2023 ILT NRC Exam Scenario

Scenario Number:

NRC Scenario 1

Revision Number: 00

Date: 06/10/2022

Developed by: _____ _____
Instructor Date

Validated by: _____ _____
SME or Instructor Date

Reviewed by: _____ _____
Operations Representative Date

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Facility: Quad Cities Scenario: **2023 NRC Scenario** 1 Op-Test No.: ILT 21-1
Examiners: _____ Operators: _____
_____ _____
_____ _____

Initial Conditions:
The plant is operating at 75% power.

Turnover: Pressurize the RCIC Steam Line, then raise load to 100% power.

Critical Tasks:

1. With a reactor scram required and the reactor not shutdown, TAKE ACTION TO REDUCE POWER by (1a) Injecting boron BEFORE exceeding 110ºF torus temperature -OR- (1b) Inserting control rods, BEFORE exceeding primary containment design limits.

2. With a steam leak inside primary containment, (2a) Spray the Drywell and Torus BEFORE exceeding PSP, -OR- (2b) Initiate an RPV Blowdown BEFORE exceeding PSP.

Event No.	Malf. No.	Event Type*	Event Description
1	NONE	BOP N	Pressurize the RCIC Steam Line
2	NONE	ATC R	Load Increase to 100% power per Generation Dispatch
3	NM10B	ATC I/TS	RBM 8 Fails Upscale
4	PC01D	BOP C	1D Drywell Cooler Fan Trip
5	RP04B	BOP C/TS	Loss of RPS B
6	MS04D	CREW M	1D MSL Break Inside the Drywell
7	RP02A/C RP03A	ATC C	Electric ATWS (Failure of RPS Channel A)
8	DIHS11001S17A RH20BR	CREW C	Both Loops of Drywell Sprays Fail to Operate
9	None	CREW C	RPV Blowdown Prior to Exceeding PSP Limit

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

Table 3.4-1 Quantitative attributes:	Table 3.4-2 Events/Evolution Type:
Total Malfunctions (5-8): **8** Malfunction(s) after EOP (1-2): **2** Abnormal Events (2-4): **3, 4, 5, 7** Major Transient(s) /E-Plan entry (1-2): **5** EOPs (1-2): **QGA 100 / 200** EOP Contingencies (0-2): **1** Critical Tasks (2-3): **2**	BOP Normal: **1** ATC Reactivity (1 per set): **2** I/C Failure (4 per set): **3**,**4, 5, 7** SRO-I I/C (4 per set inc 2 as ATC): **3, 4, 5, 7** SRO Tech Spec (2 per set): **3, 5** ALL Major Transients (2 per set): **6**

SUMMARY:

- Initial Conditions:
    - The plant is operating at 75% power, currently holding load per QCGP 3-1.
    - RCIC has been returned to service and is to be placed in its normal standby lineup.
- Event 1: The BOP performs QCOP 1300 step F.3 to return RCIC to its standby lineup.
- Event 2: The ATC starts a power increase to 100% per the ReMA and QCGP 3-1. ReMA instructions are to raise Flow Control Line (FCL) to 99% then increase core flow to achieve target power.
- Event 3: RBM Channel 8 Fails High: RBM Channel 8 fails upscale high causing a rod withdrawal block. RBM 8 is bypassed and the SRO enters TS 3.3.2.1 Condition A, (24 hours to restore channel to operable status).
- Event 4: The 1D Drywell Cooler Fan trips on overcurrent. The BOP starts the standby (1C Drywell Cooler Fan), dispatches an EO to the breaker and contacts Electrical Maintenance for assistance.
- Event 5: The RPS EPA 1B-2 trips on undervoltage. The SRO will direct actions of QOA 7000-01 to re-energize RPS from the Reserve Supply and restore the plant. The SRO will enter TS 3.3.8.2. Condition A.
- Event 6/7: The SRO directs a manual reactor scram on rising Drywell and Torus pressure and temperatures due to an un-isolable steam leak inside the Drywell. An electric ATWS occurs as RPS Channel A does not process any automatic or manual scram signals. All control rods insert when the ATC initiates the ARI system. The SRO enters and directs actions of QGA 100 and 200.
- Event 8/9: The SRO will direct Drywell and Torus Sprays per QGA 200 to control temperature and pressure, however, MO 1-1001-26B valve breaker will trip and not reset when it is given an open signal. Prior to exceeding PSP limit, the SRO directs an RPV blowdown.
- Approximate Run Time: 1.5 Hours

CRITICAL TASKS:

Critical Task #1: With a reactor scram required and the reactor not shutdown, TAKE ACTION TO REDUCE POWER by (1a) Injecting boron BEFORE exceeding 110ºF torus temperature -OR- (1b) Inserting control rods, BEFORE exceeding primary containment design limits.

Critical Task #2: With a steam leak inside primary containment, (2a)Spray the Drywell and Torus BEFORE exceeding PSP, -OR- (2b) Initiate an RPV Blowdown BEFORE exceeding PSP.

Clarification: This critical task is not met if the PSP limit is exceeded, and opportunity is available to blowdown the reactor, or this action is not performed in a timely manner. Timeliness is subjective and requires the evaluation team to consider parameter trends. If sufficient opportunity was available but emergency depressurization was unnecessarily delayed, this critical task is not met.

EXERCISE PERFORMANCE OBJECTIVES

SR-0002-P04	(Freq: LIC=B) (ILT-MP) Given a reactor plant at power, perform a power change discernible on neutron monitors using control rods in accordance with QCGP 3-1 and QCGP 4-1. (SOER 84-2 r7a)
SR-0500-P03	(Freq: LIC=B) Given an operating reactor plant with a loss of an RPS bus, take actions to control plant parameters and restore RPS in accordance with QOA 7000-01.
SR-0700-P11	(Freq: LIC=I) Given an operating plant with an RBM failure, take actions to bypass the failed RBM and meet TS requirements in accordance with QOP 0700-05.
SR-1300-P05	(Freq: LIC=I) Given a reactor plant being started up, warmup the RCIC lines and align the system for standby in accordance with QCOP 1300-01.
SR-0300-P07	(Freq: LIC=B) Given a reactor plant in an ATWS condition (QGA), perform the NSO actions to insert control rods in accordance with QCOP 0300-28.
SR-0201-P01	(Freq: LIC=B) Given a reactor plant at power when a small LOCA inside the drywell occurs, take actions to attempt to locate and isolate the leak in accordance with QCOA 0201-01.
SR-1000-P01	(Freq: LIC=A) (ILT-MP) Given a reactor plant, start the RHRSW system and RHR system in torus cooling in accordance with QCOP 1000-04 and QCOP 1000-09 or QCOP 1000-30. (Important PRA Task – Starting torus cooling in conjunction with other actions has a maximum RAW of 3.20 E4) (Recovery of torus cooling after failure terminates 15 of top 100 core damage sequences)
SR-1000-P02	(Freq: LIC=B) Given a reactor plant in an accident condition (QGA), operate torus sprays in accordance with QCOP 1000-30 and appropriate QGA.
SR-1000-P04	(Freq: LIC=A) Given a reactor plant with rising containment pressures due to a LOCA or steam leak and RHR is not needed for core cooling, verify parameters are in the safe region of the Drywell Spray Initiation Limit (QGA Figure DSIL), verify tripped or trip recirc pumps and drywell coolers, and attempt to initiate drywell sprays when torus pressure exceeds 5 psig in accordance with QGA 200 and QCOP 1000-30. (Important PRA Task-Spraying the drywell has a L2 F-V value of 1.89 E-02 which significantly reduces LERF and is a Time-Sensitive operator action).
SR-0001-P23	(Freq: LIC=A) Given a reactor plant with rising containment pressure and temperature due to a LOCA or steam leak, initiate an emergency depressurization when torus pressure cannot be maintained below the Pressure Suppression Pressure (QGA Figure PSP) or when drywell temperature cannot be restored and held below 338 degrees in accordance with QGA 200. (Important PRA Task – Emergency Depressurization has a RAW of 1.44 E4 for CDF and a RAW of 1.59 E4 for LERF).

Simulator Setup:

1. Reset to IC-20 (75% power).
2. Go to **RUN.**
3. Verify the following RWM Sequence is loaded: **7PHESU2 (or current start up sequence)**
4. Place INFO cards as follows:
    a. MO 1-1001-23A c/s.
    b. MO 1-1001-26A c/s

5. Verify 1C DW Cooler is OFF

6. Isolate the RCIC Steam Line as follows
    a. Close MO 1-1301-16
    b. Cycle the MO 1-1301-61 Open then Shut
    c. Close the MO 1-1301-17
    d. Trip the RCIC turbine using the Trip pushbutton.
    e. Clear all Annunciators (901-4 D-15 remains in alarm)
    f. Clear the SER

7. Insert Commands for setup:
    - **RP03A** (Fail RPS A Manual Scram Circuit)
    - **RP02A** (Auto Scram Circuit A1 failure)
    - **RP02C** (Auto Scram Circuit A2 failure)
    - **RD29** (Fail Auto ARI Circuit)
    - **RP05A /RP05B** (Group I isolation channel A and B trip, triggered off of Mode Switch to S/D with a 2 minute delay)
    - **RH19AR open** (Rack out RHR 23A valve breaker)
    - **RH20AR open** (Rack out RHR 26A valve breaker)
    - **RH20BR open** (Rack out RHR 26B valve breaker triggered off of control switch with 1 sec delay)

8. Verify the following commands for scenario performance**:**
    - **NM10B 100** (Fail RBM 8 upscale)
    - **PC01D** (Trip the 1D Drywell Cooler)
    - **RP04B** (Trip RPS B)
    - **RP03R ALT** (Place RPS B bus on reserve power)
    - **MS04D .5 10:** (Insert a .5% severity break over 10 min. on the D MSL in the DW.
    - **MS04D 1 15:** (Modifies the D MSL break to 1% severity break over 15 minutes.
    - **bat sv** (silences 901-3 G-11 and C-13 alarms)

9. Install “Protected System” placards and/or rings on the following equipment:
    - RBCCW pumps
    - Fuel Pool Cooling Water pumps
    - B Loop Drywell Sprays
10. Provide the following:
    - “Holding Load and Load Following” REMA
    - Marked up copy of QCOP 1300-01.

11. Place the Zinc Injection placard on 1A RFP.

LIST OF POTENTIAL PROCEDURES

Annunciator Procedures

- 901(2)-3 A-4, CORE SPRAY PUMP RUNNING, Rev. 04
- 901(2)-3 A-6, RHR PUMP RUNNING, Rev. 04
- 901(2)-3 D-12, HPCI PUMP LOW FLOW, Rev. 07
- 901(2)-3 A-16, PRI CNMT HIGH PRESSURE, Rev. 16
- 901(2)-3 C-13, TORUS VACUUM BKR VALVES OPEN DIV I, Rev. 12
- 901(2)-3 G-11, TORUS VACUUM BKR VALVES OPEN DIV II, Rev. 10
- 901(2)-3 D-13, ELECT RELIEF VALVES 3A 3B OPEN, Rev. 07
- 901(2)-3 E-13, ELECT RELIEF VALVES 3C/3D/3E OPEN, Rev. 06
- 901(2)-3 E-14, ACOUSTIC MON SAFETY RLF VALVES OPEN, Rev. 07
- 901(2)-5 A-7, RBM HIGH OR INOP, Rev. 07
- 901(2)-5 C-3, ROD OUT BLOCK, Rev. 11
- 901(2)-5 B-7, GROUP I ISOL NOT RESET, Rev. 09
- 901(2)-5 B-7, GROUP I ISOL CH TRIP, Rev. 21
- 901(2)-8 A-7, DIESEL GEN 1(2) TROUBLE, Rev. 05
- 912-5 E-1, DRYWELL 1 CLR BLOWER TRIP, Rev. 03

QOP 0700-05, Rod Block Monitor, Rev. 17

QCOP 1300-01, RCIC System Preparation for Standby Operation, Rev. 48

QCOP 1000-30, Post-Accident RHR Operation, Rev. 33

QCOP 5750-19, Drywell Cooler Operation, Rev. 11

QCGP 2-3, Reactor Scram, Rev. 101

QCGP 3-1, Reactor Power Operations, Rev. 92

QCGP 4-1, Control Rod Movements and Control Rod Sequence, Rev. 50

QOA 7000-01, 120 VAC Reactor Protection Bus Failure (One or Both Buses), Rev. 40

QCOA 0201-01, Increasing Drywell Pressure, Rev. 30

QGA 100, RPV Control, Rev. 13

QGA 101, RPV Control (ATWS), Rev. 17

QGA 200, Primary Containment Control, Rev. 13

CREW TURNOVER

1.) Plant Conditions:

a.) Unit 1 is operating at 75% power (2215 MWth) on the 97% FCL. Rod step 23 is partially withdrawn.

b.) Unit 2 is at 100% power.

c.) Technical Specification limitations:

Unit 1:
Day 4/14, TS 3.5.3 Condition A, RCIC inoperable.
Day 1 of 7, TS 3.6.2.6 Condition A, One RHR Drywell Subsystem inoperable
TS 3.6.1.3 Condition A, One or more penetration flow paths with one PCIV inoperable
Day 1 of 30, TS 3.3.3.1 Condition A, Function 6, One or more Functions with one required channel inoperable (Tracking Only)

Unit 2: None

d.) On-Line Risk is GREEN

e.) Fire Risk is GREEN.

f.) Protected Equipment:

(1) RBCCW
(2) Fuel Pool Cooling
(3) B Loop of Drywell Sprays

2.) Significant problems/abnormalities:

a.) MO 1-1001-23A valve is OOS for a limitorque replacement. Expected return to service in 2 days.

b.) RCIC was returned to service late last shift as repairs to the steam line drain traps were completed.

3.) Evolutions/maintenance for the oncoming shift:

a) Perform QCOP 1300-01 step F.3, RCIC System Preparation for Standby Operation and re-pressurize the RCIC steam line to restore RCIC to the standby lineup in preparation for an operability run later this shift. The RCIC room is clear of all personnel.

b) Generation Dispatch has requested a load increase to full power. Per the ReMA, raise FCL to 99% then increase core flow to attain target power.

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Event Description: Re-pressurize the RCIC Steam Lines.

Time	Position	Applicant's Actions or Behavior
	SRO	Directs and supervises QCOP 1300-01, step F.3.
	BOP	Verifies RCIC Barometric Condenser Condensate and Vacuum Pump control switches are in AUTO.
	BOP	Depresses INITIATION SIGNAL SEAL-IN AND RESET pushbutton.
	BOP	Verifies MO 1-1301-61, STM TO TURB VLV is closed.
	BOP	Depresses the STM LINE BRK TRIP RESET pushbutton.
	BOP	Depresses and holds TURB RESET pushbutton until 901-5 D-15, RCIC TURBINE TRIP, clears.
	BOP	Verifies AO 1-1301-12 and AO 1-1301-13, COND PMP ISO VLVs are closed.
	BOP	Verifies TURB SPEED TEST switch is in NORMAL.
	BOP	Verifies TURB SPEED TEST PWR switch is in OFF.
	BOP	Verifies AO 1-1301-34 and AO 1-1301-35, STM LINE DRAIN ISOL VLVs are open.
	BOP	Verifies AO 1-1301-32, COND DRN VLV is closed.
	BOP	Opens MO 1-1301-17, STM SPLY ISOL VLV.
	BOP	Warms RCIC steam line: • Slowly cracks open MO 1-1301-16, STM SPLY ISOL VLV. • Monitors PI 1-1340-6, TURB INLT PRESS, for increase in pressure. • Verifies annunciator 901-4 F-16, RCIC TURBINE INLET STM DRN HIGH LEVEL, is NOT in alarm. • When RCIC steam line pressure stops increasing AND 901-4 F-16 is cleared, fully opens MO 1-1301-16.
Event 1 continued		

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Event Description: Re-pressurize the RCIC Steam Lines.

Time	Position	Applicant's Actions or Behavior
	BOP	Verifies GOVERNOR VLV is open.
	BOP	Verifies TRIP THROTTLE VLV is open.
	BOP	Verifies RCIC FLOW CONTROLLER is in AUTO.
	BOP	Verifies RCIC FLOW CONTROLLER flow rate is set as 400 gpm
	BOP	Verifies all RCIC annunciators on the 901-4 panel are cleared.
	ATC	Monitors reactor power, pressure, and water level.

SIMOP ROLE PLAY: If an EO is dispatched to do a leak check on the RCIC turbine, acknowledge the command, wait 5 minutes, then report back:

"There are no leaks on the RCIC turbine."

End of Event 1

Quad Cities 2023 NRC Scenario No.1 Event No. 2 Page 1 of 1

Event Description: Load increase to 100% power.

Time	Position	Applicant's Actions or Behavior
	SRO	Directs ATC withdraw control rods in sequence to raise the FCL to 99% in accordance with the ReMA and assigns QV duties to the BOP.
	ATC	Refers to ReMA and QCGP 3-1, Reactor Power Operations.
	ATC	Updates control room on Unit 1 reactivity addition.
	ATC	Withdraws control rods to raise FCL to 99% as follows: • Selects desired control rod on the Rod Select Matrix • Verifies selection using two separate indications • Communicates maneuver to the QV • Performs 2nd self-check • Withdraws control rod to target position using the RMCS • Repeats above steps until FCL is approximately 99% • Initials Move Sheet when control rod is at target position
SIM OP NOTE: The malfunction for Event 3 requires that a control rod is selected. When the second control rod is selected, fail RBM 8. When the SRO has determined the TS actions and RBM 8 is bypassed, they may return to Event 2 for additional power change if desired by Lead Evaluator.		
	ATC	Raises both Recirc Pump speeds by depressing the RAISE pushbutton on 1(2)-0262-22, MASTER SPEED DEMAND. Repeats until target power of 85% is reached. OR At the OWS RRCS Overview display: • Selects the blue filled square in the "Master Set" box. • Types the setpoint desired in the open "OUT" box at the bottom of the display. • Selects "send" at the keyboard. • Repeats as necessary until target power of 85% is reached.
	BOP	Performs "peer checks" for Recirc speed adjustments.
	ATC	Initials relevant steps on the ReMA and informs the SRO.
LEAD EVALUATOR NOTE: If desired, when the required power change has been observed, proceed to Event 4.		
End of Event 2		

Quad Cities 2023 NRC Scenario No.1 Event No. 3 Page 1 of 1 Event Description: RBM 8 Fails Upscale		
Time	**Position**	**Applicant's Actions or Behavior**
SIM OP NOTE: At the direction of the Lead Evaluator, fail RBM 8 upscale by inserting: **NM10B 100**		
Key Parameter Response: On 901-5 panel: RBM 8 HIGH light lit, RBM 8 reading 125 units on 1-750-10B IRM-ARPM/RBM recorder, ROD OUT PERMIT light out On 901-37 panel: RBM Channel 8 Meter reading 125 units Expected Annunciator(s): 901-5 A-7, 901-5 C-3 Automatic Actions: Rod Withdrawal Block		
	ATC	Acknowledges and reports the following annunciators: 901-5 A-7, RBM HIGH OR INOP 901-5 C-3, ROD OUT BLOCK
	ATC	Verifies a Rod Block exists and reports RBM 8 has spiked upscale and is indicating 125 units.
	SRO	Contacts Instrument Maintenance to investigate and repair RBM 8.
SIM OP ROLE PLAY: As the Instrument Maintenance Supervisor, state: **"I'll prepare a work package to check the circuit boards and replace if necessary."**		
TS	SRO	Declares RBM 8 inoperable and enters TS 3.3.2.1 Condition A, 24 hours to restore inoperable RBM channel.
	SRO	Directs ATC to bypass RBM 8 per QOP 0700-05.
	ATC	Places the RBM BYPASS joystick to CH 8 and verifies white BYPASS light is lit on 901-5 panel.
	BOP	Verifies RBM 8 BYPASS light is lit on 901-37 panel.
EVALUATOR NOTE: Return to Event 2, if desired.		
End of Event 3		

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Event Description: 1D Drywell Cooler Fan Trip

Time	Position	Applicant's Actions or Behavior
SIM OP NOTE: At the direction of the Lead Evaluator, trip the 1D Drywell Cooler Fan: **PC01D**		
Key Parameter Response: Drywell temperature ↑, Drywell pressure ↑ Expected Annunciator(s): 912-5 E-1 Automatic Actions: None		
	BOP	Acknowledges annunciator 912-5 E-1 and reports the 1D Drywell Cooler Fan has tripped.
	SRO	Directs actions of QOA 912-5 E-1, DRYWELL 1 CLR BLOWER TRIP, QCOP 5750-19, DRYWELL COOLER OPERATION, or QCOA 0201-01, INCREASING DRYWELL PRESSURE.
	BOP	Starts the 1C Drywell Cooler Fan.
SIM OP ROLE PLAY: As the EO dispatched to MCC 19-4, wait 1 minute, then report: **"The breaker is tripped, but there is nothing apparent as to why it tripped."**		
	BOP	Contacts Electrical Maintenance to investigate Drywell Cooler trip.
SIM OP ROLE PLAY: If contacted, as the EM Supervisor state: **"I will send a couple of Electricians to MCC 19-4 to investigate the breaker trip. They will request a Clearance Order if needed."**		
End of Event 4		

Quad Cities 2023 NRC Scenario No.1 Event No. 5 Page 1 of 2 Event Description: Loss of RPS B		
Time	**Position**	**Applicant's Actions or Behavior**
SIM OP NOTE: At the direction of the Lead Evaluator, trip RPS B with the following command: **RP04B**		
Key Parameter Response: The 4 (White) RPS Scram Solenoid Group B lights extinguish Expected Annunciator(s): 901-5 A-15, 901-5 D-15, 901-5 A-8, 901-5 B-7, 901-5 B-8 Automatic Actions: Ch. B ½ scram, ½ Group I, ½ Group II, Group III, B SBGTS autostart		
	ATC	Reports 1/2 scram on RPS Channel B.
	CREW	Determines a loss of RPS B.
	BOP	Dispatches an EO to the Aux Electric Room to investigate.
SIM OP ROLE PLAY: As the EO, wait 1 minute, then report: **"The RPS EPA 1B-2 has tripped on undervoltage."**		
	CREW	Directs EO to restore RPS B on Reserve Supply per QCOP 7000-03.
FLOOR INSTRUCTOR ROLEPLAY: If the crew directs installation and removal of OPRM jumpers, reply appropriately that the OPRM jumpers are installed/removed.		
SIM OP ROLE PLAY: As the EO, acknowledge the direction, wait 2 minutes, then restore RPS with the following command: **RP03R ALT**		
TS	SRO	Enters the following Technical Specification LCOs: • TS 3.3.8.2 Condition A, 72 hours to remove EPA from service. (Tracking ONLY) • T.S. 3.3.6.2 Conditions A and B for Function 3, RB Exhaust Rad monitor inoperable. • T.S. 3.3.7.1 Conditions A and B for Function 5, RB Exhaust Rad monitor inoperable.
	SRO	Directs ATC/BOP to execute remaining actions of QOA 7000-01.
	ATC	Resets B Channel ½ scram.
Event 5 continued		

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Event Description: Loss of RPS B

Time	Position	Applicant's Actions or Behavior
	ATC/BOP	Resets Group I isolation using MAIN STM ISOL RESET switch at the 901-5 panel.
	ATC/BOP	Resets Group II and Group III isolations using ISOL RESET switch at the 901-5 panel.
	ATC/BOP	Resets Reactor Building Floor Drain Sump and Equipment Drain Tank Pumps at the 901-5 panel.
	BOP	Verifies Joy Air Compressor is operating.
	BOP	Gives Outboard MSIVs an OPEN signal.
	BOP	Verify open AO 4720 and AO 4721.
	BOP	Restore the primary containment vent system to proper lineup as follows: • Open AO 1(2)-1601-55. • Open AO 1(2)-1601-56. • Open MO 1(2)-1601-57. • Open AO 1(2)-1601-59.
	BOP	Re-opens Oxygen Analyzer Sample Valves.
	BOP	Resets HPCI AC Trip Logic at the 901-3 panel.
	BOP	Resets HPCI DC Trip Logic at the 901-3 panel.
	BOP	Verify MO 1-2399-40 and MO 1-2399-41 valves are open at the 901-3 panel.
SIM OP ROLE PLAY: As the EO, acknowledge tasks dispatched for field actions to restore the RWCU system or reset trips and local alarms. No actions will be taken as the scenario will move to the next event.		
LEAD EVALUATOR NOTE: When sufficient restoration actions have been completed, proceed to the next event.		
End of Event 5		

Quad Cities 2023 NRC Scenario No.1 Event No. 6/7/8/9 Page 1 of 4

Event Description: 1D MSL Break Inside the Drywell-Electric ATWS- PSP Blowdown

Time	Position	Applicant's Actions or Behavior
SIM OP NOTE: At the Lead Evaluators direction, insert a "D" Main Steam Line break in the Drywell at .5% severity break ramped over 10 minutes: **MS04D .5 10:**		
Key Parameter Response: Drywell and Torus pressure/temperature rise Expected Annunciator(s): 901-3 A-16, 901-3 A-4, 901-3 A-6, 901-3 D-12, Automatic Actions: Rx. scram, ECCS auto-starts, ECCS load shedding		
	BOP	Acknowledges 901-3 A-16, PRI CMNT HIGH PRESSURE, alarm and reports rising Drywell pressure.
	SRO	Enters and directs actions of QCOA 0201-01. Sets scram criteria on high Drywell pressure.
	BOP	Attempts to locate and isolate leak. Checks Recirc pump seals, RBCCW alarms, PIC 1-1640-11, CONTAINMENT PRESS for normal operation.
	BOP	Notifies Radiation Protection of elevated Containment pressure and evacuates the Reactor Building.
	SRO	Directs a manual reactor scram when scram criteria is met.
	ATC	Depresses both RX SCRAM CH A and CH B Pushbuttons. Places the Reactor Mode Switch to SHUTDOWN.
	ATC	Reports Electric ATWS, RPS Channel A did NOT de-energize.
CT1	ATC	Arms and Depresses ARI pushbuttons.
EVALUATOR NOTE: The ATC may continue performing the actions to shutdown the reactor until the ARI system inserts the control rods. The following actions may be taken: **1. Start SBLC injection** **2. Terminate and prevent all RPV injection**		
	SRO	Enters QGA 100, then transitions to QGA 101 and directs actions.
	BOP	Inhibits ADS and places Core Spray pumps in PTL.
	ATC	Reports ALL control rods inserted.
Events 6/7/8/9 continued		

Quad Cities 2023 NRC Scenario No.1 Event No.6/7/8/9 Page 2 of 4

Event Description: 1D MSL Break Inside the Drywell-Electric ATWS- PSP Blowdown

Time	Position	Applicant's Actions or Behavior
	SRO	Directs ATC to stop Boron injection, if started.
	ATC	If started, stops injecting Boron by placing keylock switch to OFF.
	SRO	Exits QGA 101 and re-enters QGA 100.
QGA 100, RPV Control Actions		
	SRO	Enters and directs actions of QGA 100, RPV Control.
	ATC	Enters and takes actions per QCGP 2-3, Reactor Scram.
	BOP	Verify auto actions for 0 in. RPV water level and 2.5 psig Drywell pressure.
	ATC/BOP	Report a Group I Isolation has occurred.
	BOP	Secures HPCI injection using the trip-latch. (May have been done when RPV injection was terminated and prevented).
	SRO	Directs RPV water level band of 0 to +48 inches using the Condensate/Feed System.
	ATC	Verifies/returns FRVs to AUTO operation.
	ATC	Reports RPV water level in band and continues to monitor level.
	SRO	Directs BOP to stabilize RPV pressure below 1060 psig, then start a cooldown at < 100ºF/hr using ADS valves.
	BOP	Starts an RPV cooldown at < 100ºF/hr using ADS valves.
QGA 200, Primary Containment Control Actions		
	SRO	Directs actions of QGA 200, Primary Containment Control when Drywell pressure is above 2.5 psig.
	SRO	Directs BOP to start and maximize Torus Cooling on both loops.
	BOP	Starts Torus Cooling on both RHR Loops per QCOP 1000-30 (HC) and monitors Torus temperature.
Events 6/7/8/9 continued		

Quad Cities 2023 NRC Scenario No.1 Event No. 6/7/8/9 Page 3 of 4

Event Description: 1D MSL Break Inside the Drywell-Electric ATWS- PSP Blowdown

Time	Position	Applicant's Actions or Behavior
	SRO	Verifies Torus level < 27 ft. and directs BOP to start Torus Sprays when Torus pressure exceeds 2.5 psig.
	BOP	Starts Torus sprays per QCOP 1000-30 (HC) and monitors containment response.
	BOP	Starts Torus sprays per QCOP 1000-30 (HC) and monitors containment response.
	BOP	Reports Torus pressure 5 psig and rising. Verifies Torus level below 17 ft.
	SRO	Checks the DSIL curve and verifies both Recirc pumps are tripped and Drywell Coolers are secured.
	SRO	Directs BOP to initiate Drywell Sprays.
	BOP	Reports the MO 1-1001-26B valve breaker has tripped and dispatches an EO to reset the breaker.
	BOP	Closes MO 1-1001-23B valve.
SIM OP ROLE PLAY: As the EO dispatched to MCC 19-4 for the RHR 26B valve breaker, wait 3 minutes, then report back: **"The RHR 26B valve breaker will not reset. I'll contact EMs to assist in troubleshooting.**		
	BOP	Dispatches EOs and Mechanical Maintenance to manually open the RHR 26B valve.
SIM OP ROLE PLAY: As the EOs dispatched to manually open the RHR 26B valve, state: **"We'll call the control room when we start opening the valve."**		
	SRO	Monitors containment temperatures and pressures.
	SRO	Directs restart of RBCCW and Drywell Coolers.
	ATC/BOP	Verify Drywell temperature is < 260ºF, then Restart RBCCW pumps and Drywell Coolers per QCOP 5750-19, (HC).
	SRO	Monitors containment temperatures and pressures and establishes critical parameters for Torus pressure and Drywell temperature.
Event 7/8 Continued		

Quad Cities 2023 NRC Scenario No.1	Event No. 6/7/8/9	Page 4 of 4
Event Description: 1D MSL Break Inside the Drywell-Electric ATWS- PSP Blowdown		

Time	Position	Applicant's Actions or Behavior
EVALUATOR/SIMOP NOTE: If desired, at 8 PSIG Torus Pressure the severity of the steam leak can be modified to 1% over 15 minutes to drive the scenario.		
SIM OP ROLE PLAY: The crew may attempt to contact personnel at MCC 19-4 or at the RHR 26B valve for a progress report. In either case, report efforts are continuing, but unsuccessful thus far.		
QGA 100 RPV Blowdown		
	SRO	Determines Torus pressure will not stay below the PSP curve takes actions per QGA 100 RPV Blowdown.
	SRO	Verifies Drywell pressure > 2.5 psig.
	SRO	Directs BOP to prevent LPCI and Core Spray injection to the RPV.
	SRO	Verifies Torus level is above 5 ft.
LEAD EVALUATOR NOTE: PSP will be violated at approximately 17.5 PSIG Torus pressure.		
CT2	SRO	Directs all 5 ADS Valves opened and switches left in Manual.
CT2	BOP	Opens all 5 ADS Valves and leaves switches in the MAN position.
	BOP	Confirms and reports 5 ADS valves are open by acoustic monitor indication on the 901-21 panel.
	ATC/BOP	Monitor RPV depressurization and water level.
	BOP	Prevents ECCS injection by placing RHR/Core Spray pumps in PTL as necessary when RPV pressure approaches 325 psig.
	ATC	Reports RPV pressure < 325 psig and lowering.
	ATC	Reports RPV water level stable in 0 to 48 in. band.
SIMOP NOTE: When RPV water level and Primary Containment parameters are stable, and at the Lead Evaluators direction, place the simulator in **FREEZE.**		
End of Scenario.		

END OF SCENARIO

2023 ILT NRC Exam Scenario

Scenario Number:

NRC Scenario 2

Revision Number: 00

Date: 06/10/2022

Developed by: _____ _____
Instructor Date

Validated by: _____ _____
SME or Instructor Date

Reviewed by: _____ _____
Operations Representative Date

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Facility: Quad Cities Scenario: **2023 NRC Scenario 2** Op-Test No.: ILT 21-1
Examiners: _____ Operators: _____
_____ _____
_____ _____

Initial Conditions:
The plant is holding load at 100% power.

Turnover: Swap SSMP Feed Breaker to Bus 24-1. QCOS 5750-09, ECCS Room and DGCWP Cubicle Cooler Monthly Surveillance is in progress.

Critical Tasks:

1. With a reactor scram required and the reactor not shutdown, TAKE ACTION TO REDUCE POWER by injecting boron (prior to exceeding 110ºF torus temperature) and/or inserting control rods, to prevent exceeding primary containment design limits.

2. Per QGA 101, RPV Control (ATWS), with a reactor scram required, the reactor not shutdown, and the automatic ADS timer initiated, INHIBIT ADS BEFORE ADS setpoint(s) is(are) reached and ADS initiates.

3. During a high power ATWS (>5%) with and RPV level above -35", TERMINATE AND PREVENT INJECTION (with the exception of boron, CRD, and RCIC) into the RPV per QGA 101 within 148 seconds.

4. Per QGA 101, during an ATWS with RPV injection terminated and prevented, when RWL drops below -35", slowly raise and control injection rate to MAINTAIN RPV water level above the Minimum Steam Cooling RPV Water Level (MSCRWL) without causing a sustained rise in reactor power. (BWROG RPV-6.4 ATWS PWR/LVL RESTORE RPV LVL)

Event No.	Malf. No.	Event Type*	Event Description
1	None	BOP N	Swap SSMP Feed Breaker to Bus 24-1
2	SW02A	BOP C	1A Service Water Pump Degrades
3	FW24A	ATC C	Reactor Feed Pump Vent Fan Trip w/ Failure of Standby to Autostart
4	None	SRO TS	1B Core Spray Room Cooler Low Flow
5	NM08E / RD02R RD05R	ATC C/TS	APRM 5 Fails High / Control Rod Scrams and Sticks at Position 10
6	IA02	BOP C	Instrument Air Leak (Recoverable)

7	MC08	CREW M/R	Main Condenser Vacuum Leak / Emergency Power Reduction / SCRAM
8	RD13A	CREW C	1/2 Core Hydraulic ATWS
* (N)ormal, (R)eactivity, (I)nstrument, (C)omponent, (M)ajor			

Table 3.4-1 Quantitative attributes:	Table 3.4-2 Events/Evolution Type:
Total Malfunctions (5-8): **6** Malfunction(s) after EOP (1-2): **8** Abnormal Events (2-4): **2, 3, 5, 6,** Major Transient(s) /E-Plan entry (1-2): **7** EOPs (1-2): **QGA 100** EOP Contingencies (0-2): **QGA 101** Critical Tasks (2-3): **4**	BOP Normal: **1** ATC Reactivity (1 per set): **7** BOP I/C (4 per set): **2**, **6** ATC I/C (4 per set): **3, 5** SRO-I I/C (4 per set inc 2 as ATC):**2**, **3, 5, 6** SRO Tech Spec (2 per set): **4, 5** ALL Major Transients (2 per set): **7**

SUMMARY:

- Initial Conditions:
  - The plant is currently holding load at 100% power.
  - Swap SSMP Feed Breaker to Bus 24-1 in preparation for an inspection on Bus 14-1 Cubicle 5, Bus 14-1 to Bus 31 Feed Breaker.
  - QCOS 5750-09, ECCS Room and DGCWP Cubicle Cooler Monthly Surveillance is in progress.
- Event 1: The BOP performs QCOP 2900-01, step F.11 to swap the SSMP feed to Bus 24-1.
- Event 2: The BOP will respond to annunciator 912-1 B-3, SERVICE WATER LOW PRESSURE and report Service Water discharge pressure at 80 PSIG. The 1A SWP pump current will be low out of the normal operating band. A standby SWP will be started and the 1A SWP secured.
- Event 3: The 1A RFP Vent Fan break trips and the 1B RFP Vent fails to autostart. Annunciator 901-6 F-8 alarms and RFP exhaust air temperature lowers. The ATC manually starts the 1B RFP Vent Fan and dispatches an EO to MCC 18-3 to investigate.
- Event 4: The EOs performing QCOS 5750-09, ECCS Room and DGCWP Cubicle Cooler Monthly Surveillance call in and report the 1B Core Spray Room Cooler flow at 55 gpm. The SRO declares the 1B Core Spray Pump and Room Cooler inoperable. Enters a 7 day LCO per TS 3.5.1 Condition B.
- Event 5: APRM 5 fails upscale high resulting in a RPS Channel B 1/2 scram and control rod H-5 scramming due to a blown Inlet Scram Valve Solenoid fuse (1-305-117). The control rod will stick at position 10. The SRO will direct APRM 5 bypassed and the 1/2 scram reset. Per QNE direction, the crew will attempt to drive the rod to full in position 00. All attempts will be unsuccessful, and the SRO will declare control rod H-5 inoperable. TS 3.1.3 Condition A is entered.
- Event 6: An Instrument Air leak in the Turbine Building Air Header results in lowering pressures in the 1A and 1/2B Instrument Air Receivers. The BOP will respond to annunciator 912-1 A-11, UNIT 1A INSTR AIR LOW PRESS and take the immediate operator actions by starting all available Instrument and Service Air Compressors. The SRO will set scram criteria and direct actions of QOA 4700-06, Loss of Instrument Air. Normal pressure will return to both Air Receivers and the BOP will dispatch EOs and Maintenance to search for leaks.
- Event 7: Main Condenser backpressure increases due to a tear of the Main Condenser boot. The crew will reduce power with control rods and Recirc flow. The SRO will direct a manual scram when efforts to stabilize backpressure are unsuccessful.
- Event 8: A hydraulic lock on the North Scram Discharge Volume results in a 1/2 core ATWS. The SRO directs actions of QGA 101. The ATC will take actions to shutdown the reactor by injecting SBLC and individually inserting control rods. The BOP will control RPV pressure in band. RPV water level will be controlled in band until the Hot Shutdown weight of Boron is injected. The scenario ends when RPV level is restored to a band of 0 to 48 in. and RPV pressure is stable.
- Approximate Run Time: 1.5 Hours

CRITICAL TASKS:

Critical Task #1: With a reactor scram required and the reactor not shutdown, TAKE ACTION TO REDUCE POWER by (1a) Injecting boron BEFORE exceeding 110ºF torus temperature -OR- (1b) Inserting control rods, BEFORE exceeding primary containment design limits.

Critical Task #2: Per QGA 101, RPV Control (ATWS), with a reactor scram required, the reactor not shutdown, and the automatic ADS timer initiated, INHIBIT ADS BEFORE ADS setpoint(s) is(are) reached and ADS initiates.

Clarification: This critical task is not met if RPV level and/or drywell pressure reach their respective automatic ADS actuation setpoint(s) but ADS is not prevented before the conditions specified.

Critical Task #3: During a high power ATWS (>5%) with and RPV level above -35", TERMINATE AND PREVENT INJECTION (with the exception of boron, CRD, and RCIC) into the RPV per QGA 101 within 148 seconds.

Clarification: This critical task is not met if injection (except for RCIC, boron, and CRD) has not been terminated and prevented within 148 seconds. These actions are typically met when both hydraulic FRVs and the AO LFFRV are closed. To prevent or mitigate the consequences of any large irregular neutron flux oscillations induced by neutronic/ thermal hydraulic instabilities, RPV water level is lowered sufficiently below the elevation of the feedwater sparger nozzles within 148 seconds, based on fuel analysis. This places the feedwater spargers in the steam space providing effective heating of the relatively cold feedwater and eliminating the potential for high core inlet subcooling. If injection is restarted before RWL drops to -35", this task is also not met. The timing of this evaluation is dependent upon execution of the level control leg of QGA 101, however must be complete within 148 seconds due to power oscillations that would cause fuel damage.

Critical Task #4: Per QGA 101, during an ATWS with RPV injection terminated and prevented, when RWL drops below -35", slowly raise and control injection rate to MAINTAIN RPV water level above the Minimum Steam Cooling RPV Water Level (MSCRWL, -162 in.) without causing a sustained rise in reactor power. (BWROG RPV-6.4 ATWS PWR/LVL RESTORE RPV LVL)

Clarification: This critical task applies to the QGA 101 level leg step 4, when the RWL drops below -35" (two feet below feedwater spargers). This critical task is not met if RPV injection is recommenced BEFORE reaching -35". This would result in unnecessary reactivity addition (from subcooled water) while RWL is being intentionally lowered to suppress power. Inversely, this critical task is not met if an attempt to inject is not recommenced prior to RWL reaching MSCRWL. If a prolonged loss of core cooling is observed (i.e., RWL allowed to lower below MSCRWL prior to recommencement of RPV injection), the evaluation team must determine the nature of the event and whether operator action contributed to it. If so, a judgement must be made to determine if this warrants a missed critical task here.

This critical task is also not met if RPV injection rate is too fast, resulting in a sustained positive reactivity event. The evaluation team must observe the power response as injection is recommenced and determine if the response has potential to cause fuel damage (Observable power >5% for 30 seconds).

EXERCISE PERFORMANCE OBJECTIVES

SR-0300-P05	(Freq: LIC=I) Given a reactor plant during a startup with a stuck control rod, restore the ability to drive the control rod or declare the rod inoperable in accordance with QCOA 0300-02.
SR-0700-P07	(Freq: LIC=B) Given an operating reactor plant with an APRM failure, take actions to bypass the failed APRM and meet TS requirements in accordance with QCOP 0700-04 and QCAP 0230-19. (SOER 90-3 r1)
SR-3300-P09	(Freq: LIC=I) Given a reactor plant at power with a loss of condenser vacuum, take action to attempt to locate and correct the cause for lowering vacuum in accordance with QOA 3300-02 and/or QOA 5450-05. (PRA Initiating Event -Loss of Vacuum accounts for 2.92% of total CDF and initiates 2 of the top 100 Core Damage Sequences)
SR-4700-P02	(Freq; LIC=A) Given a reactor plant at power when an instrument air system leak resulting in lowering pressure and subsequent loss of instrument air occurs, take action to determine the cause and mitigate consequences in accordance with QOA 4700-06. (SOER 88-1 r2) (Important PRA Task-Restoring IAS helps terminate 4 of top 200 Core Damage Sequences.)
SR-0203-P07	(Freq: LIC=A) Given a reactor plant in a QGA condition, inhibit ADS in accordance with QGA 100 or QGA 101. (Important PRA Task-Inhibiting ADS during an ATWS has a F-V value of 1.30E-02 for LERF.)
SR-0300-P07	(Freq: LIC=B) Given a reactor plant in an ATWS condition (QGA), perform the NSO actions to insert control rods in accordance with QCOP 0300-28.
SR-1100-P02	(Freq: LIC=A) (ILT-MP) Given a reactor plant with an ATWS, inject boron prior to exceeding 110 degrees torus water temperature OR if core instability is observed in accordance with QGA 101 and QCOP 1100-02. (Important PRA Task - Starting SBLC has a F-V of 1.23E-02 for LERF).
SR-0001-P11	(Freq: LIC=B) Given a reactor plant with an ATWS, take action to reduce heat input into the containment in accordance with QGA 101. (SOER 83-8 r11) (ATWS is a key event in 2 of top 100 most probable PRA Core Damage Sequences)
SR-0001-P12	(Freq; LIC=A) Given a reactor plant with an ATWS and conditions are met to intentionally lower RPV water level (power above 5% or unknown), terminate and prevent all RPV injection except for boron, CRD, and RCIC in accordance with QGA 101. (SOER 83-8 r11)
SR-0001-P14	(Freq: LIC=I) Given a reactor plant with an ATWS with RPV water level lowered and being maintained between MSCRWL (Minimum Steam Cooling Reactor Water Level) and the level to where it was lowered and SBLC tank level has dropped by 16 percent, raise RPV injection rate to attempt to restore RPV water level to between +0 and +48 inches; stop injection if power starts and continues to rise in accordance with QGA 101, (SOER 83-8 r11).
SR-0001-P45	(Freq: LIC=Q) Given a reactor plant in a QGA condition, verify the proper actuation of containment isolations and ECCS and emergency DG starts.

Simulator Setup:

1. Reset to IC-21 (100% power).
2. Go to **RUN.**
3. Verify the following RWM Sequence is loaded: **7PHESD (or current shut down sequence)**
4. Place INFO cards as follows:
    a. Take the 1/2 SWP BUS 14 c/s to PTL and hang an INFO card.
    b. Take the 1/2 SWP BUS 24 c/s to PTL and hang an INFO card.

5. Verify the U1 DGCWP "ON" light is lit after the setup commands are installed.

6. Insert Scenario Setup Commands:
    - **SW10R RUN** (Start the U1 DGCWP)
    - **FW24B** (1B RFP Vent Fan trip / Delete malfunction when 1B RFP Vent Fan c/s is taken to ON)
    - **LOHS15707B2 OFF** (Override 1B RFP Vent Fan "AUTO TRIP" light off)
    - **RD02R3019 10** (Stick control rod H-5 at position 10)
    - **RD05R3019** (Scram control rod H-5 triggered on APRM 5 HI HI)
    - Delete **RD05R3019 triggered off of scram reset switch**

7. Verify the following commands for scenario performance**:**
    SW02A 44 1: (Degrade the 1A Service Water Pump 44% over 1 min.)
    SW24A: (Trip the 1A RFP Vent Fan)
    NM08E 100 (Fail APRM 5 upscale 100%)
    IA02 5 2: (Insert an Instrument Air leak at 5% ramped over 2 minutes)
    MC08 100 25: (Insert a Main Condenser vacuum leak at 100% ramped over 25 min.)
    RD13A 100 (100% Hydraulic lock on North Scram Discharge Volume)

    Field Actions:
    - **RD06R3019R INOP** (Remove HCU 30-19 from service)
    - **RD04R close/open** (Close/Open 1-0301-25 valve as directed)
    - **QG08R activate** (Bypass all RPS Auto Scrams)
    - **QG14R activate** (Remove ARI fuses)

8. Install "Protected System" placards and/or rings on the following equipment:
    - RBCCW pumps
    - Fuel Pool Cooling Water pumps

9. Provide the following paperwork:
    - Turnover Sheet
    - ReMA
    - Copy of QCOP 2900-01

10. Place the Zinc Injection placard on 1B RFP.

11. Place LOCA Load Shed placards on the 1A and 1C Circulating Water Pumps.

LIST OF POTENTIAL PROCEDURES

Annunciator Procedures:

- 901(2)-3 D-2, OFF GAS HIGH RADIATION, Rev. 18
- 901(2)-5 A-3, ROD DRIFT, Rev. 08
- 901(2)-5 A-6, APRM UPSCALE/HIGH, Rev. 08
- 901(2)-5 B-3, ROD WORTH MIN BLOCK, Rev. 07
- 901(2)-5 C-3, ROD OUT BLOCK, Rev. 11
- 901(2)-5 F-5, CONDENSER VACUUM LO, Rev. 08
- 901(2)-5 H-1, OPRM TROUBLE/INOP, Rev. 03
- 901(2)-5 F-8, RX VESSEL LOW LEVEL, Rev. 11
- 901(2)-7 H-3, CONDENSER LO VACUUM 24 IN HG, Rev. 09
- QOA 900-6 F-8, RFP VENT FAN AUTO TRIP, Rev. 07
- QOA 912-1 A-11, U-1 INST AIR LOW PRESSURE, Rev. 03
- QOA 912-1 A-12, U-1A SERVICE AIR BACKUP VALVE OPEN, Rev. 04
- 912-1 B-3, SERVICE WATER SYSTEM LOW PRESSURE, Rev. 07

QCOP 0207-02, Rod Worth Minimizer Bypass Control, Rev. 13

QCOP 0250-02, Bypassing MSIV Group I Isolation Signal from Low Low Reactor Water Level, Rev. 15

QCOP 0300-28, Alternate Control Rod Insertion, Rev. 34

QOP 0700-04, Average Power Range Monitoring System Operation, Rev. 18

QCOP 1000-30, Post-Accident RHR Operation, Rev. 33

QCOP 5750-15, Reactor Feed Pump Motor Ventilation System, Rev. 07

QCOS 0300-14, Control Rod Drive Inoperable Outage Report, Rev. 14

QCGP 3-1, Reactor Power Operations, Rev. 92

QCOA 0300-02, Inability to Drive a Control Rod: Control Rod Stuck, Rev. 24

QCOA 0300-04, Mispositioned Control Rods, Rev. 21

QOA 3300-02, Loss of Condenser Vacuum, Rev. 42

QCOA 3900-01, Service Water System Failure, Rev. 26

QOA 4700-06, Loss of Instrument Air, Rev. 29

QGA 100, RPV Control, Rev. 13

QGA 101, RPV Control (ATWS), Rev. 17

QGA 200, Primary Containment Control, Rev. 13

CREW TURNOVER

1.) Plant Conditions:

a.) Unit 1 is currently holding load at 100% (2950 MWth). Rod step 18 is partially withdrawn with the FCL at ~101%.

b.) Unit 2 is at 100% Power.

c.) Technical Specification limitations:

Unit 1: None.

Unit 2: None

d.) On-Line Risk is GREEN

e.) Fire Risk is GREEN.

f.) Protected Equipment:

(1) RBCCW
(2) Fuel Pool Cooling

2.) Significant problems/abnormalities:

a.) The 1/2 Service Water pump is out of service for a motor bearing inspection.

3.) Evolutions/maintenance for the oncoming shift:

a.) Swap the SSMP feed to Bus 24-1 per QCOP 2900-01 step F.11 in preparation for an inspection of Bus 14-1 Cubicle 5. An extra NSO will perform the required verifications.

b.) QCOS 5750-09, ECCS Room and DGCWP Cubicle Cooler Monthly Surveillance is in progress. The Master Copy is in the field.

c.) Continue to hold load per QCGP 3-1 and the ReMA.

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Quad Cities 2023 NRC Scenario No.2 Event No. 1 Page 1 of 1

Event Description: Swap SSMP Feed Breaker to Bus 24-1.

Time	Position	Applicant's Actions or Behavior
	SRO	Directs BOP to swap SSMP Feed Breaker to Bus 24-1 per QCOP 2900-01 step F.11.
EVALUATOR/SIM OP ROLE PLAY: As the extra NSO act as verifier for QCOP 2900-01 steps F.11.a.(2) and F.11.a.(3).		
	BOP	Verifies the RESERVE FEED CONTROL, GCB 152-2425 feed breaker from Bus 24-1 to Bus 31 is closed.
	BOP	Opens the NORMAL FEED CONTROL, ACB 152-3101 feed breaker from Bus 14-1 to Bus 31 and obtains verification.
	BOP	Acknowledges and reports expected alarm 912-5 A-8, SAFE SHUTDOWN SYSTEM TROUBLE.
	BOP	Closes RESERVE FEED CONTROL, ACB 152-3102 feed breaker from Bus 24-1 to Bus 31 and obtains verification.
	BOP	Resets 912-5 panel annunciators.
End of Event 1		

Quad Cities 2023 NRC Scenario No.2 Event No. 2 Page 1 of 2

Event Description: 1A Service Water Pump Degrades

Time	Position	Applicant's Actions or Behavior
SIM OP NOTE: At the direction of the Lead Evaluator, degrade the 1A SWP 44% ramped over 1 minute with the following command: **SW02A 44 1:**		
Key Parameter Response: Degraded Service Water Pump Supply and Discharge Header pressures as indicated on PI ½-3940-18 and PI ½-3940-4 respectively, at the 912-1 panel. Expected Annunciator(s): 912-1 B-3 Automatic Actions: None		
	BOP	Acknowledges 912-1 B-3, SERVICE WATER LOW PRESSURE, alarm and reports the following: • Service Water Pump Supply pressure at 75 PSIG (PI ½-3940-18). • Service Water Discharge pressure at 78 PSIG (PI ½-3940-4).
	SRO	Directs BOP to take actions per QCAN 912-1 B-3 and QCOA 3900-01, Service Water System Failure.
	BOP	Dispatches EO to the Crib House to determine cause of 1A Service Water pump degradation and monitor startup of 2A or 1B Service Water pump.
	BOP	Verifies MO 1/2-3906, FIRE PROT SW SPLY VLV is closed at the 912-1 panel.
SIM OP ROLE PLAY: As the EO dispatched to the Crib House, wait 1 minute, then report: **"The 1A SWP shaft appears to be vibrating. The pump motor is also sounding louder than normal."** Acknowledge direction to monitor startup of a standby SWP if given. If asked to perform startup checks, report: **"Bearing oil levels are in normal range, all personnel are cleared for a pump start."**		
	BOP	Starts the 2A or 1B Service Water Pump to restore normal system pressure and contacts the EO.
Event 2 continued		

Quad Cities 2023 NRC Scenario No.2 Event No. 2 Page 2 of 2

Event Description: 1A Service Water Pump Degrades

Time	Position	Applicant's Actions or Behavior
SIM OP ROLE PLAY: If contacted to report on the startup of a standby SWP, report: **"The pump is running smoothly, and oil levels are good."**		
	BOP	Reports a standby Service Water Pump has been started and Service Water pressure is restored.
	BOP	Secures the 1A Service Water Pump and may place the control switch in PTL.
End of Event 2		

Quad Cities 2023 NRC Scenario No.2 Event No. 3 Page 1 of 1

Event Description: RFP Vent Fan Trip w/ Failure of Standby to Autostart

Time	Position	Applicant's Actions or Behavior
SIM OP NOTE: At the direction of the Lead Evaluator, trip the 1A RFP Vent Fan: **FW24A**		
Key Parameter Response: 1-3240-87, RFP AIR EXH TEMP ↓ Expected Annunciator(s): 901-6 F-8 Automatic Actions: Autostart of the standby 1B RFP Vent Fan		
	ATC	Reports annunciator 901-6 F-8, RFP VENT FAN AUTO TRIP, in alarm and refers to annunciator procedure.
	ATC	Reports 1B RFP Vent Fan did NOT autostart and RFP Air Exhaust temperature is lowering.
	ATC	Starts the 1B RFP Vent Fan and reports RFP Vent Fan running and RFP Air Exhaust temperature rising.
	ATC	Dispatches EO to MCC 18-3 to investigate breaker trip.
SIM OP ROLE PLAY: As the EO dispatched to MCC 18-3, wait 2 minutes, then report: **"The breaker is tripped and will not reset. I'll contact Electrical Maintenance for assistance. I also verified the 1A RFP Vent Fan discharge damper is closed."**		
	ATC	May refer to QCOP 5750-15, Reactor Feed Pump Motor Ventilation System.
End of Event 3		

Quad Cities 2023 NRC Scenario No.2 Event No. 4 Page 1 of 1

Event Description: 1B Core Spray Room Cooler Low Flow

Time	Position	Applicant's Actions or Behavior
SIM OP ROLE PLAY: As the EO performing QCOS 5750-09, ECCS Room and DGCWP Cubicle Cooler Monthly Surveillance, call in and report: **"The 1B Core Spray Room Cooler flow as indicated on FI 1-3941-97 is 55 gpm. Room Cooler flows for HPCI, both RHR rooms and the 1A Core Spray Room have met the performance acceptance criteria."** If the SRO requests that the field copy of the surveillance be brought to the control room, acknowledge the command, wait 2 minutes, then deliver the marked up copy provided.		
Key Parameter Response: None Expected Annunciator(s): None Automatic Actions: None		
	SRO	Reviews QCOS 5750-09 Performance Acceptance Criteria and determines the 1B Core Spray Room Cooler is inoperable.
TS	SRO	Enters a 7 day LCO per TS 3.5.1 Condition B, 1B Core Spray Pump inoperable.
	SRO	Updates the crew and informs the Shift Manager of 1B Core Spray Pump status.
SIM OP ROLE PLAY: If contacted, as the Shift Manager acknowledge the report and state: **"The WEC SRO will complete the Outage Report and review the surveillance for any further issues. I will contact Mechanical Maintenance to start a work package to repair the Room Cooler."**		
End of Event 4		

Quad Cities 2023 NRC Scenario No.2	Event No. 5	Page 1 of 3
Event Description: APRM 5 Fails High / Control Rod Scrams and Sticks at Position 10		

Time	Position	Applicant's Actions or Behavior
SIM OP NOTE: Fail APRM 5 upscale at 100% and trigger control rod H-5 to scram and stick at position 10 by inserting/releasing the following command at the Lead Evaluator's Direction: **NM08E 100**		
Key Parameter Response: APRM 5 recorder indicates 125. HIGH / HI HI lights lit on 901-5 and 37 panels. Channel B Scram Solenoid Lights are OUT Control Rod H-5 scrams and sticks at position 10. Expected Annunciator(s): 901-5 A-3, 901-5 A-6, 901-5 C-3, 901-5 B-11, 901-5 D-13, 901-5 D-15, 901-5 H-1 Automatic Actions: Rod out Block , 1/2 SCRAM on RPS Channel B		
	ATC	Acknowledges annunciators and reports the following: • APRM 5 indicates Upscale HI-HI • 1/2 SCRAM on RPS Channel B • Control Rod H-5 scrammed to position 10
	SRO	Contacts and directs Instrument Maintenance to investigate / troubleshoot APRM 5 failure.
SIM OP ROLE PLAY: As the Instrument Maintenance Supervisor, state: **"I'll prepare a troubleshooting package and report to the control room**		
	SRO	Determines APRM requirements are still met per TS Table 3.3.1.1-1 and TRM section 3.3.a. Directs ATC to bypass APRM 5 per QCOP 0700-04, Average Power Range Monitoring System Operation.
	ATC	Positions APRM BYPASS joystick to "CH5" and verifies white BYPASS light for APRM 5, on the 901-5 panel, is lit.
	BOP	Verifies APRM 5 is bypassed on 901-5 and 901-37 panels.
	SRO	Directs ATC to reset 1/2 SCRAM on RPS B.
Event 5 continued		

Quad Cities 2023 NRC Scenario No.2 Event No. 5 Page 2 of 3

Event Description: APRM 5 Fails High / Control Rod Scrams and Sticks at Position 10

Time	Position	Applicant's Actions or Behavior
	ATC	Resets 1/2 SCRAM and verifies all four RPS Channel B SCRAM SOLENOID GROUP indicating lights are lit.
	BOP	Fills out and places Equipment Status Tag on the APRM BYPASS joystick.
	SRO	Directs ATC to take actions per QCOA 0300-04, Mispositioned Control Rods, for control rod H-5.
	SRO	Contacts QNE for guidance on returning control rod to the proper position.
	BOP	Dispatches an EO to HCU 30-19 to check status of the scram solenoid fuses
SIM OP ROLE PLAY: As the QNE, provide the following instruction: **"Insert the control rod to position 00. I do not recommend raising Drive Water Pressure above 370 psid as there are some issues with this CRD mechanism. I will report to the control room with a Special Maneuver Rod Move Sheet to return H-5 to its original position."**		
SIM OP ROLE PLAY: As the EO dispatched to HCU 30-19, wait 2 minutes then call back and report: **Delete RD05R3019** **"I have an EM with me, and we found the 1-0305-117 SCRAM Solenoid fuse blown. We replaced it with a like for like. No other issues have been found."**		
	SRO	Directs the ATC to bypass the Rod Worth Minimizer and insert control rod H-5 to position 00.
	ATC	Bypasses the RWM per QCOP 0207-02, Rod Worth Minimizer Bypass Control.
	ATC	Selects control rod H-5 and verifies the following: • No RWM block exists • Control rod "Select" lights are lit on <u>both</u> Control Rod Matrix and Full Core Display. • Drive Water pressure is between 260 and 320 psid.
Event 5 continued		

Quad Cities 2023 NRC Scenario No.2 Event No. 5 Page 3 of 3

Event Description: APRM 5 Fails High / Control Rod Scrams and Sticks at Position 10

Time	Position	Applicant's Actions or Behavior
	ATC	Applies a continuous insert signal to control rod H-5 and reports the rod will NOT move.
	SRO	Directs ATC to enter and take actions per QCOA 0300-02, Inability to Drive a Control Rod: Control Rod Stuck.
	ATC	Raises Drive Water Pressure in 50 psid increments by throttling MO 1-302-8, U1 CRD DRIVE WTR PCV.
	ATC	Applies a continuous insert signal after each 50 psid increase in Drive Water Pressure and reports the control rod will NOT move.
LEAD EVALUATOR NOTE: Based on the QNE input, the ATC may increase Drive Water Pressure up to 370 psid as indicated on the 1-340-4, DRIVE WTR PRESS gauge at the 901-5 panel.		
	SRO	Declares control rod H-5 inoperable and refers to QCOS 0300-14, Control Rod Drive Outage Report.
TS	SRO	Enters TS 3.1.3 Condition A, One Withdrawn Control Rod Stuck. Determines stuck control rod separation criteria is met as there are no other stuck withdrawn control rods. Directs ATC/BOP to dispatch an EO to electrically disarm HCU 30-19.
	ATC/BOP	Dispatches an EO to electrically disarm HCU 30-19 per QCOP 0300-08, CRD Hydraulic Module Isolation.
SIM OP ROLE PLAY: As the EO dispatched to electrically disarm HCU 30-19, wait 2 minutes, insert the command: **RD06R3019R INOP** Then report back: **"HCU 30-19 has been electrically disarmed per QCOP 0300-08 step F.7"**		
End of Event 5		

Quad Cities 2023 NRC Scenario No.2 Event No. 6 Page 1 of 1 Event Description: Instrument Air Leak (Recoverable)		
Time	**Position**	**Applicant's Actions or Behavior**
SIM OP NOTE: At the direction of the Lead Evaluator, insert an Instrument Air System leak at a 5% severity ramped over 2 minutes: **IA02 5 2:**		
Key Parameter Response: At the 912-1 panel: 1A INST AIR RCVR PRESS ↓, 1/2B INST AIR RCVR PRESS ↓, 1-340-20, U1 SCRAM AIR ↓ Expected Annunciator(s): 912-1 A-11, 912-1 A-12 Automatic Actions: 1-4799-221, Service Air Backup Vlv opens		
	BOP	Acknowledges and annunciator 912-1 A-11, U1 INST AIR LOW PRESS is in alarm. Reports the following: • 1A Instrument Air Receiver pressure at 85 PSIG and lowering • 1/2B Instrument Air Receiver pressure at 94 PSIG and lowering • U1 Scram Air Header Pressure at 80 PSIG and lowering
	SRO	Directs BOP to enter and take actions per QOA 4700-06, Loss of Instrument Air.
	BOP	Starts the 1A and U2 Instrument Air Compressors and any available Service Air Compressors.
	BOP	Dispatches EOs to check operating Instrument Air Compressors and to look for leaks.
SIM OP ROLE PLAY: As the EO contacted in the Ready Room, state: **"I'll take a couple of EOs to check on the compressors and get assistance from Mechanical Maintenance to look for air leaks."** **If crew dispatches EO to LFFRV, acknowledge the order to report to the LFFRV.**		
SIM OP NOTE: Delete malfunction IA02 after Immediate Operator Actions are taken and EOs are dispatched.		
	SRO	Sets scram criteria at: Two (2) or more Control rods start to drift OR U1 Scram Air Header pressure as indicated at the 912-1 panel is ≤ 55 PSIG and lowering.
	BOP	Reports both Instrument Air Receiver and Scram Air Header pressures are rising.
End of Event 6		

Quad Cities 2023 NRC Scenario No.2 Event No. 7 Page 1 of 2

Event Description: Main Condenser Vacuum Leak / Emergency Power Reduction / SCRAM

Time	Position	Applicant's Actions or Behavior
SIM OP NOTE: At the direction of the Lead Evaluator, insert a 100% hydraulic lock on the North Scram Discharge Volume and Main Condenser Air In-leakage at 100% over 25 minutes with the following commands respectively: **RD13A 100** **MC08 100 25:**		
Key Parameter Response: Main Condenser backpressure ↑, Main Chimney flowrate ↑, Off-Gas radiation level ↑, Main Generator MWe ↓ Expected Annunciator(s): 901-3 D-2, 901-7 H-3, 901-5 F-5, 901-5 A-11, 901-54 C-7 Automatic Actions: Main Turbine trip at 10 in. Hg and Rx scram at 9 in. Hg backpressure		
	BOP	Acknowledges annunciator 901-54 C-7, NORMAL PROCESS FLOW HI/LO, reports rising Main Chimney flowrate.
	ATC/BOP	Reports Main Condenser backpressure rising.
	SRO	Enters and directs actions of QOA 3300-02, Loss of Condenser Vacuum.
	SRO	Sets scram criteria at 7.5 in. Hg Main Condenser backpressure.
	SRO	Directs ATC to initiate an Emergency Power Reduction to control Main Condenser backpressure < 6 in Hg.
	ATC	Reduces Recirc Pump speeds using the MANUAL RUNBACK pushbutton until Recirc pump speeds are 50% or total core flow is 55 Mlb/hr.
	ATC	Inserts CRAM rods in sequence to position 00.
	SRO	Directs BOP to monitor and report Main Condenser backpressure.
	BOP	Verifies the following: o Off-Gas and SJAE valves are open o Turbine steam seal pressure is in band o Circulating Water System is operating normally o Hotwell Level is normal o Condenser vacuum breaker is closed
Event 7 continued		

Quad Cities 2023 NRC Scenario No.2 Event No. 7 Page 2 of 2

Event Description: Main Condenser Vacuum Leak / Emergency Power Reduction / SCRAM

Time	Position	Applicant's Actions or Behavior
	BOP	Dispatches EOs to check Condenser vacuum breaker water seal and fill loop seals as necessary per QCOP 3300-09, Filling Various Plant Loop Seals.
SIM OP ROLE PLAY: As the EO, when directed to fill loop seals and check the Condenser vacuum breaker water seal, state: **"I'll get a couple of EOs and we'll head out on both tasks immediately."**		
	BOP	Reports Main Condenser backpressure rising rapidly.
	SRO	Directs ATC to insert a manual reactor scram.
	ATC	Depresses both Manual Scram pushbuttons and places the Mode Switch to SHUTDOWN.
	ATC	Reports 1/2 of the control rods did NOT insert.
	SRO	Enters QGA 100 and transitions to QGA 101.
End of Event 7		

Quad Cities 2023 NRC Scenario No.2 Event No. 8 Page 1 of 4 Event Description: 1/2 Core Hydraulic ATWS		
Time	**Position**	**Applicant's Actions or Behavior**
QGA 101, RPV CONTROL (ATWS) IMMEDIATE OPERATOR ACTIONS		
CT1 **CT3**	ATC	Reports a 1/2 core Hydraulic ATWS and performs the following Immediate Operator Actions: o Arm and Depress ARI pushbuttons o Injects with 1 SBLC pump and records SBLC Tank level. (CT1) o Terminates and prevents <u>all</u> RPV injection except Boron, CRD, and RCIC. (CT3) o Runs back both Recirc pumps to minimum speed o Determines RPV pressure stable and < 1200 PSIG, then injects SBLC with 2 pumps.
CT2	BOP	Inhibits ADS
	BOP	Bypasses RPV Low Low Level Group I isolation by placing MSIV LO-LO BYPASS CH A/C KEYLOCK switches to BYPASS on the 901-15 and CH B-D switches to BYPASS on the 901-17 panel.
SIM OP ROLE PLAY: If the U2 BOP is assigned to bypass the Offgas high radiation isolation, then remove fuse 1701-704 (AA-F6) in the 901-10 panel and report: **"The Off Gas High Radiation Isolation is bypassed"**		
	ATC/BOP	Report initial ATWS actions.
QGA 101 Power Leg Actions		
	SRO	Verifies reactor power > 5% and directs ATC to trip both Recirc pumps
	ATC	Trips both Recirc pumps by closing the discharge valves or depressing the ASD A/B EMERGENCY STOP pushbuttons.
	SRO	Directs ATC to insert control rods per QCOP 0300-28.
SIM OP ROLE PLAY: If an EO is dispatched to close/open the CRD Charging Header Isolation Valve (1-0301-25) use the commands listed below as needed and report back with the status: **RD04R close/open**		
CT1	ATC	Bypasses RWM and inserts all CRAM rods, <u>then</u> inserts control rods starting with the center rod and spiraling out using EMERGENCY IN <u>OR</u> ROD MOVEMENT CONT switch.
Event 8 continued		

Quad Cities 2023 NRC Scenario No.2 Event No. 8 Page 2 of 4

Event Description: 1/2 Core Hydraulic ATWS

Time	Position	Applicant's Actions or Behavior
	ATC	Directs an EO to pull ARI fuses at Panels 1-2201-70A and 1-2201-70B per QCOP 300-28.
SIM OP ROLE PLAY: As the EO dispatched to remove ARI fuses, wait 3 minutes, then insert/release the following command: **QG14R activate** Then call back and inform the ATC that: **"The ARI fuses are pulled."**		
	ATC	Bypasses the SDV high level and attempts to reset the reactor scram, then directs the U2 BOP to install jumpers to bypass all automatic scram signals per QCOP 0300-28.
SIM OP/LEAD EVALUATOR ROLE PLAY: When directed by ATC to bypass auto scram signals, direct the SIM OP to insert/release the following command: **QG08R activate** Wait 3 minutes, then inform the ATC that: **"The jumpers are installed to bypass all automatic reactor scrams."**		
	ATC	Resets the reactor scram and determines status of Scram Valves.
	ATC	When the SDV is drained, (alarm 901-5 A-14 clears), the ATC inserts a manual reactor scram and observes NO control rod movement.
	ATC	Resets the reactor scram and directs the U2 BOP to individually scram control rods.
LEAD EVALUATOR ROLE PLAY: If directed to individually scram control rods as the U2 BOP, wait 3 minutes, then inform the ATC that: **"Individual control rod scramming was NOT successful."**		
QGA 101 Pressure Leg Actions		
	BOP	Reports ADS valves cycling on RPV pressure.
	SRO	Directs BOP to lower RPV pressure to 940 PSIG using ADS valves.
	BOP	Opens ADS valves as necessary and reports RPV pressure at 940 PSIG.
Events 8 Continued		

Quad Cities 2023 NRC Scenario No.2 Event No. 8 Page 3 of 4

Event Description: 1/2 Core Hydraulic ATWS

Time	Position	Applicant's Actions or Behavior
EVALUATOR NOTE: If reactor power is > 38% and ADS valves are still needed for pressure control, then the SRO may assign a pressure band of 600 to 1000 PSIG.		
	SRO	Directs BOP to maintain RPV pressure between 600 and 1000 PSIG using ADS Valves.
QGA 101 Level Leg Actions		
	SRO	Directs BOP to verify isolations/actuations for 0 inches RPV water level when it is intentionally lowered.
	SRO	Directs ATC to report RPV water level at -35 inches.
	BOP	Reports RPV water level at -35 inches and lowering.
	SRO	Assigns ATC an RPV water level band of -162 in. to -35 in. (Level Band B)
CT4	ATC	Re-establishes injection with Condensate/Feed system to control RPV water level in band.
	SRO	Directs ATC to monitor SBLC Tank level and report when tank level lowers by 16%, (Tank level of 69%, Hot Shutdown weight of Boron).
	ATC	Reports SBLC Tank level at 69%.
	SRO	Directs ATC to raise water level above 0 inches and control RPV water level between 0 and 48 inches.
	ATC	Increases injection with Condensate and Feedwater and slowly raises level above 0 inches and establishes an RPV water level band of 0 to 48 inches.
Event 8 Continued		

Quad Cities 2023 NRC Scenario No.2 Event No. 8 Page 4 of 4

Event Description: 1/2 Core Hydraulic ATWS

Time	Position	Applicant's Actions or Behavior
		QGA 200, Primary Containment Control Actions
	SRO	Enters and directs actions of QGA 200.
	SRO	Directs BOP to start Torus Cooling.
	BOP	Starts one or both loops of Torus Cooling per QCOP 1000-30.
	SRO	Directs BOP to start both CAMs.
	BOP	Starts CAMs per QCOP 2400-01.
	BOP	Monitors and reports Containment parameters as needed.
SIM OP NOTE: At the direction of the Lead Evaluator, freeze the simulator when the Hot Shutdown Boron Weight (SBLC Tank Level ~ 69%) is injected and a controlled RPV water level rise has been established.		
End of Scenario		

END of SCENARIO

2023 ILT NRC Exam Scenario

Scenario Number:

NRC Scenario 3

Revision Number: 00

Date: 06/10/2022

Developed by: _____ _____
Instructor Date

Validated by: _____ _____
SME or Instructor Date

Reviewed by: _____ _____
Operations Representative Date

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Facility: Quad Cities Scenario: **2023 NRC Scenario 3** Op-Test No.: ILT 21-1
Examiners: _____ Operators: _____
_____ _____
_____ _____

Initial Conditions: 50% Reactor power, 1C Reactor Feed Pump is out of service.

Turnover: Place the 1B EHC pump in service and secure the 1A EHC pump. Continue load increase to full power per the ReMA.

Critical Tasks:

1. While executing QGA 200, Primary Containment Control, when Torus pressure exceeds 5 psig and only if operating in the safe region of the drywell spray initiation limit (DSIL), INITIATE drywell sprays. (BWROG PC-5.1 INIT DW SPRAY)

2. Per QGA 100, RPV Control, with the automatic ADS timer initiated, INHIBIT ADS BEFORE ADS setpoint(s) is/are reached and ADS initiates.

3. If the RPV level trend is not reversible with an L3 system capable of providing adequate core cooling, INITIATE an emergency depressurization before Minimum Steam Cooling RPV Water Level (MSCRWL). (BWROG RPV-1.1 LOSS HP INJ E/D TAF)

Event No.	Malf. No.	Event Type*	Event Description
1	None	BOP N	Swap the 1A and 1B EHC Pumps
2	None	ATC R	Raise Reactor Power with Control Rods and Recirculation Pumps per the ReMA
3	DIFC10262222	ATC C	Recirc Master Speed Demand “RAISE” Pushbutton Sticks
4	DIHS15401	BOP C	SJAE Suction Valves Fail Closed.
5	DIAM102033E4ACA TESTA	SRO TS	3E ERV Acoustic Monitor Failure
6	HP10	BOP C/TS	HPCI Spurious Initiation
7	FW17B DIHS13302	ATC C	1B Condensate Pump Trip w/ Failure of Standby Pump to Autostart
8	RR11A	CREW M	LOCA (1A Recirc Pump Discharge Line Break)
9	ED04B / FW01B	CREW C	Loss of Reactor Feed Pumps

10	None	CREW	TAF / RPV Blowdown.

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

ES-301-4 Quantitative attributes:
Total Malfunctions (5-8): **7**
Malfunction(s) after EOP (1-2): **9**
Abnormal Events (2-4): **3, 4, 6, 7**
Major Transient(s) /E-Plan entry (1-2): **8**
EOPs (1-2): **100 / 200**
EOP Contingencies (0-2): **100ALC/ 100BD**
Critical Tasks (2-3): **3**

ES-301-5 Quantitative attributes:
BOP Normal: **1**
ATC Reactivity (1 per set): **2**
BOP I/C (4 per set): **4, 6**
ATC I/C (4 per set): **3, 7**
SRO-I I/C (4 per set inc 2 as ATC): **3, 4, 6, 7**
SRO Tech Spec (2 per set): **5, 6**
ALL Major Transients (2 per set): **8**

SUMMARY:

- Initial Conditions:
  - The plant is currently at 50% power with the 1C Reactor Feed Pump out of service.
  - Electrical Maintenance has requested the 1A EHC pump secured and removed from service for a motor inspection.
  - The DFWLC Operator Work Station (OWS) is out of service.
- Event 1: Swap EHC Pumps: The BOP will start the 1B EHC pump and secure the 1A EHC pump per QCOP 5650-01.
- Event 2: Reactor Power Maneuver: The ATC will raise reactor power by raising Recirc pump speeds until total core flow is 65 Mlb/hr per QCGP 3-1 and the ReMA.
- Event 3: Recirc Master Speed Demand "RAISE" Pushbutton Sticks: After total core flow reaches 60 Mlb/hr, when the ATC raises pump speeds in Master Mode, the "RAISE" pushbutton will stick and Recirc pump speeds will continue to increase. The ATC terminates the power increase by one of three ways. Depress the LOWER pushbutton on the MASTER Controller or the MANUAL pushbutton on any RECIRC PUMP SPEED CONTROL STAION or place either pump in ASD SPEED HOLD.
- Event 4: SJAE Suction Valves Fail Closed: The on-line SJAE suction valves fail shut due to an intermittent failure. The failure is revealed by annunciator 901-7 A-14 and valve position indication. The BOP recovers the SJAEs by re-opening the valves to maintain Main Condenser vacuum per the QCAN direction.
- Event 5: 3E ERV Acoustic Monitor Failure: The BOP will respond to annunciator 901-3 E-14, "Acoustic Mon Safety RLF Valves Open", by checking acoustic monitors on the 901-21 panel. On the E relief valve module, the OPEN and MEMORY lights are lit and the digital reading is above the threshold. With no change in TCV position, MWe output, and the absence of the 901-3 E-13 and 901-3 E-16 alarms, the SRO declares the acoustic monitor inoperable and enters TLCO 3.3.b., Condition A.
- Event 6: HPCI Spurious Initiation: The BOP will attempt to secure HPCI injection by actuating the trip-latch REMOTE HPCI TURB TRIP pushbutton. When this proves to be unsuccessful, the operator will lower the flow controller setpoint to zero or close the HPCI Steam Supply Valves to prevent injection and dispatch an EO to locally trip HPCI. The SRO will enter TS 3.5.1 (ECCS-Operating) HPCI System inoperable.
- Event 7: 1B Condensate Pump Trip w/ Failure of Standby Pump to Autostart: 1B Cond/Cond Booster Pump trips with a failure of the standby pump to auto start. The ATC takes the immediate operator action to start the standby pump.
- Event 8/9/10: LOCA / TAF Blowdown / Loss of RFPs: The crew will insert a manual scram on high Drywell pressure due to a break in the "A" Recirc Loop Suction Line. After the reactor scram and main turbine trip, the RAT fails to transfer to Bus 11. The 1B RFP trips on overcurrent resulting in a loss of all RFPs. Actions per QGA 100 and QGA 100 Alternate Level Control leg will be taken to try and maintain RPV water level above -142 inches (MSCRWL). Containment parameters will be controlled per QGA 200 actions. When conditions permit, the crew will blowdown the RPV, and restore level with low pressure ECCS systems.

  Approximate Run Time: 1.5 Hours

CRITICAL TASKS:

Critical Task #1: While executing QGA 200, Primary Containment Control, when Torus pressure exceeds 5 psig and only if operating in the safe region of the drywell spray initiation limit (DSIL), INITIATE drywell sprays before exceeding PSP limit. (BWROG PC-5.1 INIT DW SPRAY)

Clarification: This critical task is not met if drywell sprays are not initiated after 5 psig Torus pressure. The evaluation should consider how promptly sprays are started after 5 psig is reached. This judgement should take into account the containment pressure trend and then determine when opportunity was available to initiate drywell sprays. Crew resource availability and priorities should also be considered in this evaluation.

Critical Task #2: Per QGA 100, RPV Control, with the automatic ADS timer initiated, INHIBIT ADS BEFORE ADS setpoint(s) is/are reached and ADS initiates.

Clarification: This critical task is not met if RPV level and/or drywell pressure reach their respective automatic ADS actuation setpoint(s), ADS initiates, and cooldown rates are exceeded due to ADS actuation.

Critical task #3: If the RPV level trend is not reversible with an L3 system capable of providing adequate core cooling, INITIATE an emergency depressurization before Minimum Steam Cooling RPV Water Level (MSCRWL). (BWROG RPV-1.1 LOSS HP INJ E/D TAF)

Clarification: This critical task is not met if the MNSRED ADS valves (5) are not taken to manual prior to -162 inches. This critical task may be trend dependent, and the evaluation team can adjust the criteria if level was stable near MSCRWL prior to unexpected plant change.

EXERCISE PERFORMANCE OBJECTIVES

SR-0002-P05	(Freq: LIC=I) (ILT-MP) Given a reactor plant at power, perform a power change discernible on neutron monitors using recirc flow in accordance with QCOP 0202-03 and QCGP 3-1.
SR-2300-P07	(Freq: LIC=I) Given an operating plant with an inadvertent HPCI initiation, determine that the initiation is invalid and trip the HPCI turbine in accordance with QCOA 2300-01 and QCOP 2300-04.
SR-0001-P45	(Freq: LIC=Q) Given a reactor plant in a QGA condition, verify the proper actuation of containment isolations and ECCS and emergency DG starts.
SR-1000-P02	(Freq: LIC=B) Given a reactor plant in an accident condition (QGA), operate torus sprays in accordance with QCOP 1000-30 and appropriate QGA.
SR-0001-P26	(Freq: LIC=Q) Given a reactor plant with rising drywell temperature due to a LOCA or steam leak and RHR is not needed for core cooling, verify parameters are in the safe region of the Drywell Spray Initiation Limit (QGA Figure DSIL), verify tripped or trip recirc pumps and drywell coolers, and attempt to initiate drywell sprays before drywell temperature reaches 338 degrees in accordance with QGA 200.
SR-0203-P07	(Freq: LIC=A) Given a reactor plant in a QGA condition, inhibit ADS in accordance with QGA 100 or QGA 101. (Important PRA Task- Inhibiting ADS during an ATWS has a F-V value of 1.30E-02 for LERF.)
SR-0001-P01	(Freq: LIC=A) Given the plant with a loss of normal feedwater resulting in the inability to restore RPV water level above 0 inches, inject with Alternate Injection Systems (QGA Detail L2) to attempt to hold RPV water level above -142 inches in accordance with QGA 100. (SOER 86-1 r8)
SR-0001-P02	Freq: LIC=A) Given the plant with an inability to restore and hold RPV water level above -142 inches with preferred or alternate injection subsystem (QGA Detail L1 and L2), initiate an emergency depressurization before RPV water level drops to MSCRWL (Minimum Steam Cooling Reactor Water Level) in accordance with QGA 100. (Important PRA Task - Emergency depressurization has a RAW of 1.44 E4 for CDF and a RAW of 1.59 E4 for LERF.)
SR-0001-P03	(Freq; LIC=A) Given a shutdown reactor plant with an emergency depressurization in progress due to an inability to maintain RPV water level above -142 inches, attempt to control RPV level above -142 inches using available injection systems or establish/maintain adequate core cooling using alternate methods in accordance with QGA 100.

Simulator Setup:

1. Reset to IC-19 (50% power).
2. Go to **RUN.**
3. Verify the following RWM Sequence is loaded: **7PHESU (or current start up sequence)**
4. Verify 1A EHC Pump is ON.
5. Trip Hydrogen Addition and acknowledge 901-53 panel annunciators.
6. Verify the 1D Cond/Cond Booster Pump is selected for Standby.
7. Place the RFP Selector Switch to OFF.
8. Place INFO cards as follows:
    a. Turn the DFWLC (OWS) screen OFF and place an INFO card on it.
    b. Place the control switches for the 1C RFP in PTL and hang INFO Cards.

9. Insert Commands for setup:
    - **DIHS12303RTT default** (Fail the HPCI Remote Turbine Trip pushbutton)
    - **ED04B** (Prevent closure of T-12 to Bus 11 feed breaker)
    - **FW01B** (Trip the 1B RFP when the Mode Switch is taken to S/D)
    - **FW01C** (Trip the 1C RFP)
    - **HP01** (Trip the 1B RFP when the Mode Switch is taken to S/D)
    - **DIHS13302 P2D_OFF** (Override the Cond Pump Selector Switch to OFF)
    - **LOHS13302D4 ON** (Override the 1D Cond Pump "STAND BY" light ON)
    - **LOHS13302D4** (Delete the override on the light indication when the 1D Cond/Cond Booster Pump c/s is taken to START)
10. Verify the following commands for scenario performance**:**
    - **DIFC10262222 RAISE** (Fail the Recirc Master Speed Demand "RAISE" Pushbutton ON)
    - **DIHS15401 CLOSE** (Close the online SJAE suction valves with HS override)
    - **DIAM102033E4ACA TESTA** (Override the 3E Acoustic Monitor Test Switch A to the TEST position)
    - **HP10** (Inadvertent HPCI Initiation)
    - **HP17R TRIP** (Trip HPCI with the HPCI Local Turbine Trip Lever)
    - **FW17B** (Trip the 1B Cond/Cond Booster Pump)
    - **RR11A .7 12:** (A Loop Recirc Discharge line break at .7% severity over 12 min.)

11. Install "Protected System" placards and/or rings on the following equipment:
    RBCCW pumps / Fuel Pool Cooling Water pumps

12. Provide the following paperwork:
    - Turnover
    - ReMA (Start-up from 25% power)
    - Marked up copy of QCOP 5650-01

13. Place the Zinc Injection placard on 1A RFP.

LIST OF POTENTIAL PROCEDURES

Annunciator Procedures

- 901(2)-3 A-16, PRI CNMT HIGH PRESSURE, Rev. 16
- 901(2)-3 D-12, HPCI PUMP LOW FLOW, Rev. 07
- 901(2)-3 D-13, ELECT RELIEF VALVES 3A 3B OPEN, Rev. 07
- 901(2)-3 E-13, ELECT RELIEF VALVES 3C/3D/3E OPEN, Rev. 06
- 901(2)-3 E-14, ACOUSTIC MON SAFETY RLF VALVES OPEN, Rev. 07
- 901(2)-3 C-13, TORUS VACUUM BKR VALVES OPEN DIV I, Rev. 12
- 901(2)-3 G-11, TORUS VACUUM BKR VALVES OPEN DIV II Rev. 10
- 901(2)-5 E-8, RX VESSEL HIGH LEVEL, Rev. 10
- 901(2)-5 F-8, RX VESSEL LOW LEVEL, Rev. 11
- 901(2)-3 G-15, REACTOR VESSEL LOW LOW LEVEL, Rev. 18
- 901(2)-6 A-6, COND PUMP DISCHARGE LOW PRESSURE, Rev. 10
- 901(2)-6 F-5, CONDENSATE BOOSTER PUMP AUTO TRIP, Rev. 12
- QOA 900-7 A-14, AIR EJECTOR NORTH SUCTION VALVES CLOSED, Rev. 10
- QOA 900-8 E-1, 4KV BUS 11(21) AND 12(22) LOW VOLTAGE, Rev. 06

QCGP 2-3, Reactor Scram, Rev. 101

QCGP 3-1, Reactor Power Operations, Rev. 92

QCOA 0201-01, Increasing Drywell Pressure, Rev. 30

QCOA 0202-02, Reactor Recirculation System Failure, Flow Controller Fails High, Rev. 23

QCOA 0202-08, Reactor Recirculation Control System Trouble, Rev. 19

QCOA 0400-02, Core Instabilities, Rev. 27

QCOA 2300-01, HPCI Automatic Initiation, Rev. 25

QCOA 3300-01, Loss of Condensate Pump, Rev. 24

QCOA 6500-01, 4 KV Bus 11(21) Failure, Rev. 00

QCOP 0202-03, Reactor Recirculation System Flow Controller Operation, Rev. 26

QCOP 1000-30, Post-Accident RHR Operation, Rev. 33

QCOP 2900-02, Safe Shutdown Makeup Pump System Startup, Rev. 31

QCOP 5750-19, Drywell Cooler Operation, Rev. 11

QGA 100, RPV Control, Rev. 13

QGA 200, Primary Containment Control, Rev. 13

CREW TURNOVER

1.) Plant Conditions:

a.) Unit 1 is currently at 50% power (1490 MWth) with a load increase in progress. Rod step 22 is partially withdrawn. FCL is approximately 73%.

b.) Unit 2 is at 100% Power.

c.) Technical Specification limitations:

Unit 1: None

Unit 2: None

d.) On Line Risk is GREEN

e.) Fire Risk is GREEN.

f.) Protected Equipment:

(1) RBCCW
(2) Fuel Pool Cooling

2.) Significant problems/abnormalities:

a.) The 1A EHC Pump Motor has been running with elevated temperature since late last shift. Electrical Maintenance has requested the pump be removed from service to perform a motor inspection.

b.) The DFWLC Operator Work Station (OWS) is out of service for the System Engineer for a circuit board replacement.

c.) The 1-2799-29A/B/C Solenoid H2 Injection valves tripped late last shift. The HWCS was shutdown for the System Engineer and Instrument Maintenance to investigate/ troubleshoot the HWCS PLC System. Expected system restart is late this shift.

d.) The 1C RFP is out of service for a motor winding inspection. Return to service is expected in two days.

3.) Evolutions/maintenance for the oncoming shift:

a.) Start the 1B EHC Pump and secure the 1A EHC Pump per QCOP 5650-01 step F.4. in preparation for the 1A EHC Pump clearance order.

b.) Per the QNE, continue power ascension by raising core flow to 65 Mlb/hr then withdraw control rods to raise FCL to 99% per QCGP 3-1 and the ReMA after swapping the EHC Pumps.

c.) Restart the HWCS per QCOP 2700-01 when troubleshooting activities are complete.

Quad Cities 2023 NRC Scenario No.3	Event No. 1	Page 1 of 1
Event Description: Swap the 1A and 1B EHC Pumps		
Time	**Position**	**Applicant's Actions or Behavior**
	SRO	Directs BOP to start the 1B EHC Pump and secure the 1A EHC Pump in accordance with QCOP 5650-01 step F.4.
SIM OP ROLE PLAY: As the EO stationed at the U-1 EHC skid, if asked pre-start checks of the 1B EHC pump, state: "**The pre-start checks for the 1B EHC pump are complete and satisfactory. All personnel are clear and the pump is ready for a start."**		
	BOP	Starts the 1B EHC Pump.
SIM OP ROLE PLAY: As the EO stationed at the U-1 EHC skid, if asked about the status of the 1B EHC pump, state: "**The 1B EHC pump is running normally with a discharge pressure of 1580 psig as indicated on PI 1-5650-12, and no leaks."**		
	BOP	Stops the 1A EHC Pump.
	ATC	Monitors RPV power, pressure, and water level.
End of Event 1		

Quad Cities 2023 NRC Scenario No. 3 Event No. 2 Page 1 of 1 Event Description: Raise Reactor power with Recirculation pumps.		
Time	**Position**	**Applicant's Actions or Behavior**
Key Parameter Response: APRM power ↑, Reactor pressure ↑, MW(e) ↑ Expected Annunciator(s): None Automatic Actions: FWRVs ↑		
	SRO	Directs ATC to begin power ascension per QCGP 3-1, Reactor Power Operations and the ReMA.
	SRO	Verifies compliance with the approved ReMA.
	ATC	Announces the Unit 1 reactivity addition to the control room.
	BOP	Provides peer check as requested for power change.
	ATC	Depresses RAISE pushbutton on 1-0262-22, MASTER SPEED DEMAND.
	ATC	Monitors power increase on APRMs and Flow Control Line.
	BOP	Verifies Load Set is 10% above Main Generator load.
	ATC	Notifies SRO when 65 Mlb/hr total core flow is achieved.
LEAD EVALUATOR NOTE: When the required power change has been achieved, proceed to the next event.		
End of Event 2		

Quad Cities 2023 NRC Scenario No. 3 Event No. 3 Page 1 of 1 Event Description: Recirc Master Speed Demand "RAISE" Pushbutton Sticks		
Time	**Position**	**Applicant's Actions or Behavior**
SIM OP NOTE: At the direction of the Lead Evaluator, fail the Recirc Master Speed Demand "RAISE" Pushbutton: **DIFC10262222 RAISE**		
Key Parameter Response: APRM power ↑, MW(e) ↑, RPV pressure ↑, Recirc Pump speeds ↑ Expected Annunciator(s): None Automatic Actions: None		
	ATC	Reports APRM power, total core flow, and Reactor Recirculation pump speeds continuing to rise after momentarily depressing the RAISE pushbutton.
	SRO	Directs actions of QCOA 0202-08, Reactor Recirculation Control System Trouble or QCOP 0202-03, Reactor Recirculation System Flow Controller Operation based on the method chosen to stop the Recirc Pump speed increase.
	ATC	Performs one of the following to terminate the power increase: • Place the 1-0262-25A and 1-262-25B Loop A/B SPEED CONTROLLERS in individual Manual mode (QCOP 0202-03 step F.6). • Depress the LOWER pushbutton on the 1-0262-22 Master Speed Demand Controller (QCOP 0202-03 step D.1). • Holds speed on both Recirc pumps by placing the ASD SPEED HOLD Selector switches to the "HOLD" position QCOA 0202-08 step C.1).
	ATC	Reports power increase has stopped.
	BOP/ATC	Contacts Instrument Maintenance and/or Engineering to investigate cause of the Master Controller failure.
SIM OP ROLE PLAY: If contacted as IMD or Engineering, acknowledge the report of the Master Controller failure and state you will assist with troubleshooting.		
	ATC/BOP	Adjusts Load Set if necessary.
	SRO	Directs ATC/BOP to review QCOA 0202-02, Reactor Recirculation System Failure, Flow Controller Fails High.
End of Event 3		

Quad Cities 2023 NRC Scenario No.3 Event No. 4 Page 1 of 1

Event Description: SJAE Suction Valves Fail Closed.

Time	Position	Applicant's Actions or Behavior
SIM OP NOTE: At the direction of the Lead Evaluator, fail the North SJAE Suction Valves closed: **DIHS15401 CLOSE** Delete the override when annunciator 901-7 A-14 is received.		
Key Parameter Response: North SJAE Suction Valves close, Main Condenser backpressure ↑ Expected Annunciator(s): 901-7 A-14 Automatic Actions: None		
	BOP	Reports annunciator 901-7 A-14, AIR EJECTOR NORTH SUCTION VALVES CLOSED, is in alarm.
	BOP	Verifies SJAE valves closed by 901-7 panel light indication.
	SRO	Directs BOP to perform actions of QCAN 901-7 A-14
	SRO	Sets scram criteria at 7.5 in.Hg Main Condenser backpressure.
	BOP	Verifies Circ Water Flow is in the South direction.
	BOP	Attempts to open SJAE suction valves by placing SJAE SUCT VLV C/S on Panel 901-7 to OPEN.
	BOP	Reports SJAE suction valves are open
End of Event 4		

Quad Cities 2023 NRC Scenario No.3	Event No. 5	Page 1 of 2
Event Description: 3E ERV Acoustic Monitor Failure		

Time	Position	Applicant's Actions or Behavior
SIM OP NOTE: When directed by the Lead Evaluator, fail the 3E Acoustic Monitor to indicate an open valve by overriding the test switch ON: **DIAM102033E4ACA TESTA**		
Key Parameter Response: 3E Relief Valve Acoustic Monitor OPEN and MEMORY lights lit. Input signal reads 99. No change in TCV position or MW(e). Expected Annunciator(s): 901-3 E-14 Automatic Actions: None		
	BOP	Reports annunciator 901-3 E-14, ACOUSTIC MON SAFETY RLF VALVES OPEN, in alarm and refers to annunciator procedure.
	BOP	Checks 901-21 panel to determine which acoustic monitor is in alarm and reports the following for the 3E ERV: ○ OPEN light is lit ○ MEMORY light is lit ○ Input signal reads 99
	BOP	Reports tailpipe temperatures for all relief valves ranging from 170ºF to 190ºF.
	BOP	Reports CLOSED lights are lit for all five relief valves on the 901-3 panel.
	ATC	Reports no change in MW(e) or Turbine Control Valve position.
	BOP	Attempts to reset the 3E ERV Acoustic Monitor by placing the TEST/RESET switch to RESET and observes no response.
	SRO	Contacts Instrument Maintenance to investigate 3E Relief Valve Acoustic Monitor.
Event 5 continued		

Quad Cities 2023 NRC Scenario No.3	Event No. 5	Page 2 of 2
Event Description: 3E ERV Acoustic Monitor Failure		

Time	Position	Applicant's Actions or Behavior
SIM OP ROLE PLAY: If contacted, as the Instrument Maintenance Supervisor, state: **"I will review the Manufacturers Manual, prepare a work package, and report to the control room to do diagnostic testing. We have had similar Acoustic Monitor failures on Unit 2."**		
TS	SRO	Declares the 3E Relief Valve Acoustic Monitor inoperable and enters TLCO 3.3.b Condition A, 30 days to restore channel to operable status. (Table 3.3.b-1 Function 2)
LEAD EVALUATOR NOTE: If the crew misdiagnoses the condition as a stuck open relief valve and takes the immediate operator action, they would be expected to restore the valve to auto. The crew should also then reference T.S. 3.4.3 as necessary.		
End of Event 5		

Quad Cities 2023 NRC Scenario No.3	Event No. 6	Page 1 of 2
Event Description: HPCI Spurious Initiation		

Time	Position	Applicant's Actions or Behavior
SIM OP NOTE: At the direction of the Lead Evaluator, release the block command to initiate HPCI: **HP10** Delete the malfunction HP10 after 25 seconds: **del HP10**		
Key Parameter Response: RPV water level ↑, APRM power ↑ Expected Annunciator(s): 901-3 D-12, 901-5 E-8, Automatic Actions: DFWLC compensates for HPCI injection.		
	BOP	Acknowledges annunciator 901-3 D-12, HPCI PUMP LOW FLOW and reports the HPCI system is lining up for injection.
	SRO	Determines initiation is NOT valid and directs the BOP to trip-latch REMOTE HPCI TURB TRIP pushbutton.
	BOP	Actuates the trip-latch REMOTE HPCI TURB TRIP pushbutton and reports HPCI turbine did NOT trip. Secures HPCI injection by either one of two methods: • Lower the Flow controller setpoint to zero. • Isolate steam supply by closing MO 1-2301-4, STEAM ISOL VLV and MO 1-2301-5, STM ISOL VLV.
	SRO	Directs actions of QCOA 2300-01, HPCI Automatic Initiation.
	BOP	Places MO 1-2301-14, MIN FLOW BYP VLV control switch in PTL to prevent draining the CCSTs to the Torus.
EVALUATOR / SIM OP NOTE: The SRO may take an additional action to secure HPCI injection by directing the BOP to dispatch an EO to locally trip the HPCI turbine. If this is done, wait 2 minutes, then insert the remote command actuate the local trip mechanism: **HP17R TRIP** As the EO call back and report: **"The HPCI turbine is tripped and the STOP VALVE has been verified closed."**		
Event 6 continued		

Quad Cities 2023 NRC Scenario No.3 Event No. 6 Page 2 of 2

Event Description: HPCI Spurious Initiation

Time	Position	Applicant's Actions or Behavior
	ATC	Reports RPV water level has stabilized at 30 inches and controlled by DFWLC.
	ATC	Reports RPV water level has stabilized at 30 inches and controlled by DFWLC.
	ATC	Monitors APRMs and reports a small power spike, (if injection occurred).
	SRO	Directs ATC to refer to QCOA 0400-02, Core Instabilities and monitor nuclear instrumentation for indications of core oscillations.
TS	SRO	Declares the HPCI turbine inoperable and enters TS LCO 3.5.1 Condition G. Immediately verifies RCIC system is operable and starts 14 day time clock.
	SRO	Contacts Electrical Maintenance to investigate the HPCI spurious initiation.

SIM OP ROLE PLAY: As the Electrical Maintenance Supervisor, state:

"We'll get a troubleshooting package and start with the Initiation logic relays in the Aux Electric Room. We will contact the control room prior to opening any cabinets."

End of Event 6

Quad Cities 2023 NRC Scenario No.3 Event No. 7 Page 1 of 2

Event Description: 1B Condensate Pump Trip w/ Failure of Standby Pump to Autostart

Time	Position	Applicant's Actions or Behavior
SIM OP NOTE: When directed by the Lead Examiner, trip the 1B Condensate/ Condensate Booster Pump: **FW17B**		
Key Parameter Response: 1B Condensate Pump AUTO TRIP light lit, RPV water level ↓ Expected Annunciator(s): 901-6 F-5, 901-6 A-6 Automatic Actions: Cond/Cond Booster Pump selected for "Standby" auto starts		
	BOP	Acknowledges 901-6 F-5, CONDENSATE BOOSTER PUMP AUTO TRIP alarm and reports the 1B Condensate/Condensate Booster Pump has tripped and the Standby Pump has failed to autostart.
	BOP	Manually starts the 1D Condensate/Condensate Booster Pump.
	BOP	Verifies the following: PI 1-3340-48, COND PMP DISCH HDR PRESS, indicates > 104 psig. 1-3240-73, RFP SUCT HDR PRESS, indicates > 145 psig.
	SRO	Directs actions of QCOA 3300-01, Loss of Condensate Pump.
	ATC	Reports RPV water level is +30 inches and stable.
	BOP	Verifies current > 160 amps and < 245 amps for all running Condensate/Condensate Booster Pumps.
	BOP	Notifies Generation Dispatch of plant status.
SIM OP ROLE PLAY: If contacted, as Generation Dispatch, acknowledge the report of the tripped pump.		
	BOP	Places the COND PMP SELECTOR switch to the OFF position.
Event 7 continued		

Quad Cities 2023 NRC Scenario No.3 Event No. 7 Page 2 of 2

Event Description: 1B Condensate Pump Trip w/ Failure of Standby Pump to Autostart

Time	Position	Applicant's Actions or Behavior
	ATC/BOP	Verifies proper operation of the Feed Water Reg Valves.
	BOP	Verifies Bus 13 and Bus 14 currents and voltages are in normal range.
	BOP	Dispatches EO to Bus 13 to check for any red targets on the breaker compartment or the Bus Auxiliary compartment.
	BOP	Dispatches EO to check operation of running Condensate/Condensate Booster Pumps and to perform step D.13 of QCOA 3300-01: • Secure Hydrogen injection on the 1C Cond/Cond Booster Pump • Valve in Hydrogen injection on the 1A Cond/Cond Booster Pump
SIM OP ROLE PLAY: As the EO dispatched to Bus 13, wait 1 minute, then report: **"There is an overcurrent target up on Bus 13 cubicle 8, for the 1B Cond/Cond Booster Pump. No other targets are up on any of the compartments."**		
SIM OP ROLE PLAY: As the EO dispatched to the Condensate Pumps, wait 2 minutes, then report: **"The 1A, 1C, and 1D Condensate Pumps are operating normally. Post start checks on the 1D Condensate/Condensate Booster Pump are sat."**		
End of Event 7		

Quad Cities 2023 NRC Scenario No.3	Event No. 8/9/10	Page 1 of 4
Event Description: LOCA (1A Recirc Pump Discharge Line Break) / Loss of RFPs / Blowdown		

Time	Position	Applicant's Actions or Behavior
SIM OP NOTE: At the direction of the Lead Evaluator, insert a .7% break in the 1A Recirc Pump Discharge piping ramped over 12 minutes using malfunction RR11A: **RR11A .7 12:**		
Key Parameter Response: Drywell and Torus pressure/temperature ↑, RPV water level ↓ when injection sources are lost, RPV pressure ↓ Expected Annunciator(s): 901-3 A-16, 901-3 G-15, 901-4 A-17, 901-4 B-17, 901-5 D-11, Automatic Actions: Rx. scram, ECCS auto-starts, ECCS load shedding		
	BOP	Acknowledges 901-3 A-16, PRI CMNT HIGH PRESSURE, alarm and reports rising Drywell pressure.
	SRO	Enters and directs actions of QCOA 0201-01, Increasing Drywell Pressure.
	SRO	Sets scram criteria on high Drywell pressure (2.0 psig).
	BOP	Attempts to locate and isolate leak. Checks Recirc pump seals, RBCCW alarms, PIC 1-1640-11, CONTAINMENT PRESS for normal operation.
	BOP	Starts all available Drywell cooling.
	BOP	Notifies Radiation Protection of elevated Containment pressure and evacuates the Reactor Building.
	SRO	Directs a manual reactor scram on high Drywell pressure.
	ATC	Depresses both RX SCRAM CH A and CH B Pushbuttons. Places the Reactor Mode Switch to SHUTDOWN.
	ATC	Reports all rods in, RPV water level < 0 inches and lowering, RPV pressure < 1060 psig and controlled with Main Turbine Bypass Valves.
Event 9	ATC/BOP	Reports 1B RFP has tripped and Bus 11 feed breaker from the RAT did not close after Main Turbine tripped.
	ATC/BOP	Dispatches an EO to Busses 11 and 12 to investigate feed breaker from RAT and 1B RFP breaker.
Event 8/9/10 continued		

Quad Cities 2023 NRC Scenario No.3 Event No. 8/9/10 Page 2 of 4

Event Description: LOCA / Loss of RFPs / Blowdown

Time	Position	Applicant's Actions or Behavior
SIM OP ROLE PLAY: If dispatched to Bus 11 and Bus 12, wait 2 minutes then report: **"The 1B RFP breaker at Bus 12 has an overcurrent trip and the Bus 11 reserve feed from Transformer 12 failed to close. I cannot see any obvious reason for the Bus 11 reserve feed failure. I'll get Electrical Maintenance to assist."**		
QGA 100, RPV Control Actions		
	SRO	Enters QGA 100 (RPV water level below 0 in.) and re-enters QGA 100 and QGA 200 when Drywell pressure is above 2.5 psig.
	ATC	Carries out QCGP 2-3, Reactor Scram, actions.
	ATC/BOP	Verify auto actions for 0 in. RPV water level and 2.5 psig Drywell pressure.
	SRO	Directs RCIC and CRD Pumps started for injection.
	ATC/BOP	Starts RCIC using the Manual Initiation Pushbutton and reports RCIC injecting at 400 gpm.
	SRO	Directs ATC/BOP to start the SSMP for injection.
	ATC/BOP	Starts SSMP per QCOP 2900-02, Safe Shutdown Makeup Pump System Start Up (Hard Card) and reports SSMP is injecting at 400 gpm to Unit 1.
	ATC	Reports RPV water level lowering.
	SRO	Directs BOP to inhibit ADS.
CT2	BOP	Places AUTO BLOWDOWN INHIBIT switch to INHIBIT.
QGA 100, Alternate Level Control Actions		
	ATC	Starts both SBLC pumps and reports system injection.
	ATC	Reports RPV water level at -59 in. and lowering.
Event 8/9/10 continued		

Quad Cities 2023 NRC Scenario No.3 Event No. 8/9/10 Page 3 of 4

Event Description: LOCA / Loss of RFPs / Blowdown

Time	Position	Applicant's Actions or Behavior
	ATC/BOP	Verify and report Group I isolation on RPV low-low level.
	BOP	Reports Low Pressure ECCS and Condensate pumps are available.
	ATC	Reports RPV water level at -142 inches and lowering.
	SRO	Verifies greater than 2 Injection Subsystems (L3) are lined up with pumps running.
QGA 200, Primary Containment Control Actions		
	SRO	Directs BOP initiate Torus Sprays when Torus pressure is > 2.5 psig.
	BOP	Starts Torus sprays per QCOP 1000-30, Post-Accident RHR Operation (HC) and monitors containment response.
	BOP	Reports Torus pressure at 5 psig and rising. Verifies Torus level below 17 ft.
	SRO	Checks the DSIL curve and verifies both Recirc pumps are tripped and Drywell Coolers are secured.
	SRO	Directs BOP to initiate Drywell Sprays.
CT1	BOP	Starts Drywell Sprays per QCOP 1000-30 (HC) and reports containment temperature and pressure are lowering.
	BOP	Secures Drywell or Torus sprays before the respective volume reaches 0 psig.
	SRO	Directs BOP to initiate Torus Cooling and monitor Torus temperature and level
	BOP	Starts Torus Cooling per QCOP 1000-30 (HC) on one or both loops and monitors Torus temperature and level.
	BOP	Verifies both CAM subsystems auto started at 2.5 psig Drywell pressure and reports containment Hydrogen level at 0%.
Events 8/9/10 continued		

Quad Cities 2023 NRC Scenario No.3 Event No. 8/9/10 Page 4 of 4

Event Description: LOCA / Loss of RFPs / Blowdown

Time	Position	Applicant's Actions or Behavior
QGA 100 RPV Blowdown Actions		
	SRO	Determines that PRV water level cannot be restored and held above -142 in. and transitions to "RPV Blowdown".
	SRO	Directs BOP to maximize injection to the RPV.
	BOP	Secures Containment Sprays and Torus Cooling.
	SRO	Verifies Torus level is above 5 ft.
	SRO	Directs all 5 ADS Valves opened and switches left in Manual.
CT3	BOP	Opens all 5 ADS Valves and leaves switches in the MAN position.
	BOP	Confirms and reports 5 ADS valves are open by indications on the 901-3 panel and acoustic monitors on the 901-21 panel.
	BOP	Verifies all ECCS Subsystems inject at RPV pressure < 325 psig.
	ATC	Reports RPV water level above -142 in. (TAF) and rising.
	SRO	Directs BOP/ATC to establish RPV water level band of 0 to +48 in.
	SRO	Directs BOP to secure/operate ECCS systems as necessary to restore and maintain RPV water level in band.
	ATC	Report RPV water level above 0 inches and controlling in 0 to 48 in. band.
SIMOP NOTE: When Blowdown has been performed and RPV water level restored in band, with concurrence of the Lead Examiner, place the simulator in **FREEZE.**		
End of Scenario.		

END OF SCENARIO

2023 ILT NRC Exam Scenario

Scenario Number:

NRC Scenario 4

Revision Number: 00

Date: 06/15/2022

Developed by: _____ _____
Instructor Date

Validated by: _____ _____
SME or Instructor Date

Reviewed by: _____ _____
Operations Representative Date

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Facility: Quad Cities Scenario: **2023 NRC Scenario 4** Op-Test No.: ILT 21-1
Examiners: _____ Operators: _____
_____ _____
_____ _____

Initial Conditions:
The plant is operating at 95% power.

Turnover: Reverse Main Condenser Flow. Continue holding load per Generation Dispatch.

Critical Tasks:

1. Given an operating reactor plant with the loss of both reactor recirculation pumps, take actions to scram the reactor and exit Instability Region I BEFORE an Automatic Reactor Scram due to OPRM instabilities can occur.

2. With a primary system discharging into the reactor building and the discharge unable to be isolated, verify/INITIATE an emergency depressurization when two or more areas of the same parameter (radiation, temperature, or water levels) are above max safe IAW QGA 300 and appropriate RPV blowdown leg BEFORE an additional area reaches a Max Safe Value in the same parameter.

Event No.	Malf. No.	Event Type*	Event Description
1	None	BOP N	Reverse Main Condenser Flow
2	RR09A	ATC C/TS	1B ASD Cell Failure/Bypass
3	EG07B	BOP C	1B Stator Cooling Water Pump Degrades
4	FW04C	ATC R	1C RFP Oil Leak and Bearing Failure / Emergency Power Reduction
5	None	BOP C	Secure 1C RFP and a Condensate/Condensate Booster Pump
6	NM02B	ATC I/TS	Flow Converter 2 Fails High
7	RR01A/B HP13 CU03	CREW M	Earthquake / Recirc Pumps Trip / HPCI Steam Line Break / RWCU Line Break
8	HP12A/B DIHS112012 CU25R	CREW C	HPCI and RWCU Isolation Valves Fail to Close

9	None	CREW C	RPV Blowdown (2 areas above max safe temperature)
* (N)ormal, (R)eactivity, (I)nstrument, (C)omponent, (M)ajor			

ES-301-4 Quantitative attributes:	ES-301-5 Quantitative attributes:
Total Malfunctions (5-8): **7** Malfunction(s) after EOP (1-2): **2** Abnormal Events (2-4): **2, 3, 4, 6** Major Transient(s) /E-Plan entry (1-2): **7** EOPs (1-2): **QGA 100 / 300** EOP Contingencies (0-2): **100BD** Critical Tasks (2-3): **2**	BOP Normal: **1** ATC Reactivity (1 per set): **4** BOP I/C (4 per set): **3, 5** ATC I/C (4 per set): **2, 6** SRO-I I/C (4 per set inc 2 as ATC): **2, 3, 5, 6** SRO Tech Spec (2 per set): **2, 6** ALL Major Transients (2 per set): **7**

SUMMARY: Initial Conditions:

- The plant is operating at 95% power, holding load.
- QCOP 4400-09, Circulating Water System Flow Reversal, is the first activity scheduled for the shift.

- Event 1: BOP Normal: The BOP performs QCOP 4400-09, Circulating Water System Flow Reversal.
- Event 2: 1B ASD Cell Failure: The B Recirc Pump speed will lower from 90% to ~85%, which will result in a loop flow mismatch of >5% that exceeds the Technical Specification requirement and enters TS 3.4.1 Condition B. The RRCS OWS will indicate an ASD Generated Speed Hold. The ATC will take actions per QCOA 0202-08. When the problem is diagnosed, the Speed Hold can be reset and the Recirc loop flows balanced.
- Event 3: 1B SCW Pump Degrades: The 1B Stator Cooling Pump (SCW) degrades. An EO dispatched to the pump reports the pump running hot, flow and discharge pressure low. The BOP starts the 1A SCW pump and secures the 1B SCW pump
- Event 4: 1C RFP Oil Leak/Bearing Failure: EO report of 1C RFP oil leak and bearing failure results in an emergency power reduction with reactor recirculation and/or CRAM rods IAW QCGP 3-1 to secure the 1C RFP.
- Event 5: Secure 1C RFP and a Condensate/Condensate Booster Pump: The BOP secures the 1C RFP and then refers to QCOP 3200-05 to shutdown a Condensate/Condensate Booster Pump. The 1C RFP Aux Oil Pump is also secured at the request of Mechanical Maintenance to slow down and/or stop the oil leak.
- Event 6: Flow Converter 2 Fails High: Flow Converter #2 fails upscale rendering the following equipment inoperable: APRMs 4, 5, and 6, RBM 8, and OPRMs 4, 5, 6, and 8. The US will enter the applicable Technical Specifications.
- Event 7/8/9: A seismic shock event results in a loss of both Recirc pumps and pipe ruptures in the HPCI and RWCU rooms. The ATC will insert a manual scram on loss of forced circulation and enter QCGP 2-3 to stabilize the Unit. Unit 2 will perform the required actions for QCOA 0010-09, Earthquake. The SRO will enter QGA 300 on rising room temperatures. Efforts to isolate the leaks will be unsuccessful and the crew will blowdown the RPV.
- Approximate Run Time: 1.5 Hours

CRITICAL TASKS:

Critical Task #1: Given an operating reactor plant with the loss of both reactor recirculation pumps, take actions to scram the reactor and exit Instability Region I BEFORE an Automatic Reactor Scram due to OPRM instabilities can occur.

Critical Task #2: With a primary system discharging into the reactor building and the discharge unable to be isolated, verify/INITIATE an emergency depressurization when two or more areas of the same parameter (radiation, temperature, or water levels) are above max safe IAW QGA 300 and appropriate RPV blowdown leg BEFORE an additional area reaches a Max Safe Value in the same parameter.

Clarification: The critical task is not met if an emergency depressurization is NOT performed when multiple areas reach max safe values for the same parameter with an un-isolable primary system leak discharging into the areas -or- if an emergency depressurization is performed before indications are present in multiple areas. In some cases, regarding radiation levels, control room indications will not provide adequate information. In such cases, local surveys will be needed, and sound operational judgement will need to be applied. The evaluation team must determine if the local reports justify performing an emergency depressurization in such cases, especially where accessibility is limited.

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EXERCISE PERFORMANCE OBJECTIVES

SR-0202-P05	(Freq: LIC=I) Given an operating reactor plant with a loss of both reactor recirculation pumps, take actions to scram the reactor and stabilize plant parameters in accordance with QCOA 0202-05.
SR-0202-P33	(Freq: LIC=I) Given an operating reactor plant with the U1 reactor recirc A/B ASD in Speed Hold, perform 901-4 panel actions to reset ASD A/B Speed Hold IAW QCOP 0202-39.
SR-4400-P02	(Freq: LIC=I) Given an operating reactor plant, reverse main condenser circ water flow in accordance with QCOP 4400-09.
SR-0001-P40	(Freq: LIC=A) Given a reactor plant with a reactor building area radiation alarm, temperature alarm, differential pressure at or above 0 inches, or area water level above 1 inch, attempt to isolate all discharges into an area except systems needed for fire fighting or other QGA actions in accordance with QCOA 0201-5 and QGA 300.
SR-0001-P41	(Freq: LIC=A) Given an operating reactor plant with a primary system discharging into the reactor building, verify manual scram, enter/re-enter QGA 100 before any area exceeds the maximum safe operating temperature/radiation/water level in accordance with QGA 300. (BWROG SC-1.1)
SR-0001-P42	(Freq: LIC=A) Given a reactor plant with a primary system discharging into the reactor building and the discharge cannot be isolated, verify/initiate an emergency depressurization when two or more areas exceed the maximum safe operating levels of the same parameter (radiation, temperature, or water levels) in accordance with QGA 300. (Important PRA Task- Emergency Depressurization has a RAW of 1.44 E4 for CDF and a RAW of 1.59 E4 for LERF)
SR-0001-P45	(Freq: LIC=Q) Given a reactor plant in a QGA condition, verify the proper actuation of containment isolations and ECCS and emergency DG starts.
SR-0002-P03	(Freq: LIC=Q) Given a reactor plant at power with a reactor scram, place the plant into a stable condition in accordance with QCGP 2-3.

Simulator Setup:

1. Reset to IC-21 (100% power) and Go to **RUN.**
2. Verify the following RWM Sequence is loaded: **7PHESD (or current Shutdown Sequence)**
3. Notch in FCL steps 16 to 14. Lower both recirculation pump flows using the master controller to 91.0%. Set 1A Recirc pump speed to 92.2% and 1B Recirc pump speed to 90.0%. Let the plant stabilize and verify: FCL~ 99.7%, APRMs ~ 95%. Verify 901-4 A-5 is not in alarm.
4. Place INFO cards as follows:
   a.) None.
5. Verify 1B Stator Cooling Pump running.

6. Insert Commands for setup:
   - **HP12A 50** (Bind HPCI Isolation Valve MO 1-2301-4 at 50%)
   - **HP12B 50** (Bind HPCI Isolation Valve MO 1-2301-5 at 50%)
   - **DIHS112015 NORM** (Override RWCU MO 1-1201-5 suction valve c/s to the NORM position)
   - **CU23R OPEN** (Rackout RWCU Suction Valve MO 1-1201-2, triggered on MS to S/D)
   - **RP10B** (Group III Isolation failure to actuate for Division II)
   - **SER0944** (Delete override when the 1A SCW pump c/s is taken to N_A_CL)

7. Verify the following commands for scenario performance**:**
   - Event 2: **RR09B** (Fail an ASD B Power Cell)
   - Event 3: **EG07B 16 2:** (Degrade 1B Stator Cooling Water pump 16% over 2 min.)
     SER0944 (2 min. delay) (Override alarm 901-7 C-10 ON with a 2 min. delay)
   - Event 4: **FW04C 15 2:** (Degrade the 1C RFP 15% over 2 min.)
   - Event 5: None
   - Event 6: **NM02B 100** (Fail Flow Converter #2 upscale)
   - Event 7: **RR03A** (1A Recirc Pump Seizure)
     RR01B :15 (1B ASD Input Breaker trip with 15 second delay)
     HP13 1 3: (HPCI Steam Line rupture in room at 1% severity ramped over 3 min.)
     CU03 10 3: (RWCU break at Regen Hx Inlet at 10% severity ramped over 3 min.)

   Remote functions:
   - **SW10R RUN** (Local start of the U1 DGCWP)

8. Install “Protected System” placards and/or rings on the following equipment:
   - RBCCW pumps
   - Fuel Pool Cooling Water pumps
9. Provide the following:
   - “Holding Load and Load Following” REMA
   - Turnover Sheet
   - Marked up copy of QCOP 4400-09 and an FNA6 Fuse

10. Place the Zinc Injection placard on 1A RFP.

LIST OF POTENTIAL PROCEDURES

Annunciator Procedures

- 901(2)-3 D-13, ELECT RELIEF VALVES 3A 3B OPEN, Rev. 07
- 901(2)-3 E-14, ACOUSTIC MON SAFETY RLF VALVES OPEN, Rev. 07
- 901(2)-3 F-12, HPCI PUMP AREA HI TEMP, Rev. 07
- 901(2)-4, A-5, RRCS/ASD MINOR FAILURE, Rev. 09
- 901(2)-4 A-12, RWCU AREA TEMP A HI, Rev. 08
- 901(2)-4 A-13, RWCU AREA TEMP B HI, Rev. 06
- 901(2)-4 B-2, RECIRC DRIVE A TRIP, Rev. 11
- 901(2)-4 B-6, RECIRC DRIVE B TRIP, Rev. 12
- 901(2)-4 C-5, RECIRC DRIVE B SPEED HOLD, Rev. 13
- 901(2)-5 C-3, ROD OUT BLOCK, Rev. 11
- 901(2)-5 D-6, NEUTRON MON FLOW UNIT OFF NORMAL, Rev. 08
- 901(2)-7 C-10, GEN STATOR COOLING PANEL TROUBLE, Rev. 04
- QOA 900-3 H-2, AREA HI TEMP STEM LEAK DETECTION, Rev. 09

QCOP 0202-03, Reactor Recirculation System Flow Controller Operation, Rev. 26

QCOP 0202-39, Reactor Recirculation System Manual Hold and Local Manual Operation, Rev.08

QCOP 3200-05, Reactor Feed Pump Shutdown, Rev. 43

QCOP 4400-09, Circulating Water System Flow Reversal, Rev. 30

QCOA 0201-05, Primary System Leaks (Slow Leaks) Outside Primary Containment, Rev. 12

QCOA 0201-09, Reactor Low Water Level, Rev. 28

QCOA 0202-05, Reactor Recirc Pump Trip – Both Pumps, Rev. 19

QCOA 0202-08, Reactor Recirculation Control System Trouble, Rev. 19

QCOA 1800-01, Area High Radiation, Rev. 07

QCGP 2-3, Reactor Scram, Rev. 101

QCGP 3-1, Reactor Power Operations, Rev. 92

QGA 100, RPV Control, Rev. 13

QGA 300, Secondary Containment Control, Rev. 14

CREW TURNOVER

1.) Plant Conditions:

a.) Unit 1 is currently at 95% power (2810 MWth) on the 99.7% FCL. Rod step 18 is partially withdrawn.

b.) Unit 2 is at 100% Power.

c.) Technical Specification limitations:

Unit 1: None

Unit 2: None

d.) On-Line Risk is GREEN

e.) Fire Risk is GREEN.

f.) Protected Equipment:

(1) RBCCW
(2) Fuel Pool Cooling

2.) Significant problems/abnormalities:

a.) None.

3.) Evolutions/maintenance for the oncoming shift:

a.) Perform QCOP 4400-09, Circulating Water System Flow Reversal. An operator has been briefed and is stationed at MCC 16-3. Fuses for the 901-7 panel are on hand as necessary.

b.) Continue holding load per QCGP 3-1.

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Quad Cities 2023 NRC Scenario No.4 Event No. 1 Page 1 of 1

Event Description: Reverse Main Condenser Flow

Time	Position	Applicant's Actions or Behavior
	SRO	Directs BOP to complete QCOP 4400-09, Circulating Water System Flow Reversal.
	BOP	Contacts EO at MCC 16-3 to establish communications.
SIM OP ROLE PLAY: As the EO at MCC 16-3, if called state: **"I'm in position and have located the Circ Water Reversing Valve breakers."**		
EVALUATOR NOTE: At near rated power, Holdup Pipe flow rate is ~ 20 scfm. Therefore, step F.1 should be N/A.		
	BOP	Verifies annunciator 901-7 C-1, "COND FLOW REV VLVS ON LOCAL CONT" is NOT in alarm.
	BOP	Monitors Main Condenser backpressure on PR 1-5640-79 at the 901-7 panel.
	BOP	Places and holds SJAE SUCT VLV TEST switch to the SOU position and verifies the South SJAE Suction valves open.
	BOP	When the South SJAE Suction valves indicate full open, places CIRCULATING WATER FLOW SELECTOR switch to the opposite (NORTH) position.
	BOP	Verifies the first four valves reverse within 45 seconds and the second four valves reverse within the subsequent 45 seconds.
	BOP	Verifies the following: • SJAE suction valves change over (South valves open). • Condenser seal trough fill valves change over. • Condenser differential pressure has reversed and vacuum is stable.
	ATC	Monitors reactor power, pressure, and water level.
End of Event 1		

Quad Cities 2023 NRC Scenario No.4	Event No. 2	Page 1 of 2
Event Description: 1B ASD Cell Failure/Bypass		

Time	Position	Applicant's Actions or Behavior
SIM OP NOTE: When directed by the Lead Examiner fail a power cell on the 1B ASD with malfunction: **RR09B**		
Key Parameter Response: On 901-4, 1B Recirc Pump speed lowers from ≈91% to ≈88%. A & B Recirc Controllers shift to MANUAL. Expected Annunciator(s): 901-4, A-5, RRCS/ASD MINOR FAILURE 901-4, C-5, RECIRC DRIVE B SPEED HOLD Automatic Actions: B Recirc Pump speed lowers until control goes into Speed Hold Mode		
	ATC	Responds to the unexpected annunciators 901-4 A-5 and 901-4 C-5 and informs the Unit Supervisor
	SRO	Reports both Recirc Pump Speed Controllers in MANUAL and the 1B Recirc pump is in Speed Hold Mode.
	ATC	Enters and directs actions of QCOA 0202-08, Reactor Recirculation Control System Trouble.
	ATC/BOP	Dispatches an EO to the local HMI
SIMOP ROLE PLAY: As EO dispatched to investigate at local HMI, wait 2 minutes and then report: "**The 1B ASD HMI screen shows cell A1 bypassed, and that alarm 4-04 indicates the cell tripped on an over-temperature condition. I suspect a clogged cooling line. I have the System Engineer out here investigating the problem as well."**		
	ATC	Check the RRCS Interlocks Display on the OWS to identify the Minor Failure (ASD Generated Speed Hold)
	SRO/ATC	Review QCOA 0202-08 Attachments A, B, & C for consequences and recommended actions
	SRO/ATC	Identify Jet Pump Flow Mismatch between operating loops is ~ 6-7% (Greater than the 5% limit for ≥70% power operation)
Event 2 continued		

Quad Cities 2023 NRC Scenario No.4	Event No. 2	Page 2 of 2
Event Description: 1B ASD Cell Failure/Bypass		

Time	Position	Applicant's Actions or Behavior
TS	SRO	Enters Technical Specification 3.4.1 Condition B (Declare the B Loop to be "Not in operation" within 2 hours).
SIM OP ROLE PLAY: As the ASD System Engineer, call in and state: **"The ASD had a cell failure and responded as designed. The faulty cell was automatically bypassed. The Speed Hold can be reset, and normal operation can be resumed."**		
	SRO	Directs resetting the 1B Recirc Speed Hold per QCOP 0202-39, Reactor Recirculation System Manual Hold and Local Manual Operation.
	ATC	Verify the 1B Recirc Controller Speed and Speed Demands are equal
	ATC	Momentarily place ASD B SPEED HOLD switch to the RESET position
	SRO	After the Speed Hold problem is resolved, directs ATC to return the Recirc Controllers to MASTER mode and match Recirc loop flows per QCOP 0202-03, Reactor Recirculation System Flow Controller Operation.
	ATC	Transfers Recirc Flow Control from MANUAL mode to MASTER mode by: • Depressing MASTER pushbutton on the 1-0262-25A/B, LOOP A/B SPEED CONTROLLER. • Verifies MASTER pushbutton is lit on both LOOP A/B SPEED CONTROLLERS
	ATC	Depresses RAISE/LOWER SLOW pushbutton on 1(2)-0262-25A/B LOOP A/B SPEED CONTROLLER. • Verifies Recirc Pump speed of other loop changes in the opposite direction to maintain total core flow.
LEAD EVALUATOR NOTE: Loop flows may be balanced by raising/lowering individual Recirc pump speeds in MANUAL MODE in lieu of the biasing method described above.		
	ATC	Reports A and B Recirc loop flows are balanced.
End of Event 2		

Quad Cities 2023 NRC Scenario No.4 Event No. 3 Page 1 of 1 Event Description: 1B Stator Cooling Water Pump Degrades		
Time	**Position**	**Applicant's Actions or Behavior**
SIM OP NOTE: At the direction of the Lead Evaluator, degrade the 1B Stator Cooling Water pump 16% ramped over 2 minutes and override annunciator 901-7 C-10 on: **EG07B 16 2:** **SER0944 (2 min. delay)**		
Key Parameter Response: NORMAL PRESS light out, SCW pump amps↓ Expected Annunciator(s): 901-7 C-10 Automatic Actions: Autostart of Standby SCW pump		
	BOP	Reports "Normal Pressure" light for the 1B Stator Cooling Water Pump is out.
	BOP	Acknowledges annunciator 901-7 C-10, GEN STATOR COOLING PANEL TROUBLE, and refers to procedure.
	BOP	Dispatches EO to the SCW panel to investigate.
SIM OP ROLE PLAY: As the EO dispatched to the SCW pumps, wait 1 minute, then report back: (If the standby pump has not been started) **"Alarm tile A-1, INLET LOW FLOW is in alarm. FIS 1-7441-1B, is reading 520 gpm and PI 1-7441-3, Stator Cooling Water Pumps Discharge Hdr is indicating 65 PSIG. Also, the pump is running hot."**		
	BOP	Reports the 1A SCW pump has not autostarted.
	SRO	Directs BOP to start the 1A SCW pump.
	BOP	Starts the 1A SCW pump and places the 1B SCW pump control switch in PTL.
	BOP	Contacts EO to check status of 1A SCW pump.
SIM OP ROLE PLAY: As the EO, after the 1A SCW pump is started, and the alarm clears report: **"The 1A SCW pump is running normally, pressures and flow is in the normal range."**		
End of Event 3		

Quad Cities 2023 NRC Scenario No.4	Event No. 4	Page 1 of 1
Event Description: 1C RFP Oil Leak and Bearing Failure / Emergency Power Reduction		

Time	Position	Applicant's Actions or Behavior
SIM OP NOTE: Insert the command to degrade the 1C RFP 15% over 2 minutes, then as the EO on rounds, call in on the emergency phone and report: **FW04C 15 2:** **"There is an oil leak on the 1C RFP. The pump casing is hot and the pump bearings are making a loud grinding sound. I've called Maintenance and they're on their way. The area has been cleared.**		
Key Parameter Response: RPV water level ↓, FRVs open, 1C RFP flow and current ↓ Expected Annunciator(s): None. Automatic Actions: None		
	ATC	Reports slight lowering of RPV water level and both Feed Reg Valves slowly opening.
	ATC/BOP	Reports EO call in on 1C RFP oil leak and bearing degradation.
	ATC	Reports 1C RFP current and discharge flow lowering.
	SRO	Directs an Emergency Power Reduction to 9.8 Mlb/hr feedwater flow rate to secure the 1C Reactor Feed Pump.
	ATC	Reduces Recirc pump speeds until feedwater flow is ≤ 9.8 Mlb/hr using: • MANUAL RUNBACK pushbutton • LOWER FAST/SLOW pushbuttons on Individual Speed Control Stations (1-0262-25A/B) • LOWER pushbutton on Master Speed Demand (1-0262-22)
	ATC	Inserts CRAM rods until reactor operation is within MELLLA boundary.
End of Event 4		

Quad Cities 2023 NRC Scenario No.4 Event No. 5 Page 1 of 1

Event Description: Secure 1C RFP and a Condensate/Condensate Booster Pump.

Time	Position	Applicant's Actions or Behavior
	BOP	Refers to QCOP 3200-05, Reactor Feed Pump Shutdown.
	BOP	Verifies 1C RFP Aux Oil Pump control switch has a red target and the yellow AUTO TRIP light is lit.
	BOP	Places control switch for the 1C RFP to STOP/PTL and verifies the following: • RPV water level is stable • No flow indicated on the RFP flow meter 1-640-24C • 1C RFP Aux Oil Pump starts • RFP currents on running pumps is $\leq$ 1115 amps • RFP discharge header pressure is stable
	BOP	Contacts the EO at 1C RFP.
SIM OP ROLE PLAY: If contacted, after the 1C RFP is secured, as the EO, report: **"The 1C RFP has stopped, the shaft is NOT rotating and Maintenance requests the 1C RFP Aux Oil Pump shutdown to slow down the oil leak."** Call back after 1C RFP Aux Oil pump is secured and state: **"The 1C RFP Aux Oil Pump has stopped and Maintenance will request a Clearance Order and prepare a work package. "**		
	BOP	Secures the 1C RFP Aux Oil Pump by placing the C/S in PTL.
	SRO	Directs BOP to secure a Condensate/Condensate Booster Pump.
	BOP	Verifies RFP suction pressure is $\geq$ 250 PSIG.
	BOP	Places the COND PMP SELECTOR to OFF.
	BOP	Places the C/S for the COND PMP to be shut down to STOP and then selects that pump for standby.
	BOP	Verifies running Condensate pump motor currents are > 160 amps.
	BOP	Dispatches EO to close the H_2 injection valve 1-2799-31A/B/C/D on the secured Condensate/Condensate Booster pump.
End of Event 5		

Quad Cities 2023 NRC Scenario No.4	Event No. 6	Page 1 of 2
Event Description: Flow Converter 2 Fails High		

Time	Position	Applicant's Actions or Behavior
SIM OP NOTE: At the direction of the Lead Evaluator, fail Flow Converter #2 upscale using malfunction NM02B: **NM02B 100**		
Key Parameter Response: • Flow Converter #2, "UPSCALE/TRIP" and "COMPARATOR TRIP" lights lit. • APRM 4, 5, and 6 meters indicate upscale (125) when selected to FLOW. • ROD OUT PERMIT light on the 901-5 panel is extinguished • Channel "B" OPRM "Enable" light extinguishes on the 901-5 panel Expected Annunciator(s): 901-5 C-3, 901-5 D-6 Automatic Actions: Rod Out Block		
	ATC	Acknowledges and reports annunciators 901-5 D-6, NEUTRON MON FLOW UNIT OFF NORMAL and 901-5 C-3, ROD OUT BLOCK.
	SRO	Directs actions of QCAN 901(2)-5 D-6 and contacts the QNE.
SIM OP ROLE PLAY: As the QNE, inform the SRO that you will update the IM Supervisor of the problem and help develop a troubleshooting package for Flow Converter #2.		
EVALUATOR ROLE PLAY: Flow Converter Units 1 and 2 are located inside the 901-37 panel cabinets 1 and 5 respectively. These units are NOT modeled in the simulator, however there are indicating lights for the flow converters at the top of the respective cabinets on the 901-37 panel. If cabinet 1 is opened to check Flow Converter #1, state: **"The "OK" LED is lit."** If cabinet 5 is opened to check Flow Converter #2, state: **"The "UPSCALE/TRIP" and "COMPARARTOR TRIP" LEDs are lit."**		
	BOP	Reports the UPSCALE/INOP and COMPARATOR indicating lights for Flow Converter #2 are lit (located at top of 901-37 panel Bay 5).
Event 6 continued		

Quad Cities 2023 NRC Scenario No.4 Event No. 6 Page 2 of 2

Event Description: Flow Converter 2 Fails High

Time	Position	Applicant's Actions or Behavior
	BOP	At the 901-37 panel, places the mode switch for APRMs 4, 5, and 6 and RBM 8 to the FLOW position and reports: • APRMs 4, 5, and 6 flow readings are upscale high > 110%. • RBM 8 flow reading is also upscale high > 110%.
	SRO	Directs the ATC to insert a ½ scram on RPS channel B.
	ATC	Depresses the RPS Channel B scram pushbutton and verifies: • Channel B Scram Solenoid Group lights are out. • Annunciator 901-5 A-15 is in alarm.
	ATC	Verifies reactor power, total core flow, and recirculation loop flow are within operating limits.at the OWS.
	SRO	Enters the following Technical Specification LCOs: • TS 3.3.1.1 Cond. A, (Function 2.b.,12 hrs. to place trip system in trip) • TS 3.3.1.1 Cond. C, (Restore RPS trip capability within 1 hour) • TS 3.3.1.3 Cond. A, OPRM Instrumentation, (30 days to place channel in trip) • TS 3.3.1.3 Cond B, (12 hours to implement alternate method and 120 days to restore OPRM trip capability) • TS 3.3.2.1 Cond. A, Control Rod Block Instrumentation, (24 hrs. to restore RBM channel) • TRM 3.3.a. Control Rod Block Instrumentation, Cond. A, (Function 1.a., 7 days to restore channels)
	Crew	Contacts Instrument Maintenance for Flow Converter 1 failure.
SIM OP ROLE PLAY: As Instrument Maintenance Supervisor, inform the crew that a package preparation to troubleshoot flow converter 1 will take approximately 3 hours.		
EVALUATOR NOTE: TS 3.3.1.1 Condition C and TS 3.3.1.3 Condition B are exited when the ½ scram is inserted on RPS channel B.		
End of Event 6		

Quad Cities 2023 NRC Scenario No.4 Event No. 7/8/9 Page 1 of 5

Event Description: Earthquake / HPCI Steam Line Break / RWCU Line Break / Blowdown

Time	Position	Applicant's Actions or Behavior
LEAD EVALUATOR ROLE PLAY: Inform the crew that a seismic event is occurring, and Unit 2 has entered and is taking required actions per QCOA 0010-09, Earthquake.		
SIM OP NOTE: After the Lead Evaluator informs the crew that a seismic event is occurring, insert the block commands to trip both Recirc pumps, rupture HPCI and RWCU system lines: **RR03A** **RR01B :15** After the reactor has scrammed verify the following smartsim commands have been inserted: **HP13 .5 3:** **CU03 1 25:**		
Key Parameter Response: Rx. power ↓, HPCI / RWCU Hx Room temps ↑ Expected Annunciator(s): 901-3 H-2, 901-3 F-12, 901-4 B-2, 901-4 B-6, 901-4 C-3 901-4 A-12/13, Automatic Actions: Group III and Group IV isolations		
CT1	ATC	Reports both Recirc pumps have tripped and inserts a manual reactor scram.
	SRO	Enters QGA 100 when ATC reports RPV water level is < 0 inches.
QGA 100 RPV CONTROL, actions		
	ATC	Reports all rods in, RPV water level < 0 inches and recovering, RPV pressure < 1060 PSIG.
	SRO	Directs ATC to maintain RPV water level between 0 in. and 48 in. using Condensate and Feedwater system.
	SRO	Directs ATC to enter QCGP 2-3, Reactor Scram.
	SRO	Directs BOP/ATC to verify auto actions for 0 inches RPV water level.
	SRO	Directs pressure band of 800-1000 PSIG.
	SRO	Direct the ATC/BOP to start a reactor cooldown at < 100 ºF/hr using Main Turbine Bypass valves.
Events 7/8/9 continued		

Quad Cities 2023 NRC Scenario No.4 Event No. 7/8/9 Page 2 of 5

Event Description: Earthquake / HPCI Steam Line Break / RWCU Line Break / Blowdown

Time	Position	Applicant's Actions or Behavior
	ATC/BOP	Reports the following: • Group III isolation did NOT occur. • MO 1-1201-2 valve breaker has tripped. • MO 1-1201-5 and MO 1-1201-80 valves still have OPEN indication.
	ATC/BOP	Attempts to close MO-1-1201-5 valve with the c/s and report that the valve will not close.
	SRO	Directs BOP to start Torus Cooling.
	BOP	Starts Torus Cooling on one or both loops and monitors Torus temperature.
	BOP	Acknowledges and reports annunciators 901-3 H-2, AREA HI TEMP STEAM LEAK DETECTION.
	ATC	Acknowledges and reports annunciators 901-4 A-12, RWCU AREA TEMP A HI and 901-4 A-13, RWCU AREA TEMP B HI.
QGA 300 SECONDARY CONTAINMENT CONTROL, actions		
	SRO	Enters and directs actions of QGA 300.
	ATC/BOP	Dispatches EO to start U1 Diesel Generator Cooling Water Pump.

SIM OP ROLE PLAY: If dispatched to start the U1DGCWP, wait 2 minutes, insert/release remote function:

SW10R RUN

Then call back and report:

"The Unit 1 DGCWP has been started and is running."

Events 7/8/9 continued

Quad Cities 2023 NRC Scenario No.4 Event No. 7/8/9 Page 3 of 5

Event Description: Earthquake / HPCI Steam Line Break / RWCU Line Break / Blowdown

Time	Position	Applicant's Actions or Behavior
	BOP	Checks TRS 1-1290-27, RX BLDG AREA TEMPERATURES (Recorder) at the 901-21 panel and reports: • HPCI Room at 140ºF and rising rapidly • RWCU HX Room at 150ºF and rising slowly
	SRO	Directs BOP to close HPCI STM ISOL VLVs.
	BOP	Reports MO 1-2301-4 and MO 1-2301-5 STM ISOL VLV breakers have tripped.
	BOP	Announces evacuation of Reactor Building over the plant PA system.
	BOP	Notifies Radiation Protection of conditions and requests access control.
	BOP	Dispatches EOs to MCC 19-1 and 250VDC Bus 1A to investigate HPCI 4 and HPCI 5 valve breakers respectively.
	ATC	Dispatches an EO to investigate the breaker for RWCU MO 1-1201-5 valve.
SIM OP ROLE PLAY: As the EOs dispatched to investigate valve breakers for the HPCI and RWCU systems wait 2 minutes and report: For HPCI: **"The HPCI 4 and HPCI 5 valve breakers will not reset. I'll call Electrical Maintenance for assistance."** For RWCU: **"I'm at the RWCU 5 valve breaker and there is steam and water coming out of the RWCU Heat Exchanger Room. The RP Tech said we will require some protective clothing to enter the room. I've looked inside the breaker and there isn't anything I can identify as a problem."**		
	ATC	Dispatches EO to monitor Reactor Building basement area water levels
SIM OP ROLE PLAY: As the EO dispatched to monitor area water levels, wait 5 minutes, then report: **"I've checked the RB Basement and all corner rooms. There is a large steam leak in the HPCI Room. It is not safe to enter the room. There are no other leaks in the corner rooms or in the Torus area. The RP Tech is NOT detecting any elevated dose rates.**		
Events 7/8/9 continued		

Quad Cities 2023 NRC Scenario No.4	Event No. 7/8/9	Page 4 of 5
Event Description: Earthquake / HPCI Steam Line Break / RWCU Line Break / Blowdown		

Time	Position	Applicant's Actions or Behavior
	SRO	Directs ATC/BOP to dispatch EOs and Mechanical Maintenance to manually close the HPCI 5 Valve.
SIM OP ROLE PLAY: If contacted, as the EO and/or Mechanical Maintenance, acknowledge the request and state: **"We will brief personnel in the Maintenance Shop and contact the crew at the breaker before attempting to operate the handwheel."**		
	SRO	Verifies Fuel Pool level is normal by absence 901-4 B-24, FUEL POOL STORAGE HI/LO LEVEL, alarm.
	SRO	Directs BOP to verify Fuel Pool temperature < 125ºF.
	BOP	Verifies Pt. #6 on recorder 1-1040-5, RHR TEMPS on 901-3 panel is < 125ºF.
	SRO	Determines that a Primary System is discharging into the Reactor Building (SDV Leak) and cannot be isolated.
	BOP	Reports HPCI Room temperatures is above max safe level.
	SRO	Verifies reactor is scrammed and re-enters QGA 100.
	BOP	Reports HPCI and RWCU Heat Exchanger Room temperatures are now above max safe levels.
RPV BLOWDOWN		
	SRO	Directs Blowdown steps of QGA 100 at ❹.
	BOP	Verifies Drywell pressure < 2.5 PSIG.
	BOP	Verifies Torus level is above 5 ft.
	SRO	Directs BOP to open all 5 ADS valves and leave switches in MAN position.
Events 7/8/9 continued		

Quad Cities 2023 NRC Scenario No.4 Event No. 7/8/9 Page 5 of 5

Event Description: Earthquake / HPCI Steam Line Break / RWCU Line Break / Blowdown

Time	Position	Applicant's Actions or Behavior
CT2	BOP	Opens all 5 ADS valves and leaves switches in MAN.
	BOP	Confirms all ADS valves are open by the acoustic monitor indications on the 901-21 panel.
	ATC/BOP	Monitor RPV depressurization to < 100 PSIG.
SIM OP NOTE: When Blowdown has been performed and with concurrence of the Lead Examiner, place the simulator in **FREEZE.**		
End of Scenario		

END OF SCENARIO