPED.
		  • FW isolation monitor lights – LIT.
		  • FW pumps discharge valves – CLOSED (or going closed) 1FW002A-C.
		• Verify DGs running at 1PM01J:
		  • DGs – BOTH RUNNING.
		  • 1SX169A/B – OPEN.
		  • Dispatch operator locally to monitor DGs operation.

Scenario No: **19-1 NRC 3** Event No. 6, 7, 8		
Event Description: 1C RCP trip/ATWS with rod speed failed at 8 steps/minute/1C SG steam break		
Time	Position	Applicant's Actions or Behavior

		• Verify Generator trip at 1PM01J:
		  • OCB 1-8 and 7-8 – OPEN.
		  • PMG output breaker – OPEN.
		• Verify SX pumps running:
		  • Check Unit 0 CC HX aligned to Unit 1:
		  • 1CC9473A/B – OPEN.
		  • Unit 1 SX pumps – BOTH RUNNING.
		  • Dispatch an operator to energize and open 0/1SX007 to 8000 GPM flow to the Unit 0/1 CC HX, then open the disconnects.
		• Verify Control Room ventilation aligned for emergency operations at 0PM02J:
		  • VC Rad Monitors – LESS THAN HIGH ALARM SETPOINT.
		  • Operating VC train equipment – RUNNING.
		  • 0B Supply fan.
		  • 0B Return fan.
		  • 0B M/U fan.
		  • 0B Chilled water pump.
		  • 0B Chiller.
		  • Operating VC train dampers aligned for train 0B.
		  • M/U fan outlet damper – 0VC08Y – NOT FULLY CLOSED.
		  • 0B VC train M/U filter light – LIT.
		  • 0VC09Y – OPEN.
		  • 0VC313Y – CLOSED.
		  • Operating VC train Charcoal Absorber aligned for train B.
		  • 0VC44Y – CLOSED.
		  • 0VC05Y – OPEN.
		  • 0VC06Y – OPEN.
		  • Control Room pressure greater than +0.125 inches water on 0PDI-VC038.
		• Verify Auxiliary Building ventilation aligned for emergency operations at 0PM02J:
		  • Two inaccessible filter plenums aligned.
		  • Plenum A:
		  • 0VA03CB – RUNNING.
		  • 0VA023Y – OPEN (not fully closed).
		  • 0VA436Y – CLOSED.
		  • Plenum C:
		  • 0VA03CF – RUNNING.
		  • 0VA072Y – OPEN (not fully closed).
		  • 0VA438Y – CLOSED.
		• Verify FHB ventilation aligned for emergency operation at 0PM02J:
		  • 0VA04CB – RUNNING.
		  • 0VA055Y – OPEN.
		  • 0VA062Y – OPEN (not fully closed).
		  • 0VA435Y – CLOSED.
		• Shutdown unnecessary plant equipment.
		  • Trip all running HD pumps (1C HD pump only).
		• Initiate periodic monitoring of Spent Fuel Cooling.
		• Notify SRO of manual actions taken, failed equipment status & Attachment B complete.

Scenario No: **19-1 NRC 3** Event No. 6, 7, 8		
Event Description: 1C RCP trip/ATWS with rod speed failed at 8 steps/minute/1C SG steam break		
Time	Position	Applicant's Actions or Behavior

	ATC	• Verify ECCS pumps running at 1PM05J/1PM06J:
		  • BOTH CV pumps – RUNNING.
		  • BOTH RH pumps – RUNNING.
		  • BOTH SI pumps – RUNNING.

	ATC	• Verify the following at 1PM06J:
		  • RCFCs running in accident mode:
		  • Group 2 RCFC accident mode status lights – LIT.
		  • CNMT Phase A valves closed:
		  • Group 3 Cnmt Isol monitor lights – LIT.

	ATC	• Perform the following at 1PM06J:
		  • Verify Cnmt Vent isolation:
		  • Group 6 Cnmt Vent Isol monitor lights – LIT.
		  • Verify AF system:
		  • AF pumps – BOTH RUNNING.
		  • AF isolation valves – 1AF013A-H OPEN.
		  • AF flow control valves – 1AF005A-H THROTTLED.
		  • Verify CC pumps – BOTH RUNNING.
		  • Verify SX pumps – BOTH RUNNING.

	ATC/BOP	• Check if Main Steamlines should be isolated:
		  • SG pressures < 640 psig (YES – 1C SG faulted).
		  • CNMT pressure > 8.2 psig.
		  • Verify MSIVs and MSIV bypass valves – CLOSED.

	BOP	• Check if CS is required.
		  ○ CNMT pressure remained < 20 psig (continue with **Verify total AF flow** step below).
		  ○ CNMT pressure has risen > 20 psig.
		  • Group 6 CS monitor lights – LIT.
		  • Group 6 Phase B Isolation monitor lights – LIT.
		  • Stop ALL RCPs at 1PM05J.
		  • CS eductor suction flow > 15 gpm on 1FI-CS013/14.
		  • CS eductor additive flow > 5 gpm on 1FI-CS015/16.

	BOP	• **Verify total AF flow:**
		  • AF flow > 500 gpm.
		  • Check SG NR levels – NOT RISING IN AN UNCONTROLLED MANNER.

	ATC/BOP	• Verify ECCS valve alignment:
		  • Group 2 Cold Leg Injection monitor lights required for injection – LIT.
		• Verify ECCS flow:
		  • High head SI flow > 100 gpm (1FI-917).
		  • RCS pressure > 1700 psig (if RCS pressure < 1700 psig, verify SI pump discharge flow on 1FI-918/922 > 200 gpm).

Scenario No: **19-1 NRC 3** Event No. 6, 7, 8		
Event Description: 1C RCP trip/ATWS with rod speed failed at 8 steps/minute/1C SG steam break		
Time	Position	Applicant's Actions or Behavior

	ATC	• Check PZR PORVs and spray valves at 1PM05J:
		  • PORVs – CLOSED.
		  • PORV isolation valves – BOTH ENERGIZED.
		  • PORV relief paths – only PZR PORV 1RY455A in AUTO, both PORV isolation valves OPEN.
		  • Normal PZR spray valves – CLOSED.

	ATC	• Check RCS temperatures at 1PM05J:
		  ○ With 3 RCPs running, RCS Tave – STABLE AT OR TRENDING TO 557°F (NO).
		  ○ With RCPs stopped, RCS Tcold – STABLE AT OR TRENDING TO 557°F (NO).
		  • With temperature < 557°F and dropping:
		  • Stop dumping steam.
		  • Control AF flow (maintain total feed flow > 500 gpm until SG NR level > 10% (31%) in at least one SG).

	ATC	• Check status of RCPs at 1PM05J:
		  • RCPs – ANY RUNNING (may be tripped on Phase B).
		  • Check RCP trip criteria:
		  • Verify high head SI flow (1FI-917) > 100 gpm.
		  • RCS pressure < 1425 psig (NO).

	BOP	• Check if SG secondary pressure boundaries are intact at 1PM04J: • Verify NO SG depressurizing in an uncontrolled manner or completely depressurized (NO – 1C SG faulted).
	SRO	Transition to 1BwEP-2, FAULTED SG ISOLATION.
		1BwEP-2, FAULTED SG ISOLATION
	SRO	• Notify SM of plant status and procedure entry. • Request SM evaluation of Emergency Plan conditions.
	SRO	• Enter/implement 1BwEP-2 and direct operator actions of 1BwEP-2 to establish the following conditions:
	BOP	• Check Main Steamline Isolation. • All MSIVs and MSIV bypass valves – CLOSED.
	BOP	• Check if any SG secondary pressure boundary is intact. • Check pressure in all SGs – ANY SG PRESSURE STABLE OR RISING.
	BOP	• Identify faulted SG. • Any SG pressure dropping in an uncontrolled manner OR any SG completely depressurized (YES – 1C SG).

Scenario No: **19-1 NRC 3** Event No. 6, 7, 8		
Event Description: 1C RCP trip/ATWS with rod speed failed at 8 steps/minute/1C SG steam break		
Time	Position	Applicant's Actions or Behavior

	BOP
	
	[CT-17]
	[CT-17]
		• Isolate the faulted SG.
		  • Close AF isolation valves on faulted SG.
		
		Isolate the 1C SG prior before transitioning out of 1BwEP-2. (Westinghouse – CT-17) (K/A Number – APE040 AA1.10, Importance – 4.1/4.1)
		  • **Close 1AF013C.**
		  • **Close 1AF013G.**
		• Check FW to faulted SG isolated.
		  • Associated row on FW ISOLATION MONITOR LIGHTS – LIT.
		• Verify SG PORV, 1MS018C – CLOSED.
		• Verify SG blowdown isolation valves, 1SD002G/H – CLOSED.
		• Verify SG blowdown sample isolation valve, 1SD005D – CLOSED.
		• Verify 1C MSIV and bypass valve – CLOSED.

	BOP	• Check AF pump suction pressure. • Annunciator 1-3-E7 – NOT LIT.

	BOP
	
	SRO
	BOP
		• Check secondary radiation.
		  • Reset Phase A.
		  • Open 1SD005A-D, SG Blowdown Sample Isolation valves, at 1PM11J.
		  • Contact Chemistry to sample ALL SGs for activity.
		  • Check secondary radiation trends (PPC or RMS) – NORMAL FOR PLANT CONDITIONS.
		  • 1PR27J, SJAE/GS Exhaust.
		  • 1PR08J, SG Blowdown.
		  • 1AR022/23A-D, 1A-D Main Steam Lines.
		• Secondary activity levels – NORMAL (when available).

	BOP/ATC	• Check if ECCS flow should be reduced:
		  • RCS subcooling – ACCEPTABLE.
		  • Secondary heat sink:
		  • Total feed flow to intact SGs – GREATER THAN 500 GPM.
		  • SG NR level in at least 1 intact SG – GREATER THAN 10% (31%).
		  • RCS pressure – STABLE OR RISING.
		  • PZR level – GREATER THAN 14% (28%).

	SRO	Transition to 1BwEP ES-1.1, SI TERMINATION.
		1BwEP ES-1.1, SI TERMINATION
	SRO	• Notify SM of plant status and procedure entry. • Request SM evaluation of Emergency Plan conditions.
	SRO	• Enter/implement 1BwEP ES-1.1 and direct operator actions of 1BwEP ES-1.1 to establish the following conditions:
	BOP	• Reset SI at 1PM06J. • Reset Phase A (previously performed in 1BwEP-2). • Reset Phase B.

Scenario No: **19-1 NRC 3** Event No. 6, 7, 8		
Event Description: 1C RCP trip/ATWS with rod speed failed at 8 steps/minute/1C SG steam break		
Time	Position	Applicant's Actions or Behavior

		• Establish IA to Cnmt.
		  • Check a station air compressor (SAC) is running at 0PM01J.
		  • Open 1IA065 and 1IA066 at 1PM11J.

	ATC	• Realign CV pumps: • Stop all but 1 CV pump and place in standby.
	ATC	• Check RCS pressure: • RCS pressure – STABLE OR RISING.

	ATC/BOP	• Terminate high head ECCS:
		  • CV pumps – SUCTION ALIGNED TO RWST.
		  • Reset SI Recirc Sump Isol valves – 1SI8811A/B.
		  • Reset CV Pump Miniflow Isol valves – 1CV8114/16.
		  • Verify CV Pump Miniflow Isol valves – OPEN – 1CV8110/11/14/16.
		  • Close 1SI8801A/B.

	ATC	• Establish charging flow:
		  • Place 1CV182 controller – AT 0% DEMAND.
		  • Open 1CV8105/06.
		  • Establish desired charging flow using 1CV121 and 1CV182:
		  • Maintain RCP seal injection flow – BETWEEN 8 GPM AND 13 GPM PER RCP.

		EXAMINER'S NOTE: At this point in the scenario, all Critical Tasks are complete, and the scenario stop criteria has been reached, with Lead Examiner's concurrence, STOP the scenario.

Simulation Facility: Braidwood		Scenario No.: **NRC 4**	Operating Test No.: **19-1 NRC**
Examiners:		Applicant:	SRO
			ATC
			BOP

Initial Conditions: IC-31

Turnover: Unit 1 is at 90%, steady state, Equilibrium Xenon, BOL. On-line risk is Green. Following turnover, perform a 1C TDFWP PMT per 1BwOS FW-W1, TDFW Pump Stop Valve Surveillance. An EO is briefed and standing by at the 1C TDFW pump.

Event No.	Malf. No.	Event Type*	Event Description
Preload	IMF FW75 IMF CV32B IRF ED500 1096 Trigger 1 (RP:SI(1) .EQ. TRUE) IMF CV01A		Prevent 1A FW pump auto-start Prevent 1B CV pump auto-start Set AND computer to current AND MWe SI actuation trigger 1A CV pump trip on SI
1	None	N-BOP N-SRO	Perform a 1C TDFW Pump PMT per 1BwOS FW-W1, TDFW Pump Stop Valve Surveillance
2	IMF CV05inc RAISE	I-ATC I-SRO	Letdown line pressure controller, 1PK-0131, setpoint fails high
3	IMF CV23A 90	C-ATC C, T-SRO	1A letdown HX tube leak
4	IRF ED500 896	R-ATC R-SRO	Advanced Nuclear Dispatch (AND) order to lower load by 200 MWe at 4 MW/minute
5	IMF FW02B TRIP IMF FW75 (preload)	C-BOP C-SRO	1C FW pump trip with a 1A FW pump auto-start failure
6	IMF TH15G 0	T-SRO	Loop 1D WR Thot channel fails low
7	IMF TH01 .4 60	M-ALL	PZR vapor space LOCA
8	IMF CV01A (preload) IMF CV32B (preload)	C-ATC C-SRO	1A CV pump trip on SI with 1B CV pump auto-start failure

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

SCENARIO OVERVIEW

Unit 1 is at 90%, steady state, Equilibrium Xenon, BOL. On-line risk is Green. Following turnover, perform a 1C TDFWP PMT per 1BwOS FW-W1, TDFW Pump Stop Valve Surveillance. An EO is briefed and standing by at the 1C TDFW pump.

After completing shift turnover, the crew will perform a 1C TDFW Pump PMT per 1BwOS FW-W1, TDFW Pump Stop Valve Surveillance. The BOP will perform a 1C TDFW pump PMT per 1BwOS FW-W1.

After completing the 1C TDFW Pump Stop Valve Surveillance PMT, the Letdown line pressure controller, 1PK-0131, setpoint will fail high. This will cause a letdown pressure high alarm and high letdown line pressure. The ATC will take manual control of 1PK-0131 per 1BwPR 1-9-LD to restore normal letdown pressure.

After the Letdown line pressure controller setpoint failure actions are completed, a 1A letdown HX tube leak will occur. The crew will identify the leak location as the 1A letdown HX and the SRO will enter 1BwOA PRI-6. The crew will swap to the 1B letdown HX per BwOP CV-22. Letdown will be restored per BwOP CV-17. The SRO will enter Tech Spec 3.4.13 Condition A.

After normal charging and letdown have been restored, an Advanced Nuclear Dispatch (AND) order to lower load by 200 MWe will occur. The AND ramp computer will indicate a ramp to 896 MWe is requested and the crew will call to confirm the ramp. Once the ramp is confirmed, the ramp down to 896 MWe will be commenced at 4 MW/min per the operator aid. The ATC will borate the RCS.

After the load ramp reactivity change is adequately evaluated, a 1C FW pump trip with a 1A FW pump auto-start failure will occur. The BOP will respond per 1BwPR 1-16-A1,B1,C1 (Dual Pump Operation) and will manually start the 1A FW pump (or runback the main turbine). The SRO will enter 1BwOA SEC-1. NOTE: Failure to start the 1A FW pump (or runback the main turbine) would lead to an automatic reactor trip.

After the 1A FW pump is manually started and the plant is stable, the loop 1D WR Thot channel will fail low. The SRO will enter 1BwOA INST-2 and enter Tech Spec 3.3.4 Condition A.

After the SRO has evaluated Tech Specs for the WR Thot channel failure, a PZR vapor space LOCA will occur. The ATC will respond to the PZR vapor space LOCA and will insert a manual reactor trip and SI. The SRO will enter 1BwEP-0. The ATC will manually start the 1B CV pump with the 1A CV pump tripped and trip the RCPs when the RCP trip criteria are met. The crew will then transition to 1BwEP-1.

Scenario completion criteria is crew entry into 1BwEP ES-1.2.

Critical Tasks:

1. Manually start 1B CV pump before transitioning out of 1BwEP-0.
   (Westinghouse – CT-6) (K/A number – 006 A4.07, Importance – 4.4/4.4)
2. Trip RCPs when RCP trip criteria are met (RCS pressure < 1425 psig and high head SI flow > 100 gpm or SI pump discharge flow > 200 gpm) prior to transition out of 1BwEP-0.
   (Westinghouse – CT-16) (K/A Number – EPE009 EA1.09, Importance – 3.6/3.6)

Potential Critical Tasks:

1. Manually start the 1A FW pump (or runback the main turbine) prior to a reactor trip.
   (K/A number – 059 A2.07, Importance – 3.0/3.3)

SIMULATOR SETUP GUIDE

- Verify/perform TQ-BR-201-0113, BRAIDWOOD TRAINING DEPARTMENT SIMULATOR EXAMINATION SECURITY ACTIONS CHECKLIST.
- Reset to IC-31, 90% power, steady state, equilibrium Xenon, BOL OR use the IC written below.
- Open SmartScenario file **19-1 NRC 4.ssf** from the thumb drive and place the ssf in run.
- Release the **SETUP** command box.
- Complete items on Simulator Ready for Training Checklist.
- Ensure the simulator is in RUN (allow simulator to run during board walk down and turnover).
- Verify page 1 PRELOAD items are inserted.
- Verify 0A & 0C VA plenums in-service, 0B VA plenum in standby.
- Verify/remove any Equipment Status Tags and Danger Tags not applicable to the scenario.
- Verify SER printer is clear of data.
- If desired, write an IC after all the set-up actions are completed (snap to 0). This IC may be used for running the scenario on additional simulator groups.
- Provide students with turnover sheets and a marked-up copy of 1BwOS FW-W1 (1C TDFWP PMT).
- Provide a turnover of unit status to oncoming crew.

Event 1: Perform a 1C TDFW Pump PMT per 1BwOS FW-W1, TDFW Pump Stop Valve Surveillance

As the EO observing 1C TDFWP stop valve operation, report LP (partially stroked) and HP (fully stroked) stop valves respond normally (stroke smoothly) as they are tested.

As SM, acknowledge the completion of 1BwOS FW-W1.

Event 2: Letdown line pressure controller, 1PK-0131, setpoint fails high

Release ssf command box **Event 2**.

Ensure **MF CV05 inc RAISE** is inserted to fail the 1PK-0131 setpoint high.

As SM, acknowledge the failure, risk evaluation, IR initiation and request for maintenance support.

Event 3: 1A letdown HX tube leak

Release ssf command box **Event 3**.

Ensure **MF CV23A 90** is inserted to cause a 1A letdown HX tube leak at 90 gpm.

As SM, acknowledge entry into 1BwOA PRI-1/1BwOA PRI-6 (as required) and EAL evaluation request. If asked, use SRO recommendation for 1CV8324B open/close determination in 1BwOA PRI-1.

If asked as U-2 NSO, report 2CC017 is closed.

If asked as SM, a letdown HX flush is not required, boron concentration is the same as when last in use.

When dispatched as an EO to swap Letdown HXs, use the following remote functions per BwOP CV-22, release ssf command box **L/D HX Valve Operations**, then release each valve from SmartSummary as directed:

- **IRF CC37 0** – isolate 1A Letdown HX CC inlet (1CC9452A).
- **IRF CC40 0** – isolate 1A Letdown HX CC outlet (1CC9452B) (leak isolation).
- **IRF CC39 100** – open 1B Letdown HX CC inlet (1CC9452C).
- **IRF CV63 0** – close 1A letdown CV outlet valve (1CV8467A) (leak isolation).

If ordered as an EO to drain the CC surge tank, release ssf command box **Drain CC Surge Tank**, then release each valve from SmartSummary as directed:

- **IRF CC15** AS REQUIRED – drain the CC surge tank (1CC2020B).
- **IRF CC16** AS REQUIRED – drain the CC surge tank (1CC2020A).

As Chemistry, acknowledge the request to sample letdown for placing mixed bed demin back on-line.

As SM, acknowledge the failure, risk evaluation, IR initiation and request for maintenance support. The SRO will enter Tech Spec 3.4.13 Condition A.

Event 4: Advanced Nuclear Dispatch (AND) order to lower load by 200 MWe at 4 MW/minute

Release ssf command box **Event 5**.

Ensure **RF ED500 896** is inserted for the desired AND ordered ramp down of 200 MWe.

As Constellation, acknowledge that the ramp is desired at 4 MWe/min.

As Chemistry/Rad Protection, acknowledge requests for RCS samples.

As SM, Gen Dispatch and NDO, acknowledge the ramp down to 896 MWe.

Event 5: 1C FW pump trip with a 1A FW pump auto-start failure

Release ssf command box **Event 4**.

Ensure **MF FW02B TRIP** is inserted to cause a 1C FW pump trip (1A FW pump auto-start failure is a preloaded MF).

As SM, acknowledge the 1BwOA SEC-1 entry and request for Emergency Plan evaluation.

If dispatched as an EO, report 1C MFP is tripped but no visible cause is apparent.

If dispatched as an EO to the 1A MFP, report back a good start on the 1A MFP/1C CD/CB Pp..

As SM, acknowledge the failure and requests for risk evaluation, IR initiation and notification request.

Event 6: Loop 1D WR Thot channel fails low

Release ssf command box **Event 6**.

Ensure **MF TH15G 0** is inserted to cause loop 1D WR Thot channel to fail low.

As SM, acknowledge the failure and requests for risk evaluation, IR initiation and notification request. The SRO will enter Tech Spec 3.3.4 Condition A.

Events 7, 8: PZR vapor space LOCA, 1A CV pump trip on SI with 1B CV pump auto-start failure

Release ssf command box **Events 7, 8**.

Ensure **MF TH01 .4 60** is inserted to cause a PZR vapor space LOCA (1A CV pump trip on SI with 1B CV pump auto-start failure are preloaded MFs).

If dispatched as EO, wait 3 minutes then report 1A CV pump has a Phase A overcurrent trip present.

As SM, acknowledge procedure transitions, EAL evaluation request and STA request.

After the STA is requested, as STA report CSF status – Yellow on Inventory with PZR level > 92%, Yellow on Integrity.

When requested to monitor DG operation, release ssf command box **DG Check**.

Ensure **RF EG06 RESET** is inserted to reset 1A DG alarm.
Ensure **RF EG12 RESET** is inserted to reset 1B DG alarm.

When requested to open 0/1SX007 to obtain **8000 GPM**, release ssf command box **0/1SX007 Throttling – 8000 gpm**.

Ensure **RF SW01 60** is inserted to open 0SX007 to 60%.
Ensure **RF SW02 60** is inserted to open 1SX007 to 60%.

If asked for assistance in performing BwOP PS-9, inform the crew that the U-2 admin NSO will perform BwOP PS-9.

Scenario No: **19-1 NRC 4** Event No. 1		
Event Description:		Perform a 1C TDFW Pump PMT per 1BwOS FW-W1, TDFW Pump Stop Valve Surveillance
Time	Position	Applicant's Actions or Behavior
	CUE	• From turnover, perform 1BwOS FW-W1, 1B & 1C TURBINE DRIVEN MAIN FEEDWATER PUMP STOP VALVE SURVEILLANCE, PMT for 1C TDFW pump.
	SRO	• Brief the BOP to perform 1BwOS FW-W1 (1C TDFW pump PMT) (may have been performed earlier). • Direct BOP to perform 1BwOS FW-W1 (1C TDFW pump PMT) (may have been performed earlier).

	BOP	• Refer to 1BwOS FW-W1.
		• Test 1C FW pump:
		  • Record time and date on Data Sheet D-2.
		  • On Graphic 6063, depress the LP stop valve TEST button.
		  ○ Activate pop-up window (may have opened already active).
		  • Depress confirm.
		  • Observe LP stop valve OPEN button goes out (may NOT be observable via Ovation screen). Update Data Sheet D-2.
		  • Observe LP stop valve TEST button illuminates (may NOT be observable via Ovation screen)/local valve movement. Update Data Sheet D-2.
		  • Observe LP stop valve OPEN button illuminates. Update Data Sheet D-2.
		  • Depress HP stop valve TEST button.
		  ○ Activate pop-up window. (may have opened already active).
		  • Depress confirm.
		  • Observe HP stop valve OPEN button goes out. Update Data Sheet D-2.
		  • Observe HP stop valve CLOSED button illuminates/local valve movement. Update Data Sheet D-2.
		  • Observe HP stop valve TEST button illuminates (may NOT be observable via Ovation screen) /local valve movement. Update Data Sheet D-2.
		  • Observe HP stop valve CLOSED button goes out.
		  • Observe HP stop valve OPEN button illuminates. Update Data Sheet D-2.
		• Inform SRO that 1BwOS FW-W1 is complete.

	SRO	• Acknowledge surveillance performance and completion. ○ Notify SM that 1BwOS FW-W1 PMT for the 1C FW pump is complete.
	ATC	• Monitor remainder of MCBs.
		EXAMINER'S NOTE: After 1BwOS FW-W1 is complete and with Lead Examiner's concurrence, enter next event.

Scenario No: **19-1 NRC 4** Event No. 2		
Event Description: Letdown line pressure controller, 1PK-0131, setpoint fails high		
Time	Position	Applicant's Actions or Behavior
	CUE	• Annunciator 1-8-B5, LTDWN HX OUTLT PRESS HIGH, alarms. • Letdown line pressure meter, 1PI-131, rises. • 1PK-0131 output demand lowering.

	ATC	• Determine that the 1PK-0131 controller has failed.
		• Report 1PK-0131 failure to SRO.
		• Perform actions per 1BwPR 1-9-LD, LETDOWN MALFUNCTION PROMPT RESPONSE:
		  • Place 1PK-0131 in manual.
		  • Adjust 1CV131 to restore letdown pressure to 360 psig.
		  • GO TO BwAR 1-8-B5 (verify proper valve lineup and initiate corrective actions).

	BOP	• Monitor remainder of MCBs. • Refer to BwARs, as time permits.
	SRO	• Direct/ensure ATC to take manual control of 1PK-0131 and restore letdown pressure to normal. ○ Notify SM to perform risk evaluation, initiate IR and contact maintenance to investigate/correct failure. ○ May establish a critical parameter for letdown pressure.
	ATC	• Maintain letdown pressure at desired band by operating 1PK-0131 in manual.
		EXAMINER'S NOTE: (1) The crew may elect to isolate letdown based on the letdown relief valve lifting. The steps for restoring normal letdown are in italics below. **(2) The crew may use 1BwPR 1-9-LD to isolate letdown (close 1CV8149A-C and close 1CV459/460).**
	ATC/BOP	***Establish normal letdown per BwOP CV-17, ESTABLISHING AND SECURING NORMAL AND RH LETDOWN:*** ○ *Verify/close 1CV8149A/B/C.* ○ *Verify CC aligned to letdown HX (was previously aligned).* ○ *Place 1PK-0131 in manual at 40% demand.* ○ *Place 1TK-0130 in manual at 60% demand.* ○ *Verify/open 1CV8152/8160.* ○ *Open 1CV459/460.* ○ *Verify/open 1CV8324A & 1CV8389A.* ○ *Verify 1CV381A/B are open; OFF light is lit above BTRS Mode Selector switch.* ○ *Verify/open 1CV8401A.* ○ *Verify/close 1CV8145.* ○ *Verify/open 1CV8146 or 1CV8147.* ○ *Open 1CV8105/8106.* ○ *Adjust 1FK-0121, CV pumps flow control valve, in manual to raise charging*

Scenario No: **19-1 NRC 4** Event No. 2		
Event Description: Letdown line pressure controller, 1PK-0131, setpoint fails high		
Time	Position	Applicant's Actions or Behavior
		flow to 100 gpm while concurrently adjusting 1CV182, charging header backpressure control valve, to control RCP seal injection 8-10 gpm per RCP. o *Open 1CV8149A/B/C and adjust 1PK-0131 in manual to maintain letdown pressure 360-380 psig.* o *Adjust 1TK-0130 in MANUAL to maintain letdown temperature 90-115°F.* o *Place 1FK-0121, 1LK-0459 & 1TK-0130 in AUTO (1PK-0131 remains in MANUAL).* o *At RMS, verify 1PR06J cursor is GREEN (in-service).* o *Verify proper operation of RMCS during VCT auto makeup.* o *Proper flow indicated on PW/Total Flow (1FT-0111) and Boric Acid Flow (1FT-0110) on recorder 1FR-0110.*
		EXAMINER'S NOTE: After the actions for the 1PK-0131 failure are complete and with Lead Examiner's concurrence, insert next event.

Scenario No: **19-1 NRC 4** Event No. 3		
Event Description: 1A letdown HX tube leak		
Time	Position	Applicant's Actions or Behavior
	CUE	• Letdown line flow meter, 1FI-132, lowering at 1PM05J. • CC surge tank level meters, 1LI-670 & 1LI-676, rising at 1PM06J. • 0/1PR09J, CC HX OUTLET RAD MONITOR, alarms at RMS. • 1CC017, CC surge tank vent valve, closed at 1PM06J. • Annunciator 1-2-A5, CC SURGE TANK LEVEL HIGH LOW, alarms.
	CREW	• Refer to BwARs, as time permits.
	SRO	• Identify entry conditions for 1BwOA PRI-6, COMPONENT COOLING MALFUNCTION. • Notify SM of plant status and procedure entry. • Request SM evaluation of Emergency Plan conditions. • Enter/implement 1BwOA PRI-6 and direct operator actions of 1BwOA PRI-6 to establish the following conditions:
		EXAMINER'S NOTES: (1) The SRO may enter 1BwOA PRI-6 (below) or 1BwOA PRI-1 (in italics on next page) depending on reports from the ATC and BOP. (2) Isolate normal letdown steps are on the next page.
		1BwOA PRI-6, COMPONENT COOLING MALFUNCTION
	ATC	• Monitor RCP seal cooling: ○ Seal injection flow to all RCPs. - OR - ○ Annunciator 1-7-E4 – NOT LIT. • RCP temperatures normal.
	BOP	• Check CC surge tank level at 1PM06J: • CC surge tank level > 13% and rising on 1LI-670 & 1LI-676.
	SRO	• Determine 1BwOA PRI-6, ATTACHMENT B, ABNORMAL CC SURGE TANK LEVEL, is required to be implemented.
	BOP	• Check CC surge tank level at 1PM06J: • CC surge tank level > 13% and rising on 1LI-670 & 1LI-676. ○ Dispatch EOs to drain CC surge tank.
	ATC	• Check for leakage from RCP thermal barrier at 1PM05J: • Annunciator 1-7-E4, RCP THERM BARR CC WTR FLOW HIGH LOW – LIT (NO). • Seal injection flows stable on 1FI-142A – 1FI-145A – ANY ABNORMALLY HIGH (NO).
	CREW	• Isolate CC system inleakage. • 0/1PR09J, CC HX OUTLET RAD MONITOR, radiation levels rising and/or alarming at RMS. • Notify Chemistry to sample CC system for activity. • Determine leak exists in 1A letdown heat exchanger.

Scenario No: **19-1 NRC 4** Event No. 3		
Event Description: 1A letdown HX tube leak		
Time	Position	Applicant's Actions or Behavior
		• Letdown line flow lowering on 1FI-132 at 1PM05J. • VCT level lowering on 1LR-185/1LI-112 at 1PM05J. o Verify 1CC017 closed, notify U-2 NSO to verify 2CC017 closed. o Place 1CV112A, letdown to VCT or HUT divert valve, in the HUT position to divert letdown to the HUT.
	ATC	• **Isolate normal letdown** at 1PM05J per 1BwPR 1-9-LD, LETDOWN MALFUNCTION PROMPT RESPONSE: • Close 1CV8149A, B, & C, letdown orifice valves. • Close 1CV459 & 1CV460, letdown isolation valves. • Adjust charging flow to minimum required for seal injection flow: • Throttle 1CV121. • Close 1CV182. o Close 1CV8105 & 1CV8106, charging line CNMT isolation valves. • Monitor RMCS during auto VCT makeup. • Proper flow indicated on PW/Total Flow (1FT-0111) and Boric Acid Flow (1FT-0110) on recorder 1FR-0110. • Check inleakage isolated after swapping letdown HXs.
		EXAMINER'S NOTE: (1) The crew may elect to place excess letdown on-line. The steps for placing excess letdown on line start on page 14. (2) The following steps in italics are for steps in 1BwOA PRI-1, EXCESSIVE PRIMARY PLANT LEAKAGE.
	SRO	• *Notify SM of plant status and procedure entry.* • *Request SM evaluation of Emergency Plan conditions.* • *Enter/implement 1BwOA PRI-1, EXCESSIVE PRIMARY PLANT LEAKAGE, and direct operator actions of 1BwOA PRI-1 to establish the following conditions:*
	ATC/BOP	• *Check SI status.* • *Check if SI is required:* o *PZR pressure ≤ 1829 psig – NO.* o *Steamline pressure ≤ 640 psig – NO.* o *CNMT pressure ≥ 3.4 psig – NO.* • *PZR level – STABLE OR RISING (NO).* • *Isolate letdown:* • *Verify/close 1CV8149A, B & C, letdown orifice isolation valves.* • *Monitor RCP seal cooling:* o *Seal injection flow to all RCPs.* o *RCP thermal barrier CC water flow low alarms (1-7-_4) – NOT LIT.*
	CREW	• *Check unit in Mode 1.* • *Check PZR pressure – LESS THAN 2220 PSIG (NO).* • *Monitor PZR level – STABLE OR RISING.* • *Check if leak is downstream of seal injection line flow transmitter - any individual seal injection flow – INDICATING ABNORMALLY HIGH (NO).* • *Check letdown isolated (isolated previously) – step also closes 1CV459 and 1CV460 which previous step did not.*

Scenario No: **19-1 NRC 4** Event No. 3		
Event Description: 1A letdown HX tube leak		
Time	Position	Applicant's Actions or Behavior
	BOP	• *Close 1CV459 and 1CV460, if NOT closed per 1BwPR 1-9-LD.*
		EXAMINER'S NOTE: A NOTE ALLOWS TRANSITION TO STEP 31 (CHECK NORMAL CHARGING FLOWPATH ESTABLISHED) WITH SHIFT MANAGER PERMISSION IF LEAK IS IDENTIFIED AND VERIFIED ISOLATED.

	ATC/BOP	• *Verify leak is not in charging header downstream of 1CV121:*
		  • *Close 1CV8324A.*
		  • *Establish seal injection flows – BETWEEN 10 & 15 GPM PER PUMP.*
		  • *Maintain 1CV182 demand – AT LEAST 20% OPEN.*
		  • *Check charging flow – APPROXIMATELY EQUAL TO TOTAL SEAL INJECTION FLOW.*

	ATC/BOP	• *Check if leak is isolated:*
		  • *PZR level – RISING.*
		  • *PZR level rise – APPROXIMATELY EQUALS CHARGING FLOW MINUS SEAL RETURN FLOW.*
		• *Check if Leak was in Containment:*
		  • *No abnormal Containment leakage or radiation indications exist.*
		• *Check if leak was at Regen HX:*
		  • *Consult with SM, then open standby regen HX isolation valve, 1CV8324B.*
		  • *Establish normal letdown per 1BwOA ESP-2.*
		  • *Check CV system indications normal – NO.*
		  • *Isolate letdown.*
		  • *Close 1CV8324B.*
		• *Control charging flow using 1CV121 and 1CV182 to maintain PZR level within 5% of program value and 8-13 gpm seal injection per pump.*
		• *Control PZR pressure: Operate PZR heaters and sprays as necessary.*
		• *Check Letdown status: none established.*

		EXAMINER'S NOTE: When the crew has isolated the leak (CC surge tank level stable and both CC surge tank drain valves closed), they will restore letdown to a normal lineup per BwOP CV-22, OPERATION OF LETDOWN & REGEN HEAT EXCHANGERS.
	CREW	Swap letdown heat exchangers in accordance with BwOP CV-22, OPERATION OF LETDOWN & REGEN HEAT EXCHANGERS: • Contact operators to locally align and establish CC flow to 1B letdown HX and vent 1B letdown HX. • Place 1TK-0130 in manual; adjust to maintain desired letdown temperature (N/A – letdown isolated). • Verify/open 1CV8467B, letdown HX 1B outlet valve. • Open 1CV8401B, letdown HX 1B inlet valve, at 1PM05J. • Close 1CV8401A, letdown HX 1A inlet valve, at 1PM05J. ○
		EXAMINER'S NOTE: The following step may not be completed until after letdown flow has been re-established.

Scenario No: **19-1 NRC 4** Event No. 3		
Event Description: 1A letdown HX tube leak		
Time	Position	Applicant's Actions or Behavior

	CREW	• Verify/place 1CV112A to the VCT position.
		• Verify/place 1CV129 to the Demin position.
		• Contact EOs to locally close:
		  • 1CC9452A, letdown HX 1A CC inlet isolation valve.
		  ○ 1CC9452B, letdown HX 1A CC outlet isolation valve (leak isolation).
		  ○ 1CV8467A, letdown HX 1A outlet valve (leak isolation).

	ATC/BOP	Perform the following at 1PM05J to establish normal letdown flow through the 1B letdown HX per **BwOP CV-17, ESTABLISHING AND SECURING NORMAL AND RH LETDOWN FLOW** (N/A if excess letdown was established or 1BwOA ESP-2 is used): • Verify/close 1CV8149A/B/C. • Verify CC aligned to 1B letdown HX. • Place 1PK-0131 in manual at 40% demand. • Place 1TK-0130 in manual at 60% demand. • Verify/open 1CV8152/8160. • Open 1CV459/460. • Verify/open 1CV8324A & 1CV8389A. • Verify 1CV381A/B are open; OFF light is lit above BTRS Mode Selector switch. • Verify/open 1CV8401B. • Verify/close 1CV8145. • Verify/open 1CV8146 or 1CV8147. • Open 1CV8105/8106. • Adjust 1FK-0121, CV pumps flow control valve, in manual to raise charging flow to 100 gpm while concurrently adjusting 1CV182, charging header backpressure control valve, to control RCP seal injection 8-10 gpm per RCP. • Open 1CV8149A/B/C and adjust 1PK-0131 in MANUAL to maintain letdown pressure 360-380 psig. • Adjust 1TK-0130 in MANUAL to maintain letdown temperature 90-115°F. • Place 1FK-0121, 1LK-0459 & 1TK-0130 in AUTO (1PK-0131 remains in MANUAL). • At RMS, verify 1PR06J cursor is GREEN (in-service).
		EXAMINER'S NOTE: 1BwOA ESP-2, REESTABLISHING CV LETDOWN DURING ABNORMAL CONDITIONS, may be used with SM permission.

	BOP/ATC	*Perform the following at 1PM05J **(1BwOA ESP-2)**:*
		• *Check letdown isolated:*
		  • *1CV8149A, B, & C, Letdown Orifice Isolation Valves – CLOSED.*
		  • *1CV459 & 1CV460, Letdown Line Isolation Valves – CLOSED.*
		• *Check letdown flow path:*
		  • *1CV8401B, Letdown HX 1B Isolation Valve – OPEN.*
		  • *1CV8324A, Charging to Regen HX 1A Isolation Valve – OPEN.*
		  • *1CV8389A, Letdown to Regen HX 1A Isolation Valve – OPEN.*
		  • *1CV8152 & 1CV8160, Letdown Line CNMT Isolation Valves – OPEN.*

Scenario No: **19-1 NRC 4** Event No. 3		
Event Description: 1A letdown HX tube leak		
Time	Position	Applicant's Actions or Behavior

		• *BTRS mode selector switch OFF light - LIT.*
		
		• *Align letdown controllers:*
		  • *Place 1PK-0131, Letdown Line Pressure Controller, in MANUAL and raise demand to 40%.*
		  • *Place 1TK-0130, Letdown HX Outlet Temperature Controller, in MANUAL and raise demand to 60%.*
		
		• *Verify charging flow established:*
		  • *Check 1CV8105 and 1CV8106, Charging Line CNMT Isolation Valves – OPEN (if closed, place 1CV182 controller = 0% demand, then open 1CV8105/8106).*
		  • *Adjust 1CV182, Charging Header Backpressure Control Valve, to establish 8-13 gpm RCP seal injection flow per RCP.*
		  • *Place 1FK-0121 in manual and establish 100 gpm charging flow on 1FI-121A.*
		
		• *Establish letdown flow:*
		  • *OPEN 1CV459 & 1CV460.*
		  • *OPEN 1CV8149A & B or C to establish 120 gpm letdown flow.*
		  • *Lower demand on 1PK-0131 to raise letdown pressure to ~ 360 psig on 1PI-131.*
		  • *Operate 1FK-0121 in manual to restore PZR level to normal operating band and maintain 8-13 gpm RCP seal injection flow per RCP.*
		  • *Lower demand on 1TK-0130 to control letdown temperature between 90° F to 115°F on 1TI-130.*
		  • *Place 1PK-0131 controller in AUTO (N/A – controller is failed).*
		  • *Place 1TK-0130 controller in AUTO.*
		  • *At RMS, verify 1PR06J cursor is GREEN (in-service).*

	BOP	***Establish excess letdown per BwOP CV-15, EXCESS LETDOWN OPERATIONS:*** o *VERIFY reactor power is maintained less than or equal to 99.8% power.* o *Verify/open 1CV8100 & 1CV8112, seal water return CNMT isolation valves, at 1PM05J.* o *Open 1CC9437A & 1CC9437B, CC to excess letdown HX isolation valves, at 1PM06J.* o *Verify/close (at 0% demand) 1HCV-CV123, excess letdown HX flow control valve, at 1PM05J.* o *Verify/place 1CV8143, excess letdown to seal filter or RCDT valve, in VCT position at 1PM05J.* o *Open 1RC8037A, B, C, & D, RCS loop drain valves, at 1PM05J.* o *Open 1CV8153A & 1CV8153B, excess letdown HX 1A & 1B inlet isolation valves, at 1PM05J.* o *Raise demand on 1HCV-CV123, excess letdown HX flow control valve, while maintaining excess letdown outlet temperature < 165°F on Ovation graphic 6005.*
	SRO	• Notify SM of 1A letdown HX leak, IR initiation and required notifications. • Enter Tech Spec 3.4.13 Condition A.

Scenario No: **19-1 NRC 4** Event No. 3		
Event Description: 1A letdown HX tube leak		
Time	Position	Applicant's Actions or Behavior
		EXAMINER'S NOTE: After the actions for letdown heat exchanger leak are complete and with Lead Examiner's concurrence, enter next event.

Scenario No: **19-1 NRC 4** Event No. 4		
Event Description:	Advanced Nuclear Dispatch (AND) order to lower load by 200 MWe at 4 MW/minute	
Time	Position	Applicant's Actions or Behavior
	CUE	• AND computer alarms requesting a ramp down to 896 MWe.
	SRO	• Review AND computer and determine that a ramp down to 896 MWe is requested. • Call Constellation and verify that a ramp is requested. • Initiate 1BwGP 100-4T6, LOAD CHANGE INSTRUCTION SHEET FOR POWER REDUCTION. • Perform pre-job brief per OP-BR-108-101-1002, ATTACHMENT 4, EMERGENT RAMP REACTIVITY SUMMARY BRIEF.
	SRO	• Direct lowering load to 896 MWe at 4 MWe/min. • Notify SM of plant status and required load ramp. • Notify Chemistry of power reduction and to monitor affected parameters. • Notify Chemistry and Rad Protection to perform Tech Spec sampling with a planned > 15% power change in 1 hour. • Brief ATC concerning ramp parameters and primary plant control.
	CREW	• Review Prerequisites, Precautions, and Limitations and Actions of 1BwGP 100-4, POWER DESCENSION (may be performed after ramp is initiated).

	ATC	• Initiate RCS boration per BwOP CV-6.
		• Determine required boric acid volume.
		  • Determine from Op Aid (ramp starts from 90%).
		o **Batch boration (BwOP CV-6 Attachment A, step 1):**
		  o Turn on PZR backup heaters.
		  o If desired to reset the BORIC ACID TOTALIZER to 0, select soft button RESET for the BORIC ACID BLENDER PREDETERMINED SETPOINT.
		  o Open 1CV110B, Boric Acid Blender to Chg Pumps Valve.
		  o Open 1CV110A, Boric Acid to Blender Valve.
		  o Start the BA Transfer Pump.
		  o If desired, control VCT level by adjusting the 1LK-0112 setpoint to the desired value.
		  o When desired amount of BA has been added, stop BA Transfer Pump.
		  o Close 1CV110A.
		  o Close 1CV110B.
		  o Verify VCT level or pressure at desired value and adjust 1LK-0112 to the desired level setpoint.
		  o Verify/place 1CV110A and 1CV110B in the AUTO position.
		  o Record time and amount of BA that was added in Unit log or appropriate journal.
		  o Perform the appropriate step of BwOP CV-7 to return RMCS to automatic alignment following the final boration.
		- OR -
		o **Borate in Automatic (BwOP CV-6 Attachment A, step 2):**
		  o Turn on PZR backup heaters.
		  o Set the BORIC ACID TOTALIZER to desired value.
		  o Place MAKE-UP CONT switch in the STOP position.
		  o Place MODE SELECT switch in the BORATE position.

Scenario No: **19-1 NRC 4** Event No. 4		
Event Description:	Advanced Nuclear Dispatch (AND) order to lower load by 200 MWe at 4 MW/minute	
Time	Position	Applicant's Actions or Behavior
		○ Place MAKE-UP CONT switch to the START position to commence the boration. ○ Verify the following occurs: ○ 1CV110B, Boric Acid Blender to Chg Pumps Valve, opens ○ 1CV110A, Boric Acid to Blender Valve, modulates open. ○ BA Transfer Pump starts. ○ Proper BA flow on 1FR-0110. ○ If desired, control VCT level by adjusting the 1LK-0112 setpoint to the desired value. ○ When desired amount of BA has been added, place MAKE-UP CONT switch to the STOP position. ○ Verify the following occurs: ○ 1CV110B closes. ○ 1CV110A closes. ○ BA Transfer Pump stops. ○ Record time and amount of BA that was added in Unit log or appropriate journal. ○ Perform the appropriate step of BwOP CV-7 to return RMCS to automatic alignment following the final boration.
	BOP	• Lower turbine load at Ovation Graphic 5501 by performing the following: • Select SETPOINT. • Enter desired MWs (896) into REF DEMAND window. • Select LEFT ENTER. • Verify correct value in REFERENCE DEMAND window. • Enter desired MW/min (4) into the RATE window. • Select RIGHT ENTER. • Verify correct value in RATE window. • Select EXIT. • Notify crew of pending ramp with an UPDATE. • Select GO/HOLD. • Verify GO/HOLD button illuminates orange. • Verify HOLD indicator illuminates RED. • Select GO. • Verify GO indicator illuminates RED while the main turbine ramps. • Verify main turbine load begins to drop.
	ATC/BOP	• Perform periodic control rod steps/boron concentration adjustment to maintain Tave and Delta I within limits. • Monitor reactor power, Tave, control rod position and ΔI at 1PM05J or PPC. • Monitor MWe and DEHC system response on Ovation. • During boration, monitor the following at 1PM05J, PPC or Ovation: • VCT level. • RCS Tave. • Refer to 1BwGP 100-4 for additional guidance as necessary.
		EXAMINER'S NOTE: After the load ramp reactivity change is adequately

Scenario No: **19-1 NRC 4**		Event No. 4
Event Description:		Advanced Nuclear Dispatch (AND) order to lower load by 200 MWe at 4 MW/minute
Time	Position	Applicant's Actions or Behavior
		evaluated and with Lead Examiner's concurrence, enter next event.

Scenario No: **19-1 NRC 4** Event No. 5		
Event Description: 1C FW pump trip with a 1A FW pump auto-start failure		
Time	Position	Applicant's Actions or Behavior
	CUE	• Annunciator 1-16-C1, FW PUMP 1C TRIP, alarms. • Feed flows lowering. • SG NR levels lowering.

	BOP
	
	Potential C/T
		• Recognize 1C FW pump tripped.
		• Report 1C FW pump trip to SRO.
		• Perform actions per 1BwPR 1-16-A1,B1,C1, FW PUMP TRIP (DUAL PUMP OPERATION) PROMPT RESPONSE:
		  • Verify/close 1FW012C.
		  • Check turbine load > 700 MW.
		  • Verify auto start of 1A FW pump – NO.
		  • Verify/start 1A FW pump aux LO pump (already running).
		  • Verify 1FW016 controller (1FK-FW051) set at ~25% in MANUAL.
		• Manually start the 1A FW pump (or runback the main turbine**)** prior to a reactor trip. (K/A number – 059 A2.07, Importance – 3.0/3.3)
		  • Start 1A FW pump.
		  • Runback the Main turbine (only required if 1A FW pump is NOT started).
		  • Verify 1FK-FW051 (1FW016) – CONTROLLING IN AUTO.
		  • Start standby CD/CB pump aux oil pump and standby CD/CB pump.
		  • Notify SRO to GO TO 1BwOA SEC-1.

	SRO	• Acknowledge 1C FW pump trip • Enter/implement 1BwOA SEC-1, SECONDARY PUMP TRIP, ATTACHMENT A – FW PUMP TRIP ABOVE 15% POWER and direct operator actions of 1BwOA SEC-1 to establish the following conditions:

	BOP	• Verify/close 1FW012C.
		• Check turbine load > 700 MW.
		• Check main FW pumps – AT LEAST ONE RUNNING.
		• Verify auto start of 1A FW pump (started per 1BwPR 1-16-A1,B1,C1).
		  • Verify 1A FW pump – RUNNING.
		  • Verify 1FW016 – CONTROLLING IN AUTO.
		  • Verify 1A FW pump discharge flow – GREATER THAN 1.75 MLB/HR.
		  • Start standby CD/CB pump (completed per 1BwPR 1-16-A1,B1,C1).
		  • Check feed flow – GREATER THAN OR EQUAL TO STEAM FLOW.

	BOP	• Raise FW pump suction pressure.
		  • Check annunciator 1-16-E1, FW PUMP NPSH LOW – LIT (NO).
		• Check feed flow restored:
		  • Feed flow – GREATER THAN OR EQUAL TO STEAM FLOW.
		  • SG levels – STABLE AT OR TRENDING TO NORMAL.
		  • Deactivate turbine runback (if used).
		  • Check FW pump flow – NORMAL (Feed flow on Ovation Graphic 6040 – LESS THAN 10.5 MLBM/HR for running FW pumps. If NOT, perform the following):

		• Balance FW pump flows. • Reduce feed flow while restoring SG levels. • Reduce turbine load at 20 MW/min or as required to reduce FW pump discharge flow.

	SRO/ATC	• Check plant status:
		  • Check Delta I – WITHIN LIMITS OF BwCB-1 FIGURE 19.
		  • Annunciator 1-10-E8, PDMS INOPERABLE – NOT LIT.
		  • 1BwOS PDMS-1A – NOT IMPLEMENTED.
		  • Annunciator 1-10-D7, PDMS LIMIT EXCEEDED – NOT LIT.

	ATC	• Control ΔI near target. • Annunciator 1-10-B6, ROD BANK LOW INSERTION LIMIT – NOT LIT. • Check C-7 – NOT LIT.
	CREW	Restore plant conditions: • Adjust RCS boron concentration as necessary. • Balance discharge flow between the 1A FW pump and the 1B FW pump as necessary. • Verify FW pump recirc valves on running FW pumps in MODUL (1A/B FW pumps). • Verify valve controls for running pumps in AUTO – FW pump recircs Ovation Graphics 6060/61. • Verify valve controls on running pumps in AUTO – CB pump recircs. • Review startup procedure for 1A FW pump and standby CD/CB pump. • Shutdown unnecessary CD/CB pumps per BwOP CD/CB-2. • Complete shutdown procedure for 1C FW pump. • Notify Chemistry to monitor secondary chemistry. • Notify SM to perform risk evaluation, initiate IR, evaluate reactivity screening, make notifications and evaluate for the restoration of full power operation.
		EXAMINER'S NOTE: After the 1C MFP trip actions are completed and with Lead Examiner's concurrence, enter next event.

Scenario No: **19-1 NRC 4** Event No. 6		
Event Description: Loop 1D WR Thot channel fails low		
Time	Position	Applicant's Actions or Behavior
	CUE	• Annunciator 1-12-D3, RC TEMP BELOW ARM LOW TEMP SETPOINT, alarms. • Annunciator 1-12-D4, RC SYSTEM COLD PRESS HIGH, alarms. • Hot leg 1D WR temperature meter, 1TI-443A, fails low.
	ATC	• Determine loop 1D WR Thot channel has failed low. • Report loop 1D WR Thot channel failure to SRO.
	SRO	• Identify entry conditions for 1BwOA INST-2, OPERATION WITH A FAILED INSTRUMENT CHANNEL.
	SRO	• Notify SM of plant status and procedure entry. • Request SM evaluation of Emergency Plan conditions. • Enter/implement 1BwOA INST-2 and direct operator actions of 1BwOA INST-2 ATTACHMENT Y to establish the following conditions:
	BOP	• Check steam dump control in cooldown mode: • On Ovation Graphic 6120, COOLDOWN MODE – ENABLED (NO).

	BOP/ATC	• Remove the failed temperature channel from service:
		  • Select Ovation Graphic 6120.
		  • In Signal Selectors box, SELECT WIDE RANGE LOOP TEMP AVG and enable the window.
		  • SELECT PLACE OUT OF SERVICE for loop 1D (RC-WRTAVG-LOOPD), then exit window.

	BOP/ATC	• Place steam dump control in cooldown mode: • On Ovation Graphic 6120, COOLDOWN MODE – ENABLED (NO).
	ATC	• Monitor remainder of MCBs.
	SRO	• Enter Tech Spec 3.3.4 Condition A. • Notify SM to perform risk evaluation, initiate IR and make notifications as appropriate.
		EXAMINER'S NOTE: After the actions for the loop 1D WR Thot channel failure are complete and with Lead Examiner's concurrence, insert next event.

Scenario No: **19-1 NRC 4** Event No. 7, 8		
Event Description:		PZR vapor space LOCA, 1A CV pump trip on SI with 1B CV pump auto-start failure
Time	Position	Applicant's Actions or Behavior
	CUE	• PZR pressure lowering rapidly. • Annunciator 1-12-C1, PZR PRESS CONT DEV LOW HTRS ON, alarms. • Annunciator 1-11-C3, PZR PRESS LOW RX TRIP, alarms.
	ATC	• Identify rapid drop in PZR pressure. • Report rapid drop in PZR pressure to SRO.
	SRO	• Direct ATC to trip reactor, verify reactor trip, then insert an SI.
	ATC	• Initiate a manual reactor trip, verify reactor trip, then insert an SI.
	SRO	• Identify entry conditions for 1BwEP-0, REACTOR TRIP OR SAFETY INJECTION.
	SRO	• Notify SM of plant status and procedure entry. • Request SM evaluation of Emergency Plan conditions. • Enter/implement 1BwEP-0 and direct operator actions of 1BwEP-0 to establish the following conditions:

	ATC	Perform immediate operator actions of 1BwEP-0 at 1PM05J.
		• Verify reactor trip:
		  • Rod bottom lights – ALL LIT.
		  • Reactor trip & bypass breakers – OPEN.
		  • Neutron flux – DROPPING.

	BOP	Perform immediate operator actions of 1BwEP-0 at OWS drop 210.
		• Verify turbine trip:
		  • All Turbine throttle valves – CLOSED.
		  • All Turbine governor valves – CLOSED.

	BOP	Perform immediate operator actions of 1BwEP-0 at 1PM01J. • Verify power to 4KV busses: • ESF busses – BOTH ENERGIZED (141 & 142).

	CREW	Perform immediate operator actions of 1BwEP-0 at 1PM05J.
		• Check SI Status:
		  • SI First OUT annunciator – LIT.
		  • SI ACTUATED Permissive Light – LIT.
		  • SI Equipment – AUTOMATICALLY ACTUATED:
		  ○ Either SI pump – RUNNING.
		  ○ Either CV pump to cold leg isolation valve OPEN – 1SI8801A/B.
		  • Manually actuate SI at 1PM05J & 1PM06J.

Scenario No: **19-1 NRC 4** Event No. 7, 8		
Event Description: PZR vapor space LOCA, 1A CV pump trip on SI with 1B CV pump auto-start failure		
Time	Position	Applicant's Actions or Behavior

	ATC
	
	[CT-16]
		• Determine if RCP trip criteria are met.
		  • RCS pressure < 1425 psig & High head SI flow (1FI-917) > 100 gpm.
		Trip RCPs when RCP trip criteria are met (RCS pressure < 1425 psig and high head SI flow > 100 gpm or SI pump discharge flow > 200 gpm) prior to transition out of 1BwEP-0. (Westinghouse – CT-16) (K/A Number – EPE009 EA1.09, Importance – 3.6/3.6)
		  • **Trip ALL RCPs.**

	SRO	• Direct BOP to perform Attachment B of 1BwEP-0.
		EXAMINER'S NOTE: The SRO and ATC will continue in 1BwEP-0 while the BOP is performing Attachment B.

	BOP	**1BwEP-0 ATTACHMENT B:**
		• Verify FW isolation at 1PM04J:
		  • FW pumps – TRIPPED.
		  • FW isolation monitor lights – LIT.
		  • FW pumps discharge valves (1FW002A-C) – CLOSED (or going closed).
		• Verify DGs running at 1PM01J:
		  • DGs – BOTH RUNNING.
		  • 1SX169A/B – OPEN.
		  • Dispatch operator to monitor DGs operation.
		• Verify Generator trip at 1PM01J:
		  • OCB 1-8 and 7-8 – OPEN.
		  • PMG output breaker – OPEN.
		• Verify SX pumps running:
		  • Check Unit 0 CC HX aligned to Unit 1:
		  • 1CC9473A&B – OPEN.
		  • Unit 1 SX pumps – BOTH RUNNING.
		  • Dispatch an operator to energize and open 0/1SX007 to 8000 GPM flow to the Unit 0/1 CC HX, then open the disconnects.
		• Verify Control Room ventilation aligned for emergency operations at 0PM02J:
		  • VC Rad Monitors – LESS THAN HIGH ALARM SETPOINT.
		  • Operating VC train equipment – RUNNING.
		  • 0B Supply fan
		  • 0B Return fan
		  • 0B M/U fan
		  • 0B Chilled water pump
		  • 0B Chiller
		  • Operating VC train dampers aligned for train 0B.
		  • M/U fan outlet damper – 0VC08Y – NOT FULLY CLOSED.
		  • 0B VC train M/U filter light – LIT.
		  • 0VC09Y – OPEN.
		  • 0VC313Y – CLOSED.
		  • Operating VC train Charcoal Absorber aligned for train 0B.
		  • 0VC44Y – CLOSED.
		  • 0VC05Y – OPEN.
		  • 0VC06Y – OPEN.
		  • Control Room pressure greater than +0.125 inches water on 0PDI-VC038.

Scenario No: **19-1 NRC 4** Event No. 7, 8		
Event Description: PZR vapor space LOCA, 1A CV pump trip on SI with 1B CV pump auto-start failure		
Time	Position	Applicant's Actions or Behavior

		• Verify Auxiliary Building ventilation aligned for emergency operation at 0PM02J:
		  • Two inaccessible filter plenums aligned.
		  • Plenum A:
		  • 0VA03CB – RUNNING.
		  • 0VA023Y – OPEN (not fully closed).
		  • 0VA436Y – CLOSED.
		  • Plenum C:
		  • 0VA03CF – RUNNING.
		  • 0VA072Y – OPEN (not fully closed).
		  • 0VA438Y – CLOSED.
		• Verify FHB ventilation aligned for emergency operation at 0PM02J:
		  • 0VA04CB – RUNNING.
		  • 0VA055Y – OPEN.
		  • 0VA062Y – OPEN (not fully closed).
		  • 0VA435Y – CLOSED.
		• Shutdown unnecessary plant equipment.
		  • Trip all running HD pumps.
		• Initiate periodic monitoring of Spent Fuel Cooling.
		• Notify SRO of manual actions taken, failed equipment status & Attachment B complete.

	ATC
	
	[CT-6]
		• Verify ECCS pumps running at 1PM05J/1PM06J:
		  • BOTH CV pumps – RUNNING (NO).
		Manually start 1B CV pump before transition out of 1BwEP-0.
		(Westinghouse – CT-6) (K/A number – 006 A4.07, Importance – 4.4/4.4)
		  • **Start 1B CV pump.**
		  • Attempt to re-start 1A CV pump (will NOT start).
		  • BOTH RH pumps – RUNNING.
		  • BOTH SI pumps – RUNNING.

	ATC	• Verify the following at 1PM06J:
		  • RCFCs running in accident mode:
		  • Group 2 RCFC accident mode status lights – LIT.
		  • CNMT Phase A valves closed:
		  • Group 3 Cnmt Isol monitor lights – LIT.
		  • Verify Cnmt Vent isolation:
		  • Group 6 Cnmt Vent Isol monitor lights – LIT.
		  • Verify AF system:
		  • AF pumps – BOTH RUNNING.
		  • AF isolation valves – 1AF013A-H OPEN.
		  • AF flow control valves – 1AF005A-H THROTTLED.
		  • Verify CC pumps – BOTH RUNNING.
		  • Verify SX pumps – BOTH RUNNING.

	ATC/BOP	• Check if Main Steamlines should be isolated:

Scenario No: **19-1 NRC 4** Event No. 7, 8		
Event Description: PZR vapor space LOCA, 1A CV pump trip on SI with 1B CV pump auto-start failure		
Time	Position	Applicant's Actions or Behavior
		• All S/G pressures > 640 psig (at 1PM04J). • CNMT pressure < 8.2 psig.
	BOP	• Check if CS is required: • CNMT pressure remained < 20 psig.
	BOP/ATC	• Verify total AF flow: • AF flow > 500 gpm. • S/G NR levels – NOT RISING IN AN UNCONTROLLED MANNER.
	ATC/BOP	• Verify ECCS valve alignment: • Group 2 Cold Leg Injection monitor lights required for injection – LIT.
	ATC/BOP	• Verify ECCS flow: • High head SI flow > 100 gpm (1FI-917). • RCS pressure < 1700 psig. • SI pumps discharge flow > 200 gpm. • RCS pressure < 325 psig (NO).
	ATC	• Check PZR PORVs and spray valves at 1PM05J: • PORVs – CLOSED. • PORV isolation valves – BOTH ENERGIZED. • PORV relief paths – both PORVs in AUTO, both PORV isolation valves OPEN. • Normal PZR spray valves – CLOSED.
	ATC	• Check RCS temperatures at 1PM05J: ○ With RCPs running, RCS Tave – STABLE AT OR TRENDING TO 557°F (NO). ○ With RCPs stopped, RCS Tcold – STABLE AT OR TRENDING TO 557°F (NO). • With temperature < 557°F and dropping: • Stop dumping steam. • Control AF flow (maintain total feed flow > 500 gpm until SG NR level > 10% (31%) in at least one SG).
	ATC	• Check status of RCPs at 1PM05J: • RCPs – NONE RUNNING.
	BOP/ATC	• Check if SG secondary pressure boundaries are intact at 1PM04J: • Check pressure in all SGs: • NO SG pressure dropping in an uncontrolled manner. • NO SG completely depressurized.
	BOP/ATC	• Check if SG tubes are intact. • SG NR levels – NOT RISING IN AN UNCONTROLLED MANNER.

Scenario No: **19-1 NRC 4** Event No. 7, 8		
Event Description: PZR vapor space LOCA, 1A CV pump trip on SI with 1B CV pump auto-start failure		
Time	Position	Applicant's Actions or Behavior

		• Check that the following have remained < alert/alarm setpoint at RMS:
		  • 1PR08J, SG Blowdown.
		  • 1PR27J, SJAE/GS Exhaust.
		  • 1AR022/23A-D, 1A-D Main Steam Lines.

	CREW	• Determine RCS in NOT intact:
		  • CNMT area rad monitors > alert alarm setpoint at RMS.
		  • CNMT pressure > 3.4 psig (1PI-CS-934-937) at 1PM06J.
		  • CNMT floor drain sump level > 46 inches (1LI-PC002/003) at 1PM06J.

	SRO	Transition to 1BwEP-1, LOSS OF REACTOR OR SECONDARY COOLANT.
		1BwEP-1, LOSS OF REACTOR OR SECONDARY COOLANT
	SRO	• Notify SM of plant status and procedure entry. • Request SM evaluation of Emergency Plan conditions. • Request STA evaluation of status trees. • Enter/implement 1BwEP-1 and direct operator actions of 1BwEP-1 to establish the following conditions:
	ATC	• Check if RCPs should be stopped at 1PM05J: • ALL RCPs – STOPPED.

	BOP	• Check if SGs secondary pressure boundaries are intact at 1PM04J:
		  • Check pressure in all SGs:
		  • NO SG pressure dropping in an uncontrolled manner.
		  • NO SG completely depressurized.

	BOP	• Check intact SG levels at 1PM04J:
		  • SG NR levels > 10% (31%).
		  • Control feed flow to maintain SG NR levels between 10% (31%) and 50%.

	BOP
	
	SRO
	BOP
		• Check secondary radiation normal.
		  • Reset Phase A.
		  • Open 1SD005A-D, SG Blowdown Sample Isolation valves, at 1PM11J.
		  • Contact Chemistry to sample ALL SGs for activity.
		  • Check secondary radiation trends at RMS or PPC – NORMAL FOR PLANT CONDITIONS:
		  • 1PR27J, SJAE/GS Exhaust.
		  • 1PR08J, SG Blowdown.
		  • 1AR022/23A-D, 1A-D Main Steam Lines.
		  • Secondary activity levels – NORMAL (when available).

	ATC	• Check PZR PORVs and isolation valves at 1PM05J:
		  • PORV isolation valves – BOTH ENERGIZED.
		  • PORVs – BOTH CLOSED.

Scenario No: **19-1 NRC 4** Event No. 7, 8		
Event Description: PZR vapor space LOCA, 1A CV pump trip on SI with 1B CV pump auto-start failure		
Time	Position	Applicant's Actions or Behavior
		• PORV isolation valves – BOTH OPEN.
	SRO	• Check if ECCS flow should be reduced at 1PM05J: o RCS subcooling – NOT ACCEPTABLE (continue with **CS step** below). o RCS subcooling – ACCEPTABLE (and meet all other criteria to terminate SI): • GO TO 1BwEP ES-1.1, SI TERMINATION. • Enter/implement 1BwEP ES-1.1 and direct operator actions of 1BwEP ES-1.1 to establish the following conditions:
		1BwEP ES-1.1, SI TERMINATION
	BOP/ATC	• Reset SI. • Reset Cnmt isolation (Phase A) and establish IA to Cnmt. • Stop 1 CV pump and check RCS pressure stable or rising (N/A – only 1 CV pump running). • Terminate high head ECCS: • CV pumps – SUCTION ALIGNED TO RWST. • Reset SI recirc sump and CV pump valve SI signals. • Verify 1CV8110/11/14/16 open. • Close 1SI8801A/B. • Establish charging flow: • Place 1CV182 controller – AT 0% DEMAND. • Open 1CV8105/8106. • Establish desired charging flow using 1CV121 and 1CV182: • Maintain RCP seal injection flow – BETWEEN 8 GPM AND 13 GPM PER RCP. • Control charging to maintain PZR level stable. • Check if SI pumps should be stopped. • Check RCS pressure: • Pressure – STABLE OR RISING. • Pressure – GREATER THAN 1700 PSIG (NO).
	SRO	• GO TO 1BwEP ES-1.2, POST LOCA COOLDOWN AND DEPRESSURIZATION (see EXAMINER'S NOTE on bottom of next page).
	BOP	**Continue in 1BwEP-1 – CS step.** • Check if CS should be stopped: • CS pumps – ANY RUNNING (NO).
	ATC	• Check if RH pumps should be stopped: • Reset SI. • Depress both SI reset pushbuttons. • Verify SI ACTUATED permissive light – NOT LIT.

Scenario No: **19-1 NRC 4** Event No. 7, 8		
Event Description: PZR vapor space LOCA, 1A CV pump trip on SI with 1B CV pump auto-start failure		
Time	Position	Applicant's Actions or Behavior
		• Verify AUTO SI BLOCKED permissive light – LIT. • Check RCS pressure > 325 psig and RCS pressure is stable or rising. If lowering, GO TO **step 9** below. If stable or rising, continue with next item below. • RH pumps – ANY RUNNING WITH SUCTION ALIGNED TO RWST. • Stop RH pumps and place in standby.
	BOP	• Check RCS and SG pressures for faulted SG indications (**step 9**): • Check pressure in ALL SGs – STABLE OR RISING. • Check RCS pressure – STABLE OR DROPPING.
	BOP	• Check if DGs should be stopped: • 4 KV busses – ENERGIZED BY OFFSITE POWER. • Stop unloaded DGs and place in standby per BwOP DG-12.
	CREW	• Initiate evaluation of plant status: • Check cold leg recirculation capability – both RH trains available. • Check Aux Building radiation trends (PPC or RMS) – ALL NORMAL FOR PLANT CONDITIONS. • Obtain samples – place H2 monitors in-service and consult TSC for obtaining samples. • Evaluate plant equipment for long term recovery (shutdown 0A VC chiller). • Start additional plant equipment to assist in recovery as directed by SRO. • Check if Source Range detectors should be energized.
	SRO	• Check if RCS cooldown and depressurization is required: • RCS pressure – GREATER THAN 325 PSIG. • Transition to 1BwEP ES-1.2, POST LOCA COOLDOWN AND DEPRESSURIZATION.
		EXAMINER'S NOTE: At this point in the scenario, all Critical Tasks are complete, and the scenario stop criteria has been reached, with Lead Examiner's concurrence, STOP the scenario.