Exelon Nuclear

2018 ILT NRC Exam Scenario

Scenario Number:

NRC Scenario 1

Revision Number: 00

Date: 03/08/2018

Developed by: _____ _____
Instructor Date

Validated by: _____ _____
SME or Instructor Date

Reviewed by: _____ _____
Operations Representative Date

Approved by: _____ _____
Training Department Date

Facility: Quad Cities Scenario: **2018 NRC Scenario 1** Op-Test No.: ILT 16-1
Examiners: _____ Operators: _____
_____ _____
_____ _____

Initial Conditions:
The plant is operating at 100% power with the 1C RFP Bus 12 Feed Breaker Out-of-Service.

Turnover: Perform QCOS 0202-13, Monthly Testing Reactor Recirculation System Air Operated Valves.

Event No.	Malf. No.	Event Type*	Event Description
1	None	BOP N	Perform surveillance QCOS 0202-13.
2		BOP C	1A Service Water pump trip with a reduced capacity on the standby 1B Service Water pump.
3		SRO TS	Level transmitter LT-1-0263-23B fails downscale.
4		BOP C/TS	Spurious opening of the 'B' ERV.
5		ATC I	CRD flow control valve fails closed in auto.
6		ATC R	Initiate emergency power reduction IAW QCGP 3-1 to secure 1B RFP.
7		BOP C	Isolate 1B RFP leak.
8		CREW M	Small LOCA inside DW.
9		BOP C	HPCI fails to start due to stuck closed stop valve.
10		CREW M	Emergency depressurization due to inability to maintain RPV water level above TAF and restoration of level with ECCS pumps.

* (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): **E9**
Abnormal Events (2-4): **E2, 4, 5**
Major Transient(s) /E-Plan entry (1-2): **E8, 10**
EOPs (1-2): **QGA 100 & 200**
EOP Contingencies (0-2): **QGA 100/500-1**
Critical Tasks (2-3): **4**

ES-301-5 Quantitative attributes:
BOP Normal: **E1**
ATC Reactivity (1 per set): **E6**
BOP I/C (4 per set): **E2 & 4**
ATC I/C (4 per set): **E5**
SRO-I I/C (4 per set inc 2 as ATC): **E2, 4, 5, 7**
SRO Tech Spec (2 per set): **E3 & 4**
ALL Major Transients (2 per set) **E8**

SUMMARY:

- Initial Conditions:
  - The plant is operating at 100% power with the 1C RFP Bus 12 Feed Breaker Out of Service.
  - QCOS 0202-13, Monthly Testing Reactor Recirculation System Air Operated Valves is the first activity scheduled for the shift.
- Event 1: The BOP performs QCOS 0202-13, Monthly Testing Reactor Recirculation System Air Operated Valves.
- Event 2: The 1A Service Water pump will trip on overcurrent resulting in an auto-start of the 1B Service Water pump. The operator will notice a reduced Service Water pressure. The ½ Service Water pump will be started and the 1B Service Water pump secured, restoring Service Water pressure.
- Event 3: Level instrument LT-1-263-23B fails low as indicated on LI-1-263-100B on 901-5 panel. Enter TS 3.3.2.2 (RFP, HPCI, RCIC, and main turbine high level trip) and evaluate for TS 3.3.4.1 (ATWS-RPT), TS 3.3.5.1 (LPCI, CS, and ADS Div II), TS 3.3.3.1 (PAM RPV water level), and TS 3.3.5.2 (RCIC Hi/Lo level trips).
- Event 4: Spurious opening of 'B' ERV. Take action per QCOA 0203-01. Fuses must be removed to reclose ERV. Removal of fuses will be delayed to see if operators take action to initiate torus cooling. Once fuses are removed, the ERV will close and be inoperable. The SRO will enter TS 3.4.3 (safety and relief valves), TS 3.5.1 (ADS function of ECCS during operations), and TS 3.6.1.6 (low set relief function of two relief valves).
- Event 5: CRD flow control valve fails closed in auto. ATC able to restore flow by taking FIC 1-340-1 to manual per QCOA 0300-06.
- Event 6: Report of steam leak on 'B' RFP. Initiate emergency power reduction with reactor recirculation and/or CRAM rods IAW QCGP 3-1 to secure “B’ RFP.
- Event 7: Isolate the 1B RFP by closing the suction and discharge valves.
- Event 8: Small LOCA. 1A Recirc Pump suction line break.
- Event 9: HPCI fails to start due to stuck closed stop valve.
- Event 10: The crew enters QGA 500-1, Emergency depressurization (**CT**) due to inability to maintain or restore RPV water level above -142". RPV level will be restored > TAF (**CT**) on Condensate/Condensate Booster, RHR, and Core Spray pumps when reactor pressure falls below the respective pump shutoff heads.
- Approximate Run Time: 1.5 Hours

CRITICAL TASKS:

Critical Task #1: When torus pressure exceeds 5 psig, INITIATE drywell sprays while in the safe region of the Drywell Spray Initiation Limit (DSIL). (BWROG PC-5.1 INIT DW SPRAY)

Critical Task #2: Given the plant with the inability to maintain level above –59 inches, INHIBIT ADS, to prevent an uncontrolled depressurization IAW QGA 100.

Critical task #3: Given the plant with an inability to maintain RPV water level above -142 inches with an injection source lined-up and running, initiate an emergency depressurization before RPV water level drops to -162 inches in accordance with QGA 100 and QGA 500-1.

Critical task #4: Restore and maintain RPV water level above TAF.

EXERCISE PERFORMANCE OBJECTIVES

SR-0263-P02	(Freq: LIC=B) Given a reactor plant with a RPV water level or pressure instrument failure, determine which equipment is affected and meet the associated TS requirements.
SR-0203-P02	(Freq: LIC=B) Given an operating plant with a stuck open relief valve, take actions to close the valve in accordance with QCOA 0203-01.
SR-0300-P02	(Freq: LIC=I) Given an operating plant with a failure of the CRD flow control valve, shift to the standby flow control valve in accordance with QCOA 0300-06.
SR-0001-P45	(Freq: LIC=A) Given a reactor plant in a QGA condition, verify the proper actuation of containment isolations and ECCS and emergency DG starts in accordance with QGA 100 or QGA 101.
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=B) 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 K), 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=B) Given a reactor plant in a QGA condition, inhibit ADS in accordance with QGA 100 or QGA 101.
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 E) 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 maintain RPV water level above -142 inches with an injection source lined-up and running, initiate an emergency depressurization before RPV water level drops to MSCRWL (Minimum Steam Cooling Reactor Water Level) in accordance with QGA 100 and QGA 500-1. (Important PRA Operator Action - emergency depressurization terminates 15 of top 100 Core Damage Sequences)
SR-0001-P18	(Freq: LIC=B) Given a reactor plant where emergency depressurization is required using QGA 500-1 and less than 5 ADS valves can be opened, use Emergency Depressurization Systems (QGA Detail D) to blowdown the RPV to torus DP less than the DHRP (Decay Heat Removal Pressure) in accordance with QGA 500-1.
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 500-1 and QGA 100.

Simulator Setup:

1. Reset to IC-21 (100% power).
2. Go to **RUN.**
3. Verify the following RWM Sequence is loaded: **5PHESD (or current shut down sequence)**
4. Place INFO cards as follows:
    a. Take the 1C RFP C/S from Bus 12 to PTL and place an INFO card.

(The following commands to be utilized for this scenario are contained in the CAEP file: 2018 NRC Scenario 1.cae)

5. Insert Commands for setup:
    - **imf ed04b** (Prevent the Bus 11 auto transfer to T-12 Main Feed upon loss of normal power source)
    - **imf sw02b (8) 50 2:** (Degrade the 1B SWP 50% ramped over 2 min on trigger 8)
    - **ior dihs10287303b auto** (Override the 3B ERV c/s to auto)
    - **imf hp01** (Trip the HPCI turbine)
    - **ior dihs165001104 3** (Override the XFMR 12 to Bus 11 c/s to N_A_TRIP)
    - **imf rr19b (1) 0** (Downscale failure of LT 1-0263-23B on trigger 1)
    - **imf ser0731 (1) on** (Override alarm 901-4 H-19 on with trigger 1)
    - **imf ser1058 (1) on** (Override alarm 901-5 D-4 on with trigger 1)
    - **trgset 8 "zlohs13901a(2)"** (Set trigger 8 true when the 1A SWP trip light is on)

6. Verify the following commands for scenario performance**:**
    - **imf sw01a** (Trip the 1A SW pump)
    - **trg! 1** (Manual trigger fails LT 1-0263-23B downscale)
    - **imf ad01b 0 3:** (Spuriously open the B ERV by failing the set point to 0)
    - **irf ad02r remove** (Pull B ERV fuses for normal and reserve control power)
    - **imf rd11 0** (Fail the CRD Flow Controller to zero)
    - **imf fw01b** (Trip the 1B RFP)
    - **imf rr10a .25 10:00** (Inserts a .25% break over 10 minutes in the 1A Recirc Pump suction piping)
    - **mmf rr10a 1.5 3:00** (Modify the Recirc line break to 1.5% ramped over 3 minutes)
    - **bat sv** (silences 901-3 G-11 and C-13 alarms)
    - **irf rd01r both** (Valve in 2nd set of CRD suction filters)

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

8. Provide the following paperwork:
    - "Holding Load and Load Following" REMA
    - Marked up copy QCOS 0202-13

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

LIST OF POTENTIAL PROCEDURES

Annunciator Procedures

- 912-1 A-3, SERVICE WATER PUMP TRIP, Rev. 5
- 912-1 B-3, SERVICE WATER LOW PRESSURE, Rev. 6
- 901(2)-3 G-15, REACTOR VESSEL LOW LOW LEVEL, Rev. 18
- 901(2)-3 D-13, ELECT RELIEF VALVES 3A 3B OPEN, Rev. 7
- 901(2)-3 E-14, ACOUSTIC MON SAFETY RLF VALVES OPEN, Rev. 7
- 901(2)-3, A-16, PRI CNMT HIGH PRESSURE, Rev. 15
- 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, G-15, REACTOR VESSEL LOW LOW LEVEL, Rev. 17
- 901(2)-5 E-8, RX VESSEL HIGH LEVEL, Rev. 10
- 901(2)-5 F-8, RX VESSEL LOW LEVEL, Rev. 11

QCOP 0300-01, CRD System Startup and Operation, Rev. 32

QCOP 3200-05, Reactor Feed Pump Shutdown, Rev. 39

QCOP 3700-02, RBCCW System Startup and Operation, Rev. 29

QCOP 3900-01, Service Water System Operation, Rev. 17

QCGP 2-3, Reactor Scram, Rev. 88

QCGP 3-1, Reactor Power Operations, Rev. 86

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

QCOA 0203-01, Failure of a Relief Valve to Close or Reseat Properly, Rev. 13

QCOA 0300-06, Control Rod Drive Flow Control Valve Failure, Rev. 7

QCOA 3900-01, Service Water System Failure, Rev. 24

QCOA 6800-05, ATWS System Trouble, Rev. 7

QGA 100, RPV Control, Rev. 11

QGA 200, Primary Containment Control, Rev. 11

QGA 500-1, RPV Blowdown, Rev. 15

CREW TURNOVER

1.) Plant Conditions:

a.) Unit 1 is currently at 100% Power

b.) Unit 2 is at 100% Power.

c.) Technical Specification limitations:

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.) Electrical Maintenance and Engineering are performing an inspections of Bus 12 cubicle 10 and the feed breaker to the 1C Reactor Feed pump. The breaker failed to close during power ascension 2 days ago.

3.) Evolutions/maintenance for the oncoming shift:

a) Perform QCOS 0202-13, Monthly Testing Reactor Recirculation System Air Operated Valves.

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

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Event Description: Perform QCOS 0202-13, Monthly Testing Reactor Recirculation System Air Operated Valves.

Time	Position	Applicant's Actions or Behavior
	SRO	Directs BOP to complete QCOS 0202-13, Monthly Testing Reactor Recirculation System Air Operated Valves.
	BOP	Contacts and directs Chemistry Technician to close the 1-220-151 valve.
SIM OP ROLE PLAY: Wait 2 minutes, then call back from the Reactor Building Sample Panel as the Chem Tech and report: **"The 1-220-151 valve is closed."**		
	BOP	Verifies AO 1-220-44 is open at the 901-4 panel.
	BOP	Places the AO 1-220-44 valve C/S to "CLOSE" and verifies the valve closes.
	BOP	Places the AO 1-220-44 valve C/S to "OPEN" and verifies the valve opens.
	BOP	Verifies AO 1-220-45 is open at the 901-4 panel.
	BOP	Places the AO 1-220-45 valve C/S to "CLOSE" and verifies the valve closes.
	BOP	Places the AO 1-220-45 valve C/S to "OPEN" and verifies the valve opens.
	BOP	Contacts and directs Chemistry Technician to slowly re-open the 1-220-151 valve.
SIM OP ROLE PLAY: As the Chem Tech, wait 30 seconds after being directed to re-open the 1-220-151 valve, then report: **"The 1-220-151 valve is open."**		
	BOP	Dispatches an EO or Chemistry Technician to verify the 1-220-151 valve at the Reactor Building Sample Panel is open.
SIM OP ROLE PLAY: As the EO/CT, wait 30 seconds after being directed to <u>verify</u> open the 1-220-151 valve, then report: **"The 1-220-151 valve is open."**		
	ATC	Performs independent verification of AO 1-220-44 and AO 1-220-45 valves.
	BOP	Completes surveillance paperwork and turns it over to the Unit Supervisor for review.
	ATC	Monitors reactor power, pressure, and water level.
End of Event 1		

Quad Cities 2018 NRC Scenario No.1 Event No. 2 Page 1 of 2 Event Description: 1A Service Water pump trips with the 1B Service Water pump degraded.		
Time	**Position**	**Applicant's Actions or Behavior**
SIM OP: Trip the 1A Service Water pump **imf sw01a** Verify trigger 8 goes true, if not, manually initiate trigger 8 **trg! 8**		
Key Parameter Response: Degraded Service Water Pump Supply and Discharge Header pressures as indicated on PI ½-3940-4 and PI ½-3940-18 on the 912-1 panel. Expected Annunciator(s): 912-1 A-3, 912-1 B-3		
	BOP	Acknowledges 912-1 A-3, SERVICE WATER PUMP TRIP, alarm and reports the 1A Service Water pump has tripped.
SIM OP NOTE: As directed by the Lead Evaluator, silence the Fire alarm: **bat fire** and report the following FAS alarm message: **64-13 DIESEL FIRE PUMP A RUNNING**		
	BOP	Reports the 1B Service Water pump has auto-started and monitors Service Water pressures on PI ½-3940-4 and PI ½-3940-18.
	SRO	Directs BOP to take actions per QCAN 912-2 A-3.
	BOP	Dispatches EOs to the Crib House and Bus 13 to determine cause of 1A Service Water pump trip and monitor 1B Service Water pump operation.
	BOP	Reports Service Water pressures are 90 psig and lowering.
	SRO	May set scram criteria of 80 psig and lowering.
	BOP	Starts a Standby Service Water pump and reports Service Water pressure > 80 psig and rising into the green band.
Event 2 continued		

Quad Cities 2018 NRC Scenario No.1 Event No. 2 Page 2 of 2 Event Description: 1A Service Water pump trips with the 1B Service Water pump degraded		
Time	**Position**	**Applicant's Actions or Behavior**
SIM OP ROLE PLAY: As the EO, wait 1 minute, then report back from Bus 13: **"The 1A Service Water pump breaker has tripped on overcurrent."**		
SIM OP ROLE PLAY: If dispatched to the Crib House, as the EO, wait 2 minutes, then report back (if the 1B SWP is still running): **"The 1B Service Water pump shaft is vibrating and the pump sounds like its cavitating."**		
	BOP	Starts a standby Service Water pump and secures the 1B Service Water pump with SRO concurrence and/or direction.
	BOP	Reports Service water parameters are holding steady and in band.
	BOP	Directs EO at the Crib House to shut down the ½A Fire Diesel after a 30 minute run time per QCOP 4100-03.
SIM OP ROLE PLAY: As the Crib House EO, acknowledge the direction, then wait 30 minutes and stop the ½A Fire Diesel and place it back in standby using remote function FP01R: **irf fp01r off** then insert **irf fp01r auto**		
	SRO	Contacts Electrical and Mechanical Maintenance to start work packages on the 1A and 1B Service Water pumps respectively.
	ATC	Monitors reactor power, pressure, and water level.
End of Event 2		

Quad Cities 2018 NRC Scenario No.1 Event No. 3 Page 1 of 2 Event Description: Level transmitter LT 1-0263-23B fails downscale.		
Time	**Position**	**Applicant's Actions or Behavior**
SIM OP: Fail LT 1-0263-23B downscale **trg! 1**		
Key Parameter Response: LI 1-0263-100B fails downscale Expected Annunciator(s): 901-3 G-15, 901-4 H-19, 901-5 D-4 Automatic Actions: None		
	BOP	Acknowledges and reports 901-3 G-15, REACTOR VESSEL LOW LOW LEVEL, alarm and refers to procedure.
	ATC	Reports LI 1-0263-100B, Rx Vessel NR LVL, is indicating downscale.
	ATC	Dispatches an EO to the 2201-70A/B panels in the Aux Electric Room.
	SRO	Contacts Instrument Maintenance to assist in troubleshooting the downscale failure of LI 1-0263-100B.
SIM OP ROLE PLAY: As the EO dispatched to the Aux Electric Room, wait 2 minutes, then call back and report the following: **"The Master Trip Unit (MTU) LIS 1-0263-25B is reading downscale and the gross failure and trip lights are lit. Also slave trip units (STU) 1-0263-25-1B and 1-0263-25-2B have gross fail and trip lights lit. There is <u>ONLY</u> a gross fail light lit on STUs 1-0263-25-3B, 4B, and 5B."**		
SIM OP ROLE PLAY: As the Instrument Maintenance Supervisor, wait 3 minutes then report: **"Some initial readings at the MTU indicate the input signal from LT 1-0263-23B is out of range low. We'll prepare a troubleshooting package for the level transmitter."**		
	SRO	Refers to Technical Specifications and/or QCOS 1600-05 Attach. A, QCOS 1600-06 Attach. A, K, and L, QCOA 6800-05.
Event 3 continued		

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Event Description: Level transmitter LT 1-0263-23B fails downscale.

Time	Position	Applicant's Actions or Behavior
	SRO	Enters the following LCOs: TS 3.3.2.2, Cond. A (7 days to restore RFP and Main Turbine high water level trips) TS 3.3.3.1, Cond. A (30 days to restore PAM RPV water level instrument) TS 3.3.5.1, Cond. C, Function 3.c, (24 hours to restore HPCI high level trip) TS 3.3.5.2, Cond. C, Function 2, (24 hours to restore RCIC high level trip) TS 3.3.5.2, Cond. B, Function 1, (24 hours to place RCIC low-level channel in trip) TS 3.3.5.1, Cond. B, Functions 1.a, 2.a, (24 hours to place low-level channel in trip for CS and LPCI) TS 3.3.5.1, Cond. F, Function 5.a, (8 days to place ADS low-level channel in trip) TS 3.3.4.1, Cond. A (14 days to place ATWS-RPT channel in trip)
End of Event 3		

Quad Cities 2018 NRC Scenario No.1 Event No. 4 Page 1 of 2 Event Description: Spurious opening of the 1B ERV		
Time	**Position**	**Applicant's Actions or Behavior**
SIM OP: Spuriously open the 1B ERV by failing the set point to 0 ramped over 3 minutes. **imf ad01b 0 3**:		
Key Parameter Response: ~40 MW(e) loss, Torus temp.↑, RPV pressure and level fluctuation Expected Annunciator(s): 901-3 D-13, 901-3 E-14, 901-3 E-16 Automatic Actions: TCVs adjust to restore RPV pressure.		
LEAD EVALUATOR NOTE: The opened relief valve will result in an erroneous thermal power calculation ~2966 Mw(th). The crew may take one of following actions: • Reduce reactor power by notching control rod(s) and lowering Recirc pump speeds until thermal power is ≤ 2957 MW(th). • Contact a QNE to calculate a corrected heat balance. • Hold power constant until the relief valve is closed.		
	BOP	Acknowledges annunciators and reports the "B" Relief valve has an open indication.
	ATC	Reports loss of approx.40 MW(e), RPV water level and pressure fluctuations.
	BOP	Places the B ERV key switch to OFF and reports the indication lights are still lit.
	BOP	Checks acoustic monitors and temperature recorder at the 901-21 panel and reports "B" Relief valve indicates open and tailpipe temperature is rising.
	SRO	Directs BOP take to actions per QCOA 0203-01.
	BOP	Cycles the key switch between MANUAL and AUTO and reports the valve did NOT close.
	SRO	Sets scram criteria of 95°F Torus temperature.
	BOP	Dispatches an EO to the 2201-32 panel (2nd floor Rx Bldg) to pull the normal and reserve control power fuses for the "B" Relief valve.
	BOP	Starts Torus Cooling per QCOP 1000-09.
Event 4 continued		

Quad Cities 2018 NRC Scenario No.1 Event No. 4 Page 2 of 2 Event Description: Spurious opening of the 1B ERV		
Time	**Position**	**Applicant's Actions or Behavior**
SIM OP ROLE PLAY: As the EO dispatched to the 2201-32 panel to pull the fuses for the B Relief Valve, wait 3 minutes, then insert the following command: **irf ad02r remove** Call back and report: **"Step D.4 of QCOA 0203-01 is complete. The Normal and Reserve control power fuses for the B Relief Valve are removed."**		
	BOP	Reports the "B Relief valve indicating lights are OUT and annunciators 901-3 D-13 and 901-3 E-14 have reset.
	BOP	Checks acoustic monitor for the "B" Relief valve and reports the valve indicates closed.
	BOP	Monitors Torus temperature and "B" Relief valve tailpipe temperature.
	BOP	Reports annunciator 901-3 E-16 has reset.
	SRO	Enters the following LCOs: TS 3.4.3, Safety and Relief Valves, Cond. A (14 days to restore valve) TS 3.5.1, ECCS-Operating, Cond. H (14 days to restore valve) TS 3.6.1.6, Low Set Relief Valves, Cond. A (14 days to restore valve)
End of Event 4		

Quad Cities 2018 NRC Scenario No.1 Event No. 5 Page 1 of 1 Event Description: Fail the CRD Flow Control Valve Closed		
Time	**Position**	**Applicant's Actions or Behavior**
SIM OP: Fail the CRD Flow Control Valve closed using malfunction RD11 ramped over 2 minutes: **imf rd11 0 2:00**		
Key Parameter Response: On the 901-5 panel: PI 1-340-4, Drive Wtr Press, PI 1-340-5, Clg Wtr Press, FI 1-340-8, Drive Wtr Flow, and FI 1-340-9, Clg Wtr Flow all indicate 0. The CRD Flow Controller 1-340-1 also indicates 0 cooling water flow. Expected Annunciator(s): None Automatic Actions: None		
	ATC	Reports CRD cooling water and drive water flows and pressures are lowering.
	SRO	Directs actions of QCOA 0300-06, Control Rod Drive Flow Control Valve Failure.
	ATC	Places the FIC 1-340-1, CRD Flow Controller in MANUAL and adjusts flow to 60 gpm.
	SRO	Contacts Instrument Maintenance to investigate and troubleshoot the CRD Flow Controller.
SIM OP ROLE PLAY: If contacted, as the IM Supervisor, state: **"We will start a troubleshooting work package. We will require the FIC to be in manual to start, but may require switching over to the standby FCV later if necessary."**		
	BOP	Monitors Unit and Common panels.
End of Event 5		

Quad Cities 2018 NRC Scenario No.1 Event No. 6 Page 1 of 1 Event Description: 1B RFP steam leak / Emergency Power Reduction		
Time	**Position**	**Applicant's Actions or Behavior**
SIM OP: As the EO on rounds, call in on the emergency phone and report: **"There is a steam leak on the 1B RFP just upstream of the pump discharge. It appears to be getting worse.**		
Key Parameter Response: None Expected Annunciator(s): None Automatic Actions: None		
	SRO	Directs an Emergency Power Reduction to 9.8 Mlb/hr feedwater flow rate to secure the 1B Reactor Feed Pump.
	ATC	Reduces Recirc Pump speeds using the MANUAL RUNBACK pushbutton or the LOWER FAST pushbuttons on the individual speed controllers.
	BOP	Dispatches EOs and Shift Supervisor to the RFP room to secure area.
SIM OP ROLE PLAY: As EO and or Shift Supervisor, acknowledge call to secure RFP area due to steam leak.		
	ATC	Verifies feedwater flow is $\leq$ 9.8 Mlb/hr.
	ATC	Inserts CRAM rods until reactor operation is within MELLLA boundary.
	BOP	Verifies 1B RFP Aux Oil Pump control switch has a red target and the yellow AUTO TRIP light is lit.
	BOP	Places control switch for the 1B RFP to STOP and verifies the following: • RPV water level is stable • No flow indicated on the RFP flow meter 1-640-24B • 1B RFP Aux Oil Pump starts • RFP currents on running pumps is $\leq$ 1115 amps • RFP discharge header pressure is stable
End of Event 6		

Quad Cities 2018 NRC Scenario No.1 Event No. 7 Page 1 of 1 Event Description: Isolate 1B RFP steam leak		
Time	**Position**	**Applicant's Actions or Behavior**
	BOP	Closes MO 1-3201B RFP DISCH VLV and contacts EO at RFP area.
SIM OP NOTE: After the 1B RFP Discharge Valve is closed, trip the pump using malfunction FW01B to prevent a restart: **"imf fw01b"**		
SIM OP ROLE PLAY: If contacted, after the discharge valve is closed, as the EO, report: **"The steam leak has subsided, but the suction valve 1-3499-16 will have to be closed to completely isolate the leak. The valve is accessible and Mechanical Maintenance is here to assist."** Call back after 4 minutes and report: **"The 1-3499-16, B RFP suction valve, is closed and the steam leak has stopped."**		
	BOP	Refers to QCOP 3200-05, Reactor Feed Pump Shutdown.
	BOP	Verifies RFP suction pressure is $\geq$ 250 psig.
	BOP	Places the COND PMP SELECTOR to OFF.
	BOP	Places the control switch 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 7		

Quad Cities 2018 NRC Scenario No.1 Event No. 8/9/10 Page 1 of 4 Event Description: Small Break LOCA—1A Recirc Pump Suction Pipe Break		
Time	**Position**	**Applicant's Actions or Behavior**
SIM OP: Insert a .25% break in the 1A Recirc Pump Suction piping ramped over 10 minutes using malfunction RR10A: **imf rr10a .25 10:**		
Key Parameter Response: Drywell and Torus pressure/temperature rises, RPV water level lowers when injection sources are lost, RPV pressure lowers 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. 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	Starts all available Drywell cooling.
	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 all rods in, RPV water level < 0 inches and recovering, RPV pressure < 1060 psig and controlled with Main Turbine Bypass Valves.
	SRO	Enters QGA 100 on low RPV water level. Re-enters QGA 100 and enters QGA 200 on high Drywell pressure.
	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.
Events 8/9/10 continued		

Quad Cities	2018 NRC Scenario No.1	Event No. 8/9/10	Page 2 of 4

Event Description: LOCA—1A Recirc Pump Suction Pipe Break

Time	Position	Applicant's Actions or Behavior
	BOP	Reports Bus 11 is NOT energized from Transformer 12 and dispatches an EO to investigate.
SIM OP ROLE PLAY: As the EO sent to Bus 11, report: **"The feed breaker from T-12 to Bus 11 is still open, there are no targets up. The breaker appears to be misaligned. EMs are here to assist."**		
	SRO	Directs RPV water level band of 0 to +48 inches using Preferred Systems: HPCI/RCIC/SSMP.
	BOP	Attempt to align HPCI for injection and reports the HPCI Stop Valve will not open. Dispatches an EO and Maintenance to investigate.
SIM OP ROLE PLAY: As the EO and/or MM, wait 5 minutes, then report: **"The HPCI Stop Valve stem is bound, the valve cannot be opened."**		
	ATC/BOP	Starts RCIC and/or SSMP for injection and attempts to control RPV water level within 0 to +48 in. band.
	SRO	Directs an RPV cooldown at < 100°F/hr using main turbine bypass valves.
	SRO	Directs actions of QGA 200, Primary Containment Control.
	SRO	Directs BOP to spray the Torus when Torus pressure exceeds 2.5 psig.
	BOP	Starts Torus sprays 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.
CT1	SRO	Directs BOP to initiate Drywell Sprays.
CT1	BOP	Starts Drywell Sprays 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.
Events 8/9/10 continued		

Quad Cities	2018 NRC Scenario No.1	Event No. 8/9/10	Page 3 of 4
Event Description: LOCA—1A Recirc Pump Suction Pipe Break			

Time	Position	Applicant's Actions or Behavior
	BOP	Starts Torus Cooling on one or both loops and monitors Torus temperature.
	BOP	Reports containment Hydrogen level at 0%.
	ATC	Reports RPV water level lowering.
	SRO	Directs second CRD pump started for injection per QCOP 0300-16.
SIM OP ROLE PLAY: If dispatched to valve in the 2nd set of CRD suction filters, wait 2 minutes, insert the remote function RD01R, then as EO report: **irf rd01r both** **"The 2nd set of CRD filters are valved in."**		
	BOP	Starts second CRD pump.
	SRO	Directs Alternate Systems (Detail E) for injection.
	SRO	Directs ATC to inject with SBLC system.
	ATC	Starts both SBLC pumps and reports system injection.
CT2	SRO	Directs BOP to inhibit ADS.
CT2	BOP	Inhibits ADS.
	BOP	Reports RPV water level at -59 in. and lowering.
	BOP/ATC	Reports Group I isolation on RPV low-low level.
SIM OP NOTE: At the direction of the Lead Evaluator, modify the 1A Recirc suction leak to 1.5% ramped over 3 minutes using malfunction RR10A: **mrf rr10a 1.5 3:00**		
	SRO	Transitions to Alternate Level Control Leg of QGA 100 and verifies at least 2 Injection Subsystems (Detail F) are available.
	BOP	Reports all Low Pressure ECCS Subsystems and Safe Shutdown Makeup Pump are available.
Events 8/9/10 continued		

Quad Cities	2018 NRC Scenario No.1	Event No. 8/9/10	Page 4 of 4
Event Description: LOCA—1A Recirc Pump Suction Pipe Break			

Time	Position	Applicant's Actions or Behavior
	BOP	Bypasses 2/3 Core Height interlock after receiving permission from the Unit Supervisor.
	BOP	Reports RPV water level at -142 inches.
	SRO	Verifies all Injection Subsystems are lined up with pumps running.
	SRO	Transitions to QGA 500-1 before RPV water level drops to -162 inches.
	SRO	Verifies all rods are in.
	SRO	Verifies Drywell pressure < 2.5 psig.
	SRO	Directs BOP to maximize injection to the RPV.
	BOP	Secures Containment Sprays and Torus Cooling.
	SRO	Verifies Torus level is above 5 ft.
CT3	SRO	Directs all 4 ADS Valves opened and switches left in Manual.
CT3	BOP	Opens all 4 ADS Valves and leaves switches in the MAN position.
	BOP	Confirms and reports 4 ADS valves are open by acoustic monitor indication on the 901-21 panel.
	SRO	Directs use of Emergency Depressurization Systems (Detail O).
	BOP	Verifies all ECCS Subsystems inject at RPV pressure < 325 psig
	ATC	Monitors and reports RPV water level rising.
	ATC	Reports RPV water level above -142 in. (TAF) and rising.
CT4	SRO	Directs BOP/ATC to establish RPV water level band of 0 to +48 in.
CT4	SRO	Directs BOP to secure/operate ECCS systems as necessary to restore and maintain RPV water level in band.
CT4	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

Exelon Nuclear

2018 ILT NRC Exam Scenario

Scenario Number:

NRC Scenario 2

Revision Number: 00

Date: 03/15/2018

Developed by: _____ _____
Instructor Date

Validated by: _____ _____
SME or Instructor Date

Reviewed by: _____ _____
Operations Representative Date

Approved by: _____ _____
Training Department Date

Appendix D **Scenario Outline** **Form ES-D-1**

Facility: Quad Cities Scenario No.: **2018 NRC Scenario 2** Op-Test No.: ILT 16-1
Examiners: _____ Operators:_____
_____ _____
_____ _____

Initial Conditions:
Plant is currently at 25% power with a startup in progress. Drywell and Torus are inerted.
Turnover: Establish Drywell/Torus DP per QCOP 1600-20, and continue startup to full power.

Event No.	Malf. No.	Event Type*	Event Description
1	None	BOP N	Establish Drywell/Torus D/P ≥ 1.0 psid IAW QCOP 1600-20.
2	None	ATC R	Raise reactor power IAW QCGP 1-1, QCGP 4-1, and the REMA.
3	RD02R	ATC/SRO C/TS	Stuck control rod, perform QCOA 0300-02.
4	AOAI1564025	BOP C	Degraded EHC pump with a failure of the standby pump to autostart.
5	NM02A	ATC I/TS	Upscale failure of Flow Converter #1. Inoperable OPRMs, APRMs, and RBM.
6	SW12A	BOP C	Swap TBCCW pumps based on field report of eminent failure of running pump.
7	TC16A-C TC17A-C RD13A/B	CREW M	Group I / Hydraulic ATWS
8	SL01A/B	ATC C	Failure of first SBLC pump to inject

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

ES-301-4 Quantitative attributes:
Total Malfunctions (5-8): **6**
Malfunction(s) after EOP (1-2): **E8**
Abnormal Events (2-4): **E3, 4, 5, 6**
Major Transient(s) /E-Plan entry (1-2): **E7**
EOPs (1-2): **QGA 100 & 200**
EOP Contingencies (0-2): **QGA 101**
Critical Tasks (2-3): **4**

ES-301-5 Quantitative attributes:
BOP Normal: **E1**
ATC Reactivity (1 per set): **E2**
BOP I/C (4 per set): **E4 & 6**
ATC I/C (4 per set): **E3 & 5**
SRO-I I/C (4 per set inc 2 as ATC):
E3, 4, 5, 6,
SRO Tech Spec (2 per set): **E3 & 5**
ALL Major Transients (2 per set) **E7**

SUMMARY:

- Initial Conditions:
    - Plant startup is in progress after a weekend outage. Presently at 25% power. Primary containment is inerted. The crew entered the following TS LCO 3.6.2.5 Condition A, 1 hour ago.
    - Establish Drywell/Torus D/P $\geq$ 1.0 psid per QCOP 1600-20 and continue the startup per QCGP 1-1. Raise reactor power with recirculation flow and control rods IAW with the REMA.
- Event 1: The BOP verifies torus O_2 concentration is < 4.0% then realigns the containment inerting valves to the drywell per QCOP 1600-20 step F.28 to establish a $\geq$1.0 psid differential pressure.
- Event 2: The ATC raises reactor power using control rods IAW QCGP 1-1, QCGP 4-1, and the REMA.
- Event 3: During the power ascension, control rod H-8 will stick at position 20. The ATC will take actions per QCOA 0300-02, but will be unable to move the control rod. The US will declare the control rod inoperable and enter TS LCO 3.1.3 Condition A.
- Event 4: The “A” EHC pump degrades as indicated by a lowering EHC pump current, pressure and annunciator 901-7 A-6, EHC FLUID LOW PRESSURE. The BOP will start the “B” EHC pump and secure the “A” EHC pump.
- Event 5: Flow Converter #1 fails upscale rendering the following equipment inoperable: APRMs 1, 2, and 3, RBM 7, and OPRMs 1, 2, 3, and 7. The US will enter the applicable Tech Specs..
- Event 6: An EO on rounds will call into the control room and report that the 1A TBCCW pump motor is sounding abnormally noisy and is hot to the touch. The ATC will start the 1B TBCCW pump and secure the 1A TBCCW pump.
- Event 7: The DEHC pressure regulators fail upscale resulting in a Group I isolation on low RPV pressure with the mode switch in RUN. The control rods fail to insert (Hydraulic ATWS) and the crew will enter QGA 100 and transition to QGA 101. The crew will establish a water level in a band of -35 to -162 inches, RPV pressure between 800 to 1000 psig, and individually insert control rods with the RMCS.
- Event 8: When the ATC injects with SBLC, the first selected pump will fail to start. The ATC will then select the other SBLC pump and verify the system properly initiated.
- 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 injecting boron (prior to exceeding 110°F torus temperature) and/or inserting control rods, to prevent exceeding primary containment design limits.

Critical Task #2: With a reactor scram required and the reactor not shutdown, and conditions for ADS blowdown are met, INHIBIT ADS to prevent an uncontrolled RPV depressurization, to prevent an uncontrolled RPV depressurization resulting in a significant power excursion.

Critical task #3: During an ATWS with conditions met to perform power/level control, TERMINATE AND PREVENT INJECTION, with the exception of boron, CRD, and RCIC into the RPV until conditions are met to re-establish injection.

Critical task #4: When conditions are met to re-establish injection, use available injection systems to MAINTAIN RPV water level above the Minimum Steam Cooling RPV Water Level (-162”).

EXERCISE PERFORMANCE OBJECTIVES

SR-1600-P01	(Freq: LIC=I) Given a reactor plant during a startup, inert the primary containment using electric vaporizers and the reactor building ventilation in accordance with QCOP 1600-20.
SR-0002-P04	(Freq: LIC=B) (ILT-MP) Given a 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-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-1100-P02	(Freq; LIC=B) Given a reactor plant with an ATWS, inject boron prior to reaching 110 degrees torus water temperature OR if core instability is observed in accordance with QGA 101 and QCOP 1100-02. (Important PRA Operator Action – starting SBLC has a RAW of 4.4)
SR-0203-P07	(Freq: LIC=B) Given a reactor plant in a QGA condition, inhibit ADS in accordance with QGA 100 or QGA 101.
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-0001-P45	(Freq: LIC=A) Given a reactor plant in a QGA condition, verify the proper actuation of containment isolations and ECCS and emergency DG starts in accordance with QGA 100 or QGA 101.
SR-0001-P11	(Freq: LIC=B) Given a reactor plant with an ATWS, take action to reduce heat input into containment in accordance with QGA 101. (SOER 83-8 r11) ((ATWS is a key event in 2 of the top 100 most probable PRA Core Damage Sequences).
SR-0001-P12	(Freq; LIC=B) Given a reactor plant with an ATWS and conditions are met to intentionally lower RPV water level (power/level control), terminate and prevent all RPV injection except for boron, CRD, and RCIC in accordance with QGA 101. (SOER 83-8 r11)
SR-0001-P13	(Freq: LIC=B) Given a reactor plant with an ATWS and conditions are met to re-establish RPV injection during power/level control, use Preferred ATWS Systems (QGA Detail G) to attempt to maintain RPV water level between MSCRWL (Minimum Steam Cooling Reactor Water Level) and the level to where it was lowered in accordance with QGA 101.
SR-1000-P01	(Freq: LIC=B) (ILT-MP) Given a reactor plant either operating or shutdown, start the RHRSW system and RHR system in torus cooling in accordance with QCOP 1000-4 and QCOP 1000-9 or QCOP 1000-30. (Important PRA Operator Action – starting torus cooling in conjunction with other actions has a maximum RAW of 2.1E+4) (recovery of torus cooling after failure terminates 20 of top 100 core damage sequences)

Simulator Setup:

1. Reset to IC-17 (25% power).
2. Go to **RUN.**
3. Verify the following RWM Sequence is loaded: **5PESU2**
4. Establish Containment inerting lineup and OOS equipment:
    a. Turn off the Pumpback Air Compressor and equalize Drywell and Torus pressure.
    b. Perform QCOP 1600-20 steps F.1.e., F.3, F.4, F.6.e.(1A Fan), F.9, F.10.a.d., F.23.b. and F.24.
    c. Pump the sumps prior to running the caep file.
    d. Equalize DW and Torus D/P.

    (The following commands to be utilized for this scenario are contained in the CAEP file: 2018 NRC Scenario 2.cae)
5. Insert Commands for setup:
    - **imf rd02r 3031 20** (Stick control rod H-8 at position 20)
    - **ior aopi1514012 (1) 1300 4:00** (Override PI 1-5650-12 to 1300# ramped over 4 min. on trigger 1)
    - **ior aoai1564025 (1) 22 4:00** (Override 1A EHC pump current meter to 22 amps ramped over 4 min. on trigger 1)
    - **imf ser0783 on (1 3:30)** (Override alarm 901-7 A-6 on after a 3.5 min delay on trigger 1)
    - **ior loil15650panp off (1 3:20)** (Override the 1A EHC pump "Normal Pressure" light off on trigger 1 after a 3:20 delay)
    - **trgset 2 "zdhis1564022(3)"** (Set trigger 2 true when the 1A EHC pmp c/s is in N_A_TRIP)
    - **trg 2 "dor aoai1564025"** (Delete the override on the 1A EHC pump current meter)
    - **trgset 3 "zdihs1564034(4)"** (Set trigger 3 true when the 1B EHC pump c/s is in N-A_CLS)
    - **trg 3 "dor aopi1514012"** (Delete the override on PI 1-5650-12)
    - **imf sl01a** (SBLC pump A trip)
    - **imf sl01b** (SBLC pump B trip)
    - **trgset 4 "zdihs11130301(2)"** (Set trigger 2 true when SBLC c/s is in SYS1)
    - **trg 4 "dmf sl01b"** (Delete SBLC pump B trip)
    - **trgset 5 "zdihs11130301(4)"** (Set trigger 4 true when SBLC c/s is in SYS2)
    - **trg 5 "dmf sl01a"** (Delete SBLC pump A trip)
    - **imf tc16a (6) 1200** (EHC Dome Press Xmtr EPT1 upscale failure)
    - **imf tc16b (6) 1200** (EHC Dome Press Xmtr EPT2 upscale failure)
    - **imf tc16c (6) 1200** (EHC Dome Press Xmtr EPT3 upscale failure)
    - **imf tc17a (6) 1050** (EHC Throttle Press Xmtr 112A upscale failure)
    - **imf tc17b (6) 1050** (EHC Throttle Press Xmtr 112B upscale failure)
    - **imf tc17c (6) 1050** (EHC Throttle Press Xmtr 112C upscale failure)
    - **trgset 7 "zdihs1564034(4)"** (Set trigger 7 true when the 1B EHC pmp c/s is in N_A_CLS)
    - **trg 7 "dmf ser0783"** (Delete override on 901-7 A-6 alarm)
    - **irf hv02r ro** (Rack out the 1B DW/Torus Purge Fan breaker)

Scenario commands on next page

5. Scenario commands (continued):

    - **irf rd06r3031r inop** (Isolate HCU 3031)
    - **imf rd13a 100** (Insert a 100% Hydraulic lock on the North SDV)
    - **imf rd13b 100** (Insert a 100% Hydraulic lock on the South SDV)
    - **trg! 1** (Degrade the 1A EHC pump)
    - **imf nm02a 100 00:00:05** (Fail Flow Converting #1 upscale ramped over 5 sec.)
    - **imf sw12a 54 10:** (Degrade the 1A TBCCW pump 54% ramped over 10 min.)
    - **trg! 6** (Initiate a Group I by failing the DEHC pressure xmtrs)
    - **irf rd04r close** (Close the CRD 25 valve)
    - **irf qg08r activate** (Install jumpers to bypass all reactor scrams)
    - **irf qg14r activate** (Remove the ARI fuses)
    - **irf rd04r open** (Open the CRD 25 valve)

6. Start both CAMs, clear annunciators and select one to Drywell and one to Torus.

7. Lineup for Torus inerting per QCOP 1600-20 step F.24.

8. Install “Protected System” placards and/or rings on the following equipment:
    - None

9. Place the Zinc Injection placard on the 1 RFP.

10. Provide a “Startup REMA, Turnover, and marked up copies of QCOP 1600-20 thru step F.26 and QCGP 1-1 thru step F.9.s.

LIST OF POTENTIAL PROCEDURES

Annunciator Procedures

- 912-1 D-2, TURBINE BUILDING COOLING WATER LOW PRESSURE, Rev. 4
- 901(2)-3 G-15, REACTOR VESSEL LOW LOW LEVEL, Rev. 18
- 901(2)-3 D-13, ELECT RELIEF VALVES 3A 3B OPEN, Rev. 7
- 901(2)-3 E-14, ACOUSTIC MON SAFETY RLF VALVES OPEN, Rev. 7
- 901(2)-5 B-7, GROUP I ISOL CH TRIP, Rev. 20
- 901(2)-5 A-8, GROUP II ISOL CH TRIP, Rev. 14
- 901(2)-5 B-6, RWCU GRP 3 PCIS VALVES ISOLATION, 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)-5 D-6, FLOW CONVERTER REFERENCE FLOW OFF NORMAL ROD BLOCK, Rev. 7
- 901(2)-6 F-7, REACTOR FEED PUMP AUTO TRIP, Rev. 15
- 901(2)-7 A-6, EHC FLUID LOW PRESSURE, Rev. 4

QCOP 1600-20, Nitrogen Inerting of Primary Containment Using the Vaporizer(s) and Reactor Building Ventilation System, Rev. 33

QCOP 3800-02, Unit 1 TBCCW System Operation, Rev. 4

QCOP 5650-01, Unit 1 EHC System Operation, Rev. 39

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

QCOA 3200-01, Reactor Feed Pump Auto Trip, Rev. 23

QCGP 1-1, Unit 1 Normal Startup, Rev. 111

QCGP 3-1, Reactor Power Operations, Rev. 86

QCGP 4-1, Control Rod Movements and Control Rod Sequence, Rev. 48

QGA 100, RPV Control, Rev. 11

QGA 200, Primary Containment Control, Rev. 11

QGA 101, RPV Control (ATWS), Rev. 15

CREW TURNOVER

1.) Plant Conditions:

a.) Unit 1 is currently at 25% power with a startup in progress from a weekend maintenance outage.

b.) Unit 2 is at 100% Power.

c.) Technical Specification limitations:

a.) Hour 10/24, TS 3.6.2.5 Condition A, Drywell/Suppression chamber differential pressure < 1.0 psid.

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) Realign Torus purge valves and establish Drywell/Torus D/P $\geq$ 1.0 psid IAW QCOP 1600-20, step F.27.

b.) Continue plant start up in accordance with QCGP 1-1, Normal Unit 1 Startup, at step F.9.t. and the REMA.

Quad Cities 2018 NRC Scenario No.2 Event No. 1 Page 1 of 1

Event Description: Realign Torus purge valves to establish Drywell/Torus D/P ≥ 1.0 psid per QCOP 1600-20.

Time	Position	Applicant's Actions or Behavior
	SRO	Directs BOP to establish Drywell/Torus D/P ≥ 1.0 psid IAW QCOP 1600-20, step F.27.
	BOP	Closes AO 1-1601-60, TORUS 18-INCH VENT VLV.
	BOP	Closes AO 1-1601-56, TORUS PRG VLV.
	BOP	Closes AO 1-1601-24, VENT TO RX BLDG EXH SYS.
	BOP	Opens AO 1-1601-21, DW PRG VLV.
	ATC	Monitors reactor power, pressure, and water level.
End of Event 1		

Quad Cities 2018 NRC Scenario No.2 Event No. 2 Page 1 of 1

Event Description: Raise reactor power IAW QCGP 1-1, QCGP 4-1, and the REMA.

Time	Position	Applicant's Actions or Behavior
Key Parameter Response: Reactor pressure, APRM power, and Generator MW(e) increase Expected Annunciator(s): Possible 901-5 C-3 Automatic Action(s): None		
	SRO	Directs ATC to raise power with control rods in accordance with the REMA.
	ATC	Updates control room on Unit 1 reactivity addition.
	ATC	Selects the control rod on the Rod Select Matrix.
	ATC	Verifies selection of the proper control rod on the RWM and Control Rod Sequence Book, its present position, and bounds on the RWM.
	ATC	Communicates the intended maneuver to the BOP.
	BOP	Verifies the following for each control rod to be moved: • Correct control rod is selected • Initial position • Target position • Method of movement (single notch or continuous) • Direction of movement
	BOP	Informs the ATC that the selected control rod may be moved.
	ATC	Performs another self-check then moves the control rod to the desired position.
	ATC	Initials the Move Sheet when the control rod is at the target position.
	ATC	Verifies RPV water level, pressure, and APRM response.
SIM OP NOTE: The above sequence of steps for control rod movement is repeated for each control rod moved.		
End of Event 2		

Quad Cities 2018 NRC Scenario No.2 Event No. 3 Page 1 of 3 Event Description: Stuck control rod, perform QCOA 0300-02. Enter TS 3.1.3.		
Time	**Position**	**Applicant's Actions or Behavior**
Key Parameter Response: Control rod H-8 sticks at position 20 Expected Annunciator(s): None Automatic Actions: None		
	ATC	ATC selects and begins withdrawing control rod H-8 to position 48 as required.
	BOP	Verifies selection and withdrawal of control rod H-8.
	ATC	Reports control rod H-8 will not withdraw beyond position 20.
	SRO	Directs actions of QCOA 0300-02, Inability to Drive a Control Rod: Control Rod Stuck.
	ATC	Verifies the following: • No control rod block exists • 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.
	ATC	Attempts to withdraw control rod H-8 again and reports no rod movement.
	ATC	Throttles MO 1-302-8, CRD DRIVE WTR PCV, in 50 psid increments to a maximum of 400 psid, alternating between rod movement attempts and raising Drive Water pressure.
	ATC	Dispatches an EO to monitor local Drive Water pressure at PI 1-302-69, CRD DRIVE WATER HEADER.
Event 3 continued		

Quad Cities 2018 NRC Scenario No.2 Event No. 3 Page 2 of 2

Event Description: Stuck control rod, perform QCOA 0300-02. Enter TS 3.1.3.

Time	Position	Applicant's Actions or Behavior
SIM OP ROLE PLAY: As the EO dispatched to the 1st Floor Rx. Bldg. wait 1 minute, then call back and report: **"I have located PI 1-302-69 and am standing by. Initial reading is ~1400 psig. The Field Supervisor will monitor HCU 30-31."** After the ATC increases Drive Header pressure, report back when requested: **"Drive Header pressure is ~1450 psig."**		
TIME COMPRESS: State to the crew: After several attempts at sequentially higher pressures you are still unable to move control rod H-18.		
LEAD EVALUATOR ROLE PLAY: As the QNE, state that you: **"Will contact Maintenance to prepare a work package to troubleshoot and make repairs to the HCU 30-31 as required. I will prepare and load a new sequence to account for control rod H-8 coming out-of-service, after which rod withdrawal can continue."**		
	SRO	Directs ATC to return Drive Water pressure to 260 to 320 psid and hold power constant.
	ATC	Throttles MO 1-302-8 and restores Drive Water pressure within the 260 to 320 psid band.
	SRO	Declares control rod H-8 inoperable and refers to QCOS 0300-14 and Technical Specifications.
	SRO	Enters TS 3.1.3, Control Rod Operability, Condition A.
LEAD EVALUATOR ROLE PLAY: As the QNE, if asked by the SRO about the locations of "slow" control rods in the core, state: **"There are NO "slow" control rods adjacent to H-8."**		
	SRO	Determines control rod separation criteria is met as there are NO "slow" control rods adjacent to H-8.
	SRO	Dispatches an EO to isolate HCU 30-31 per QCOP 0300-08.
SIM OP ROLE PLAY: As EO, wait 4 minutes, insert the remote function RD06R, then call back and report: **"HCU 30-31 is isolated and the amphenols are disconnected."** **irf rd06r3031r inop**		

End of Event 3

Appendix D **Required Operator Actions** **Form ES-D-2**

Quad Cities 2018 NRC Scenario No.2 Event No. 4 Page 1 of 1 Event Description: Degraded 1A EHC pump with a failure of the standby pump to autostart.		
Time	**Position**	**Applicant's Actions or Behavior**
SIM OP: Insert a full core hydraulic lock using malfunction RD13A/B prior to manually initiating trigger 1 to degrade the 1A EHC pump: **imf rd13a 100** **imf rd13b 100** then **trg! 1**		
Key Parameter Response: PI 1-5650-12 lowers to 1300 psig and 1A EHC OIL PMP CUR meter lowers to 22 amps. 1A EHC pump "NORMAL PRESS" light is extinguished. Expected Annunciator(s): 901-7 A-6 Automatic Actions: None		
	BOP	Acknowledges annunciator 901-7 A-6, EHC FLUID LOW PRESSURE, and reports the following: EHC pressure is 1300 psig and the Normal Pressure light is out. 1A EHC pump current is 22 amps and low out of band.
	SRO	Directs actions of QCAN 901(2)-7 A-6 and/or QCOP 5650-01.
	BOP	Starts the 1B EHC pump and dispatches an EO to the EHC pump skid.
SIM OP ROLE PLAY: As the EO dispatched to the EHC pump skid, wait 2 minutes, then report: **"The 1B EHC pump is running normally, however the 1A EHC pump is noisy and the motor casing is hot."**		
	BOP	Secures the 1A EHC pump by placing the control witch in PTL.
	ATC	Monitors reactor power, pressure, and water level.
End of Event 4		

Quad Cities 2018 NRC Scenario No. 2 Event No. 5		Page 1 of 2
Event Description: Upscale failure of Flow Converter #1.		
Time	**Position**	**Applicant's Actions or Behavior**
SIM OP: Fail Flow Converter #1 upscale using malfunction NM02A: **imf nm02a 100**		
Key Parameter Response: • Flow Converter #1, "UPSCALE/TRIP" and "COMPARATOR TRIP" lights lit. • APRM 1, 2, and 3 meters indicate upscale (125) when selected to FLOW. • ROD OUT PERMIT light on the 901-5 panel is extinguished • Channel "A" 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 / LEAD EVALUATOR 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 #1.		
	BOP	Reports the UPSCALE/INOP and COMPARATOR indicating lights for Flow Converter #1 are lit. (located at top of 901-37 panel Bay 1)
FLOOR INSTRUCTOR ROLE PLAY: Flow Converter Units 1 and 2 are located inside the 901-37 panel in Bay 1 and Bay 5 respectively. These units are NOT modeled in the simulator. If Bay Door 1 is opened to check Flow Converter #1, state: **"The "UPSCALE/TRIP" and "COMPARARTOR TRIP" LEDs are lit."** If Bay Door 5 is opened to check Flow Converter #2, state: **"The "OK" LED is lit."**		
Event 5 continued		

Quad Cities	2018 NRC Scenario No.2	Event No. 5	Page 2 of 2

Event Description: Upscale failure of Flow Converter #1.

Time	Position	Applicant's Actions or Behavior
	BOP	At the 901-37 panel, places the mode switch for APRMs 1, 2, and 3 and RBM 7 to the FLOW position and reports: • APRMs 1, 2, and 3 flow bias signals are upscale high > 110%. • RBM 7 flow bias signal is upscale high > 110%.
	SRO	Directs the ATC to insert a ½ scram on RPS channel A.
	ATC	Depresses the RPS Channel A scram pushbutton and verifies: • Channel A Scram Solenoid Group lights are out. • Annunciator 901-5 A-10 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)
LEAD 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 A.		
End of Event 5		

Quad Cities	2018 NRC Scenario No.2	Event No. 6	Page 1 of 1

Event Description: Swap TBCCW pumps due to running pump degradation.

Time	Position	Applicant's Actions or Behavior
SIM OP: Degrade the 1A TBCCW pump 54% ramped over 10 minutes using malfunction SW12A: **imf sw12a 54 10:**		
Key Parameter Response: PI 1-3840-2, U1 DISCH HDR PRESS ↓ Expected Annunciator(s): 912-1 D-2 Automatic Actions: None		
	BOP	Acknowledges and reports annunciator 912-1 D-2, TURB BLDG COOLING WATER LOW PRESSURE.
	BOP	Reports TBCCW Discharge Header pressure 35 psig and lowering.
	SRO	Sets scram criteria at inability to restore TBCCW pressure > 35 psig.
	BOP	Starts the 1B TBCCW pump and reports TBCCW Header pressure 35 psig and rising into green band.
	BOP	Dispatches EO to check Heat Exchangers, Expansion Tank, and the TBCCW pumps for leaks and abnormal operation.
SIM ROLE PLAY: If dispatched, as the EO, wait 3 minutes and report: **"The 1A TBCCW pump motor is running very hot and noisy. There are no leaks and the Expansion Tank has a normal level."**		
	BOP	Secures the 1A TBCCW pump and verifies TBCCW Discharge Header pressure is steady at ~40 psig.
	ATC	Verifies TBCCW cooled equipment, (ie. CRD, Condensate, and EHC pumps), are operating properly.
End of Event 6		

Quad Cities	2018 NRC Scenario No.2	Event No. 7/8	Page 1 of 4
Event Description: Group I / Hydraulic ATWS / SBLC Pump Failure			

Time	Position	Applicant's Actions or Behavior
SIM OP: Initiate a Group I isolation and a full core hydraulic ATWS by failing the DEHC pressure transmitters upscale using trigger 6: **trg! 6**		
Key Parameter Response: RPV pressure/level increase, RFP +48" trip, No control rod movement on manual / auto scrams. Expected Annunciator(s): 901-5 A-1, 901-5 B-4, 901-5 B-7 Automatic Actions: Group I, II, III isolations, ERVs open to control RPV pressure		
	ATC	Reports RPV pressure rapidly lowering and a Group I isolation.
	ATC	Inserts a manual reactor scram and reports a Hydraulic ATWS.
	SRO	Enters QGA 100, then transitions to QGA 101 and directs actions.
CT2	BOP	Inhibits ADS and places Core Spray Pumps in PTL.
	ATC	Actuates the ARI system.
	ATC	Injects SBLC by selecting SYS 1 or SYS 2 and reports the pump has failed to inject.
CT1	ATC	Selects the other SBLC system for injection and verifies the following: • Squib continuity light is OFF • Flow light is lit • RWCU system isolates. • PI 1-1140-1, PMP DISCH PRESS $\geq$ Reactor pressure
	ATC	Reports SBLC system injection and Tank Level.
	ATC	Verifies Recirc pumps operating at minimum speed.
	SRO	Verifies reactor power > 5% and directs ATC to trip the Recirc pumps.
	ATC	Trips both Recirc pumps by closing discharge valves, using Emergency Stop Pushbutton, or ASD control switches.
CT1	SRO	Directs ATC to insert control rods per QCOP 0300-28.
CT1	ATC	Bypasses the RWM and begins inserting control rods starting from the center and spiraling out.
Event 8 continued		

Quad Cities	2018 NRC Scenario No.2	Event No. 7/8	Page 2 of 4
Event Description:	Group I / Hydraulic ATWS / SBLC Pump Failure		

Time	Position	Applicant's Actions or Behavior
	ATC	Adjusts Drive Water pressure as necessary by dispatching an EO to close the 1-301-25 valve and/or manually adjusting the CRD FCV.
SIM OP ROLE PLAY: If dispatched to close the 1-301-25 valve, wait 3 minutes then insert the command using remote function RD04R and report back: **irf rd04r close**		
	ATC	Bypasses the SDV high level scram and attempts to reset the scram.
	ATC	Contacts an EO to place jumpers in the 901-15 and 901-17 panels per QCOP 0300-28 to bypass reactor scram signals.
SIM OP ROLE PLAY: As the EO, directed to install jumpers, wait 2 minutes, then insert the command using remote function QG08R and report back to the ATC: **irf qg08r activate**		
	ATC	Resets the reactor scram and verifies scram valves are closed.
	ATC	If necessary, dispatches an EO to the Aux Electric Room to de-energize ARI by pulling fuses in the 2201-70A/B panels per QCOP 0300-28.
SIM OP ROLE PLAY: If dispatched to pull ARI fuses in the Aux Electric Room, wait 2 minutes, then insert remote function QGR14R and report back to the ATC: **irf qg14r activate**		
	ATC	If desired, directs an EO to re-open the 1-301-25 valve.
SIM OP ROLE PLAY: If dispatched to open the 1-301-25 valve, wait 3 minutes then insert the command using remote function RD04R and report back: **irf rd04r open**		
	ATC	Directs Shift Supervisor to individually scram control rods from the 901-16 panel when the SDV has drained, (as indicated by alarm 901-5 A-14 resetting).
SIMOP ROLE PLAY: After 3 minutes or at the direction of the Lead Evaluator, report to the ATC: **"Individual control rod scramming is NOT successful."**		
Event 8 continued		

Quad Cities	2018 NRC Scenario No.2	Event No. 7/8	Page 3 of 4
Event Description: Group I / Hydraulic ATWS / SBLC Pump Failure			

Time	Position	Applicant's Actions or Behavior
	SRO	Directs action of QGA 101, Level Leg.
	SRO	Directs BOP to verify isolations and auto actions for 0" RPV water level.
	SRO	Verifies all MSIVs are closed.
CT3	SRO	Directs BOP and ATC to terminate and prevent all RPV injection except Boron, CRD, and RCIC.
CT3	ATC	Terminates and prevents injection from the 901-5 panel as follows: • Places the Low Flow FWRV in MANUAL and reduces output to zero. • Places A & B FWRVs in MANUAL and reduces both controller outputs to zero. • Closes A & B FWRV Isolations MO 1-3206A/B.
CT3	BOP	Trip-Latches the HPCI turbine.
	SRO	Directs ATC to lower RPV water level and report at -35 inches.
	ATC	Reports RPV water level at -35 inches and lowering.
	SRO	Records RPV water level when one of the following conditions are met: • Reactor power < 5% • RPV water level at TAF • All ADS valves closed and Drywell pressure stays < 2.5 psig
	SRO	Assigns RPV water level band of -162" and the recorded level at which one of the three conditions was met.
CT4	SRO	Directs ATC to maintain RPV water level in assigned band using Preferred ATWS Systems (Detail G).
CT4	ATC	Re-establishes injection using Condensate/Feedwater system.
	SRO	Directs actions of QGA 101, Pressure Leg.
	BOP	Reports ADS valves cycling to control RPV pressure.
	SRO	Directs BOP to maintain an RPV pressure band of 800 to 1000 psig using ADS valves.
Event 8 continued		

Quad Cities	2018 NRC Scenario No.2	Event No. 7/8	Page 4 of 4
Event Description: Group I / Hydraulic ATWS / SBLC Pump Failure			

Time	Position	Applicant's Actions or Behavior
	SRO	Enters QGA 200 on Torus temperature > 95°F and/or Torus level > 2".
	SRO	Directs BOP to establish and maximize Torus Cooling in both RHR loops.
	BOP	Places RHR Loop A/B CONTAINMENT CLG switch 17 to ON.
	BOP	Places Loop A/B RHR SW START PERMISSIVE switch 19 to MANUAL OVERRIDE.
	BOP	Opens MO 1-1001-5A/B to approx. 40%.
	BOP	Starts an RHRSW pump on each loop and throttles MO 1-1001-5A to maintain discharge pressure $\geq$ 20 psig higher than RHR pressure and flow < 3600 gpm per pump.
LEAD EVALUATOR NOTE: If both RHRSW pumps are started on a loop, then discharge pressure is maintained < 350 psig and flow < 7200 gpm.		
	BOP	Opens MO 1-1001-34A/B, TORUS TEST OR SPRAY VLV.
	BOP	Starts an RHR pumps on each loop.
	BOP	Throttles open MO 1-1001-36A/B, TORUS H2O TEST VLV, to maintain RHR pump discharge pressure between 100 and 250 psig.
	BOP	Throttles closed MO 1-1001-16A/B, RHR HX BYP VLV, as required to control Torus temperature.
	BOP	If necessary, obtains SRO permission to bypass 2/3 Core Height Interlock and places switch 18 to MANUAL OVERRD.
	BOP	Monitors and reports containment parameters as requested.
SIM OP NOTE: With concurrence of the Lead Evaluator, the scenario is terminated when RPV water level is being controlled in band, RPV pressure is stable and in band, and reactor power is lowering.		
End of Scenario		

Facility: _Quad Cities Scenario No.: _____3_____ Op-Test No.: _2018____

Examiners: _____ Operators: _____

_____ _____

Initial Conditions: 75% RTP, YELLOW PRA Risk, Day 1 of 7 of Technical Specification 3.6.4.3.A.1 for the 'A' train of SBGT OOS for planned maintenance.

Turnover: Perform QCOS 5600-08, "Turbine Generator Quarterly Testing" step H.1 testing the Main Stop Valves (MSVs).

Critical Tasks: #1: Given an operating reactor plant with a primary system discharging into the reactor building and with Standby Gas Treatment failing to auto start. Take action to start the standby SBGT train.

#2: Given an operating reactor plant with a primary system discharging into the reactor building and the discharge cannot be isolated, INITIATE an emergency depressurization when two or more areas exceed the maximum safe operating levels of the same parameter (radiation, temperature, or water level).

Event No.	Position	Event Type*	Event Description
1	BOP	N	Test the MSVs IAW surveillance procedure QCOS 5600-08. Begin at step H.1.
2	ATC	C	Running CRD pump experiences a motor shaft shear and continues to run degraded. ATC carries out the actions of QCOA 0300-01. Swap to standby CRD pump.
3	BOP	C	1A RBCCW pump fails due to a motor fault. BOP swaps to ½C RBCCW pump. Pump will need to be aligned to Unit 1.
4	ATC BOP	C/TS	Control Rod Drift alarm received. Rod (F-8) drifts outward with operators unable to maintain at position '00'. ATC carry out actions of QCOA 0300-11and US enter TS 3.1.3.C.1 Control Rod Operability. BOP will SCRAM F-8 from 901-16.
5	ATC	R/TS	Trip of the 1A ASD/RR pump due to a failed power cell. Single loop operations IAW QCOA 0202-04. Emergency power reduction IAW QCGP 3-1. Enter TS 3.4.1 and acknowledge actions for TS 3.2.1, 3.2.2, 3.2.3, 3.3.1.1, and 3.3.2.1.
6	Crew	M	Fuel failure results in high-high off gas radiation alarms. Enter QCOA 1700-04. Manually SCRAM and enter QCGP 2-3. Report from the field indicates a leak in the SDV piping. Enter EOPs QGA 300 and QGA 100, and AOP QCOA 0201-05. Enter contingency EOP QGA 500-1 for 2 areas exceeding max safe radiation levels.
7	BOP	C	Failure of 'B' SBGT train to start on low reactor water level. BOP carry out actions of QCOA 7500-02.

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

Event 1: Test the MSVs IAW surveillance procedure QCOS 5600-08, “Turbine Generator Quarterly Testing.” Perform procedure starting at step H.1.

Event 2: Running CRD pump experiences a motor shaft shear and continues to run degraded. ATC carries out the actions of QCOA 0300-01, “Control Rod Drive Pump Failure” swaps to standby CRD pump.

Event 3: Annunciator 912-1, D-1 RBCCW Low Pressure is received in the main control with an indication of 1A RBCCW tripped. 1A RBCCW pump failed due to a motor fault as indicated by an overcurrent flag locally at its breaker. BOP swaps to ½C RBCCW pump which will need to be aligned to Unit 1 after verifying that it is not required for Unit 2 operations IAW QCOP 3700-02, “RBCCW System Startup and Operation”. Operators will monitor various temperatures IAW QCOA 3700-01, “RBCCW Low Pressure” but temperatures will not exceed limits or require isolating the system as long as operators establish flow from the ½C RBCCW pump.

Event 4: Control Rod (F-8) Drift alarm received for intermediate position control rod. Rod will be drifting outward with operators unable to maintain at position ‘00’. ATC carry out actions of QCOA 0300-11, “Control Rod Drift” and US enter TS 3.1.3.C.1 Control Rod Operability. BOP will SCRAM F-8 from the 901-16 panel.

Event 5: Trip of the 1A ASD/RR pump. Single loop operations IAW QCOA 0202-04, “Reactor Recirc Pump Trip – Single Pump”. Emergency power reduction IAW QCGP 3-1, “Reactor Power Operations”. Enter TS 3.4.1 and acknowledge actions for TS 3.2.1, 3.2.2, 3.2.3, 3.3.1.1, and 3.3.2.1.

Event 6: Fuel defect results in HIGH-HIGH Off gas radiation alarms. Enter QCOA 1700-04, Abnormal Off Gas Radiation.” Procedure will eventually direct operators to manually initiate a reactor SCRAM and enter QCGP 2-3, “Reactor SCRAM.” Report from the field indicates that a failure in the SDV piping has occurred. Enter EOPs QGA 300, “Secondary Containment Control” and QGA 100, “RPV Control” and AOP QCOA 0201-05, “Primary System Leaks (Slow Leaks) Outside Primary Containment”. Enter contingency EOP QGA 500-1, “RPV Blowdown” for 2 areas exceeding max safe radiation levels.

Event 7: Failure of ‘B’ SBGT train to start initially on low reactor water level. BOP carry out actions of QCOA 7500-02, “Standby Gas Treatment Fan Tripped or Failed to Start Automatically”. Train will start with operator manual action from the main control room.

EXERCISE PERFORMANCE OBJECTIVES

Objective	Objective Description
SR-0300-P04	Given an operating reactor plant with a CRD pump trip, start the standby CRD pump in accordance with QCOA 0300-01.
SR-3700-P01	Given a reactor plant at power when a loss of RBCCW (low pressure or high temperature) occurs, take action to determine the cause and to reduce RBCCW load in accordance with QCOA 3700-01 or QCOA 3700-03.
SR-0300-P03	Given an operating reactor plant with a drifting control rod, insert/disarm the drive and attempt to determine the cause in accordance with QCOA 0300-04 and QCOA 0300-11.
SR-0002-P03	Given a reactor plant at power with a reactor scram, place the plant into a stable condition in accordance with QCGP 2-3.
SR-0002-P04	Given a reactor plant at power, perform a power change discernible on neutron monitors using control rods in accordance with QCOP 0280-01, QCGP 3-1 and QCGP 4-1.
SR-0001-P45	Given a reactor plant in a QGA condition, verify the proper actuation of containment isolations and ECCS and emergency DG starts in accordance with QGA 100 or QGA 101.
SR-0202-P04	Given an operating reactor plant with a loss of one reactor recirculation pump, take actions to determine the cause, stabilize plant parameters and to exit the instability region in accordance with QCOA 0202-04.
SR-0202-K32	Given Reactor Recirculation System operability status OR key parameter indications, various plant conditions and a copy of Tech Specs, DETERMINE Tech Spec compliance and required actions, if any.
SR-0001-P42	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 and QGA 500-1. (Important PRA Operator Action - emergency depressurization terminates 15 of top 100 Core Damage Sequences) (BWROG SC-1.2)
SR-7500-P02	SR-7500-P02 (Freq: LIC=B) Given SBGTS in a standby lineup with an automatic initiation signal and a failure of SBGTS to start or start properly, recognize the SBGTS failure and manually start the standby SBGTS train in accordance with QCOA 7500-02.
SR-1700-P03	Given a reactor plant at power and a fuel clad failure or high activity in off-gas, take action to reduce the release in accordance with QCOA 1700-05 or QCOA 1700-04.
SR-0001-P42	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 and QGA 500-1.

Simulator setup:

1. Reset to IC-20 (Approximately 75% power).
2. Go to **RUN**
3. Verify 1A EHC pump is on
4. Verify the following RWM Sequence is loaded: 5PESU2
    a. Mark up the Control Rod Move Sheet to reflect all rods withdrawn up to Step 36.

(Commands to be utilized during this scenario are contained in the CAEP file: 2018 NRC Scenario 3.cae)

5. Insert Commands for setup:

imf PC09B
Manually Close 'A' SBGT 2-7503 Valve
Override lights off for 1-7503 Valve
ior LOIL275031 OFF
ior LOIL275032 OFF
trgset 4 "ZDIHS10590300(1)"
imf RD14B 80 (4)
imf rm0109 (4) 35 25:
imf rm0111 (4) 38 25:
imf rm0112 (4) 36 25:
imf rm0113 (4) 38 25:
ior DIHS10590303 norm

Commands to execute during the scenario

imf rd08a 100 'A' CRD Pump Reduced Capacity
ior aoai103023a .2 Lower 1A CRD pump current as indicated on 1-340-1A
imf sw06a 1A RBCCW Pump Trip
imf RD04R2231 Rod F-8 Drifts Out
irf RD06R2231R inop Isolate / Disarm F-8
imf RR01A Trip of the 'A' ASD
imf cr01 80 2: Fuel damage
irf sw10r run EDG CWP Start

6. Take the following equipment OOS (hang INFO Card):
    - 1/2A SBGTS Mode Selector Switch to OFF

7. Complete the following Control Panel setup items:
    - Verify the LOCA TRIP ENABLED labels are above the 1A and 1C Circ Water Pumps.

8. Provide a current revision of the following procedures, signed off as specified:
    - QCOS 5600-08, up to H.1

9. Ensure (1) orange ring is available to provide equipment status.

10. Ensure 2 EST's are available to provide equipment status.

CRITICAL TASKS:

Critical Task #1: Given an operating reactor plant with a primary system discharging into the reactor building and with Standby Gas Treatment failing to auto start. Take action to start the standby SBGT train.

Critical Task #2: Given an operating reactor plant with a primary system discharging into the reactor building and the discharge cannot be isolated, INITIATE an emergency depressurization when two or more areas exceed the maximum safe operating levels of the same parameter (radiation, temperature, or water level).

LIST OF POTENTIAL PROCEDURES

Annunciator Procedures

- 901-5, F-2, CRD CHARGING WATER LOW PRESSURE
- 912-1, C-1, RX BUILDING CLOSED CLG WATER PUMP TRIP
- 912-1, D-1, RX BUILDING COOLING WATER LOW PRESSURE
- 901-05 A-3 ROD DRIFT
- 901-4 A-1 REACTOR RECIRCULATION CONTROL SYSTEM MAJOR FAILURE
- 901-4 A-3 RECIRCULATION PUMP A LOW DIFFERENTIAL PRESSURE
- 901-4 A-5 REACTOR RECIRCULATION CONTROL SYSTEM ADJUSTABLE
- SPEED DRIVE MINOR FAILURE
- 901-4 B-2 RECIRCULATION ADJUSTABLE SPEED DRIVE A TRIP
- 901-5 E-8 RX VESSEL HIGH LEVEL
- 901-5 F-8 RX VESSEL LOW LEVEL
- 901-3 D-2 OFFGAS HI RADIATION
- 901-55/56 A-1, DRYWELL HIGH RAD CONC
- 901-5 A-8 & D-8, GROUP 2 & CONTROL ROOM VENT ISOLATED
- 901-3 C-2, OFFGAS HIGH HIGH RADIATION
- 901-3 A-1, RX BLDG HI RADIATION
- 912-5 B-6, STANDBY GAS TREATMENT SYS B TROUBLE

QCOS 5600-08, Turbine Generator Quarterly Testing

QCOA 0300-01, Control Rod Drive Pump Failure

QCOP 0300-23, CRD Pump Changeover

QCOP 3700-02, RBCCW System Startup and Operation

QCOP 9950-20, Plant Process Computer Powerplex Core Power Distribution Calculation

QCOA 0202-04, Reactor Recirc Pump Trip—Single Pump

QCOA 1700-04, Abnormal Off Gas Radiation

QCOA 1700-05, Abnormal Main Steam Line Radiation

QCOA 1800-01, Area High Radiation

QCOP 2400-01, CAM System Operation

QCGP 2-3, Reactor Scram

QGA 100, RPV Control

QCOA 7500-02, Standby Gas Treatment Fan Tripped or Failed to Start Automatically

QGA 300, Secondary Containment Control

QGA 500-1, RPV Blowdown

QCOP 1000-05, Shutdown Cooling Operation

CREW TURNOVER

1. **Plant Conditions:**

   a.) Unit 1 is at 75% power holding load

   b.) Unit 2 is at 100% power.

   c.) Technical Specification limitations:

      (1) Unit 1: Day 1 of 7 of Technical Specification 3.6.4.3.A.1 for the 'A' train of SBGT OOS for planned maintenance.

      (2) Unit 2: None

   d.) On Line Risk is YELLOW.

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2.) Significant problems/abnormalities:

   a.) None

3.) Evolutions/maintenance for the oncoming shift:

   a) QCOS 5600-08, "Turbine Generator Quarterly Testing", step H.1.i, is to be completed as a PMT for MSV #4.

   b) Holding load for a scheduled control rod shuffle. The QNE will bring the Special Rod Maneuver sequence to the control room and load the RWM.

Quad Cities 2018 NRC Scenario No. 3 Event No. 1 Page 1 of 1

Event Description: Test the Turbine MSV's per QCOS 5600-08, "Turbine Generator Quarterly Testing"

Time	Position	Applicant's Actions or Behavior
SIM OP: None		
Key Parameter Response: None Expected Annunciator(s): None Automatic Actions: None		
	SRO	Directs and supervises QCOS 5600-08 (Turbine Generator Quarterly Testing) starting at step H.1.i
	BOP	Acknowledges the order and references QCOS 5600-08
	BOP	On Operator's Workstation select <TESTS><MSV-CV TEST>
	BOP	Test MSV #4 as follows:
	BOP	Select MSV #4
	BOP	Verify TEST PERMITTED indication is YES
	BOP	Verify MSV4 FA solenoid indicates de-energized
	BOP	Select TEST START
	BOP	Verify MSV #4 begins to slow close
	BOP	Verify the following TURB STOP VLV CLOSURE SCRAM SIGNAL relays drop out: • Relay 590-124G and Relay 590-124H
SIM OP ROLE PLAY: If requested, as the U2 ANSO report that relays 590-124G and 590-124H dropped out.		
	BOP	Visually verify valve closes on the screen trace AND by observing MSV4 FA solenoid status changing to display FAST CLOSE DETECTED
	BOP	Select TEST OFF
	BOP	Verify MSV #4 returns to the full open position
	BOP	Verifies MSV4 FA solenoid indicates de-energized
	BOP	Verifies the following TURB STOP VLV CLOSURE SCRAM SIGNAL relays pick up: • Relay 590-124G and Relay 590-124H
SIM OP ROLE PLAY: If requested as the U2 ANSO report that relays 590-124G and 590-124H picked up.		
End of Event 1		

Quad Cities 2018 NRC Scenario No. 3 Event No. 2 Page 1 of 2

Event Description: CRD Pump Shaft Shear (QCOA 0300-01)

Time	Position	Applicant's Actions or Behavior
SIM OP: When directed by the Lead Examiner, simulate a shaft shear of the 1A CRD pump by inserting the following two commands: **ior aoai103023a .2** **imf rd08a 100**		
Key Parameter Response: Lowering CRD pressures. Expected Annunciator(s): 901-5, F-2, CRD CHARGING WATER LOW PRESSURE Automatic Actions: None		
	ATC	Acknowledges annunciator 901-5 F-2, "CRD CHARGING WATER LOW PRESSURE," and reports CRD system conditions. Performs actions per the QCAN
	ATC/BOP	Dispatches EO to investigate cause of CRD low pressure.
	SRO	Directs ATC to perform QCOA 0300-01
	SRO	May set scram criteria of "2 or more accumulator trouble alarms AND charging water header pressure less than 940 psig for 20 minutes"
SIM OP ROLE PLAY: As EO dispatched to the CRD pump, wait 2 minutes and report the 1A CRD Pump is uncoupled from the motor.		
	SRO	Orders the 1B CRD Pump started per QCOP 0300-23 CRD PUMP CHANGEOVER
	ATC	Verifies the MO 1-301-2B, 1B PMP DISCH VLV, is closed for the standby pump.
	ATC	Starts the 1B CRD pump
	ATC	Verifies current is less than 34 amps on the 1-302-1B (QCAN 901-5 B-2).
	ATC	Throttles MO 1-301-2B to maintain 1400-1500 psig discharge pressure.
	ATC	Closes MO 1-301-2A.
	ATC	Trips the 1A CRD Pump
Event 2 continued		

Quad Cities 2018 NRC Scenario No. 3 Event No. 2 Page 2 of 2

Event Description: CRD Pump Shaft Shear (QCOA 0300-01)

Time	Position	Applicant's Actions or Behavior
	ATC	Dispatches EO to verify proper operation of running pump.
	BOP	Monitors Balance-of-Plant equipment.
SIM OP ROLE PLAY: As EO dispatched to the CRD pump, wait 2 minutes and report the 1B CRD pump sounds normal, no leaks, and oil levels are in band.		
	ATC	Dispatches EO to CLOSE the MIN FLOW ISOLATION Valve on A CRD Pump (1-301-254A) and OPEN the MIN FLOW ISOLATION Valve on B CRD Pump (1-301-254B).
SIM OP ROLE PLAY: As EO dispatched to the CRD pump, wait 2 minutes and report the 1B CRD pump Min Flow valve is Open and the 1A CRD Pump Min Flow Valve is Closed.		
	ATC	May adjust CRD Drive Water Press to 260-350 psig
	ATC	Throttles MO 1-302-8, DRIVE PRESS VLV (throttles closed valve to raise pressure).
	SRO	May direct an orange ring be placed on the 1A CRD Pump control switch.
End of Event 2		

Quad Cities 2018 NRC Scenario No. 3 Event No. 3 Page 1 of 1

Event Description: 1A RBCCW Pump failure

Time	Position	Applicant's Actions or Behavior
SIM OP: When directed by the Lead Examiner, trip the 1A RBCCW Pump: **imf sw06a**		
Key Parameter Response: 1A RBCCW Pump indication lights off, Lowering RBCCW pressures. Expected Annunciator(s): 912-1, C-1, RX BUILDING CLOSED CLG WATER PUMP TRIP 912-1, D-1, RX BUILDING COOLING WATER LOW PRESSURE Automatic Actions: None		
	BOP	Acknowledges annunciator 912-1 C-1, "RX BUILDING CLOSED CLG WATER PUMP TRIP," and reports the "1A RBCCW pump has tripped". Performs actions per the QCAN
	SRO	Directs the BOP to start the 1/2C RBCCW Pump
	BOP	Places the 1/2C RBCCW Pump in operation per QCOP 3700-02
LEAD EVALUATOR: If asked as Unit 2 US about the use of the ½C RBCCW Pump: The ½C RBCCW Pump is not needed for Unit 2.		
	BOP/SRO	Verifies that the ½C RBCCW Pump is not required for Unit 2 operation.
	ATC	Dispatches EO to investigate cause of the 1A RBCCW trip.
SIM OP ROLE PLAY: As the EO at the RBCCW Pumps: Acknowledge the directives to line up the ½C RBCCW Pump.		
SIM OP ROLE PLAY: As the EO investigating cause of 1A RBCCW pump trip, report that the 1A RPBBC breaker is tripped on overcurrent.		
	BOP	Directs EO to lineup the ½C RBCCW to Unit 1 and vent the pump (QCOP 3700-02 Step F.4.(b) through F.4.(d).)
SIM OP ROLE PLAY: As EO, wait 2 minutes and report back the ½C RBCCW pump is lined up to Unit 1 and vented per QCOP 3700-02 steps F.4.(b) through F.4.(d).		
	BOP	Starts the ½C RBCCW pump from Bus 19 (preferred) or Bus 29.
	BOP	Monitor RBCCW Discharge pressure for normal system pressure.
	ATC	If directed, monitors Reactor Recirculation pump seal temperatures.
End of event 3		

Quad Cities 2018 NRC Scenario No. 3 Event No. 4 Page 1 of 1

Event Description: Control Rod Drift

Time	Position	Applicant's Actions or Behavior
SIM OP: When directed by the lead evaluator, insert the malfunction to cause control rod F-8 to drift out of the core. (**imf RD04R2231)**		
Key Parameter Response: Control rod F-8 begins drifting out of the core Expected Annunciator(s): 901-05 A-3 ROD DRIFT Automatic Actions: None		
	ATC	Responds to unexpected annunciators and informs the Unit Supervisor.
	SRO	Directs actions of QCOA 0300-11, Control Rod Drift.
	SRO	Sets scram criteria of 2 or more rods drifting.
	ATC	Determines Control F-8 is drifting out of the core without latching
	ATC	Selects Control Rod F-8 and inserts the Control Rod to 00
	ATC	Determines the Control Rod will NOT stay inserted to at least position 04 with an insert signal applied
	ATC	Determines the reactor is <75% RTP and no power reduction is required
	SRO	Notifies the Shift Manager
	BOP	Contacts a Qualified Nuclear Engineer (QNE).
	BOP	Demands an OD-20 per QCOP 9950-20
	ATC	Determines the Control Rod will NOT latch at position 00
SIM OP ROLE PLAY: If contacted as the QNE, inform the operator that you will adjust the rod sequence to compensate for the inoperable control rod and verify no thermal limits were violated.		
	BOP	Requests the individual Control Rod scram test key
EVALUATOR ROLE PLAY: When requested, give the BOP the Individual Control Rod Scram Test Key.		
	BOP	Places the individual Control Rod scram test switch to the scram position at Panel 901-16.
	SRO	Enters Technical Specification 3.1.3 Condition C, Control Rod Operability.
End of event 4		

Quad Cities	2018 NRC Scenario No. 3	Event No. 5	Page 1 of 2
Event Description: 1A Recirc Pump Trip			

Time	Position	Applicant's Actions or Behavior
SIM OP: Trip the 1A Recirc Pump using malfunction RR01A: **imf rr01a**		
Key Parameter Response: RWL initially oscillates between 36 and 26 inches, Rx power drops to approx. 54%, Rx. pressure lowers to approx. 960 psig. Expected Annunciator(s): 901-4 A-1, 901-4 A-3, 901-4 A-5, 901-4 B-2, 901-5 E-8, 901-5 F-8 Automatic Actions: None		
	ATC	Reports the 1A Recirc Pump has tripped and refers to annunciator procedures.
	SRO	Sets scram criteria at: Trip of 2nd Recirc pump OR Indication of core instabilities.
	SRO	Directs action of QCOA 0202-04, Reactor Recirc Pump Trip—Single Pump.
	ATC	Monitors for oscillations in SRM period or LPRM/APRM levels.
	ATC	Places the RWM in Power Reduction Mode and depresses Array Mode to latch all CRAM rods.
	ATC	Inserts CRAM rods as needed to lower FCL and to avoid /exit Instability Regions I and II.
	ATC/BOP	Verifies speed on operating Recirc Pump is < 78% and maintains pump motor current < 770 amps as indicated on 1-202-730B, PMP CUR.
	ATC/BOP	Closes MO 1-202-5A, PMP DISCH VLV, then re-opens it after 5 minutes.
	ATC/BOP	Verifies operating Recirc loop flow is < 49 Mlb/hr.
	ATC/BOP	Monitor for 50°F differential temperature between Recirc Loops.
	BOP	Monitors RPV bottom head temperature.
	ATC/BOP	Dispatch EO to Bus 11 and 1A ASD to investigate.
SIM OP ROLE PLAY: If dispatched, as EO, wait 3 minutes then report from Bus 11: **"The breaker has tripped on overcurrent. I've contacted EM's to assist."**		
Event 5 Continued		

Quad Cities 2018 NRC Scenario No. 3 Event No. 5 Page 2 of 2

Event Description: 1A Recirc Pump Trip

Time	Position	Applicant's Actions or Behavior
	SRO	Notifies QNE and Generation Dispatch of tripped Recirc Pump.
	BOP	Contacts Chemistry department and informs then of load drop of > 30%.
	SRO	Enters TS 3.4.1 Condition C and contacts Instrument Maintenance to apply APRM/RBM set point changes for single loop operation. **TS**

SIM OP ROLE PLAY: If contacted, as the QNE, after being briefed on the 1A Recirc Pump trip inform the caller that you:

"Will implement the Single Loop Thermal Limits in Powerplex and review the control rod pattern for any adjustments that may be necessary."

SIM OP ROLE PLAY: If contacted, as Chemistry Technician state that you :

"Will start taking reactor coolant samples and analyzing for I-131 equivalent."

SIM OP ROLE PLAY: If contacted, as Generation Dispatch, acknowledge the down power due to the Recirc Pump trip.

SIM OP ROLE PLAY: If contacted, as Instrument Maintenance Supervisor, when contacted to apply APRM/RBM single loop set points state that:

"You will brief a crew on QCIPM 0756-06 and have them report to the control room to adjust the APRM/RBM set points."

End of Event 5

Quad Cities	2018 NRC Scenario No. 3	Event No. 6-7	Page 1 of 5

Event Description: Fuel Element Failure/QGA 300/QGA 500-1

Time	Position	Applicant's Actions or Behavior
SIM OP NOTE: When directed by the Lead Evaluator, cause a Fuel failure by inserting malfunction CR01: **imf cr01 80 2:**		
Key Parameter Response: Rising Rad levels for Off Gas, MSL, Drywell, Reactor & Turb Bldg Expected Annunciator(s): 901-3 D-2 OFFGAS HI RADIATION 901-55/56 A-1, DRYWELL HIGH RAD CONC 901-5 A-8 & D-8, GROUP 2 & CONTROL ROOM VENT ISOLATED 901-3 C-2, OFFGAS HIGH HIGH RADIATION Automatic Actions: Group 2 Isol, CR Vent Isol, Offgas Isolation 15-Min timer Starts		
	BOP	Responds to Annunciator OFF GAS HI RADIATION
	SRO	Enters and directs actions of QCOA 1700-04 and QCOA 1700-05
	SRO	Directs reactor power be held constant
	BOP	Reports Off Gas radiation levels are steadily rising as indicated on the A & B SJAE Rad monitors (901-10) and Recorder (901-02)
	BOP	Monitors Main Steam Line Radiation monitors and reports to US
	BOP	Monitors Area Radiation Monitors at the 901-11 panel and reports to US
	SRO/BOP	Evacuates any areas of high radiation and refers to QCOA 1800-01 as needed
	SRO/BOP	Notifies Chemistry and the QNE of abnormal Off Gas activity
	SRO/BOP	Directs Chemistry to draw Reactor Coolant and Recombiner outlet samples within 4 hours
	SRO/BOP	Checks for indications of high coolant conductivity
	SRO/BOP	Checks Chimney Gas Monitors for trends
SIM OP ROLE PLAY: Acknowledge directives as necessary if notified as Rad Protection and Chemistry personnel.		
	SRO/BOP	Notifies Rad Protection to perform surveys
	SRO/BOP	Notifies Chemistry to monitor CAMS
	BOP	Responds to Annunciator DRYWELL HIGH RAD CONC and notifies the Unit Supervisor
	SRO/BOP	(Continuous) Monitor Drywell Radiation Levels
	BOP	Confirms rising rad levels on RIS 1-2419 A& B at Panel 901-55 & 56
Event 6 continued		

Quad Cities 2018 NRC Scenario No. 3 Event No. 6-7 Page 2 of 5

Event Description: Fuel Element Failure/QGA 300/QGA 500-1

Time	Position	Applicant's Actions or Behavior
	BOP	Monitors Containment H_2 and O_2 levels per QCOP 2400-01
	SRO/BOP	Notifies Radiation Protection
	ATC	Responds to Annunciator GROUP 2 ISOL CH TRIP and CONTROL ROOM VENT ISOLATED and informs the Unit Supervisor
	SRO	May direct verification of Group 2 and CR Vent isolation
	ATC/BOP	As directed, verifies the Group 2 and CR Vent isolations
	BOP	Responds to Annunciator OFF GAS HIGH HIGH RADIATION
	BOP	Verifies Offgas 15-Minute Timer has started (at 901-10)
	SRO	When Offgas activity cannot be reduced < the Offgas HI HI Rad Alarm, directs actions to shutdown the reactor and isolate the release
	ATC	Manually scrams the reactor
SIMOP NOTE: When the Mode Switch is taken to Shutdown, verify trigger 4 goes true inserting the SDV leak **imf RD14B 80 (4)** **imf rm0109 (4) 35 25:** **imf rm0111 (4) 38 25:** **imf rm0112 (4) 36 25:** **imf rm0113 (4) 38 25:**		
	SRO	Directs closing of AO 1-5406 Offgas Discharge to Stack
	BOP	Closes AO 1-5406
	BOP	As directed, verifies that AO 1-5408A and AO 1-5408B close
	BOP	Manually initiates a Group 1 Isolation / Closes MSIVs and MSIV Drain valves
	SRO	Directs actions QCGP 2-3
	ATC	Places RX MODE switch to SHUTDOWN position
	ATC	Verifies the SDV vent and drain valves are closed
	ATC	Verifies that all Control Rods have fully inserted
	ATC	Makes scram report including entry into QGA 100 on RPV Water Level < 0 inches
Event 6 continued		

Quad Cities 2018 NRC Scenario No. 3 Event No. 6-7 Page 3 of 5

Event Description: Fuel Element Failure/QGA 300/QGA 500-1

Key Parameter Response: Increasing Radiation levels and Temperature in the Reactor Building. 'B' Train of SBGT fails to start.
Expected Annunciator(s):
901-3 A-1, RX BLDG HI RADIATION
912-5 B-6, STANDBY GAS TREATMENT SYS B TROUBLE
Automatic Actions: None

Time	Position	Applicant's Actions or Behavior
	ATC	Attempts to maintain RPV level 0 to +48" with preferred injection systems: • Verifies DFWLC in Single Element • May isolate Feed Water Reg Valve(s) • May place Low Flow Feed Reg Valve in Service • May secure unnecessary Feed and Condensate Pumps
	ATC	Verifies both Recirc Pumps running at minimum speed in Manual
	ATC	Reports when all rods are fully inserted
	SRO	Enters and directs actions of QGA 100
	SRO	Directs ATC/BOP to verify 0" isolations and auto-starts
EVALUATOR NOTE: The B SBGTS will not automatically start. **This is Event 7.**		
	BOP	Reports that the SBGTS failed to auto intiate.
	SRO	Directs actions from QCOA 7500-02
CT1	BOP	Manually starts 'B' Train of SBGTS
	ATC/BOP	Stabilize RPV Pressure < 1060 psig with Relief Valves
	ATC/BOP	Verifies Group 2 and 3 Isolations, RB vent isolation and SBGT start
	ATC	Verifies Main Turbine trips, all SV's, CV's, ISV's, IV's and extraction steam check valves close
	ATC	Verifies Main Generator Output Breakers tripped after 30 seconds and places control switches in PTL
	ATC	Verifies Main Generator Field and Exciter Field Breakers
	ATC	Verifies all 4 KV buses powered from T-12
	ATC	Verifies 1B Recirc Pump is running at minimum speed in Manual
	ATC	Starts the Control Room AFU Booster Fan within 40 minutes
Event 6 continued		

Quad Cities 2018 NRC Scenario No. 3 Event No. 6-7 Page 4 of 5

Event Description: Fuel Element Failure/QGA 300/QGA 500-1

Time	Position	Applicant's Actions or Behavior
	ATC	Dispatches EO to reset the Generator 86 Relays
	BOP	Responds to Annunciator RX BLDG HI RADIATION and informs the Unit Supervisor
	SRO	Enters QGA 300
	SRO	Orders the DGCWP to be started.
	ATC/BOP	Dispatches EO to start the U-1 EDG cooling water pump and monitor RB Basement water levels
SIM OP ROLE PLAY: If dispatched as EO, wait 2 minutes and start the Unit 1 EDG CWP: Report that there is no water in the RB Basement. **irf sw10r run**		
	BOP	Monitors Area Radiation levels from the 901-2 and 901-10 panels and reports QGA 300 Entry Conditions
	BOP	Reports 1rst and 2nd floor RB Radiation levels are alarming.
	BOP/ATC	Monitors Reactor Bldg Temperatures at Panel 901-21 (TR 1-1290)
	BOP/ATC	Directs EO with Rad Prot. support to investigate source of leak
SIM OP ROLE-PLAY: As EO, wait 2 minutes and report: **"There is steam and water coming from the South Scram Discharge Volume."**		
	BOP	Monitors Reactor Bldg ARMs on Panel 901-11
	BOP	Recognizes and reports that ARMs 9,11,12, and 13 (First and Second Floor Rx Building) are trending higher.
	BOP	Reports that First and Second Floor Rx Building Radiation levels are greater than Max Safe.
	ATC	May attempt to rest the Scram
CT2	SRO	When 2 areas (HPCI Room and Torus Area) exceed Max Safe radiation levels, enter and direct QGA 500-1
	SRO	Verifies all rods in
	BOP	Reports Drywell pressure < 2.5 psig and Torus level above 5 ft.
	SRO	Orders all 5 ADS valves opened and leave switches in Manual
Event 6 continued		

Quad Cities 2018 NRC Scenario No. 3 Event No. 6-7 Page 5 of 5

Event Description: Fuel Element Failure/QGA 300/QGA 500-1

Time	Position	Applicant's Actions or Behavior
CT2	BOP	Opens all 5 ADS valves and leaves all switches in the "MAN" position
	BOP	Verifies ADS valve positions at the 901-21 panel
	ATC/BOP	Starts cooldown to cold shutdown per QCOP 1000-05
	ATC	Monitors and controls RPV water level

SIM OP NOTE: When the RPV is depressurized per QGA 500-1 guidance, the BOP has started 'B' train of SBGTS, and/or at the discretion of the Lead Examiner, place the simulator in **FREEZE.**

Exelon Nuclear

2018 ILT NRC Exam Scenario

Scenario Number:

NRC Scenario 4

Revision Number: 00

Date: 03/15/2018

Developed by: _____ _____
Instructor Date

Validated by: _____ _____
SME or Instructor Date

Reviewed by: _____ _____
Operations Representative Date

Approved by: _____ _____
Training Department Date

Appendix D **Scenario Outline** **Form ES-D-1**

Facility: Quad Cities Scenario No.: 4 Op-Test No.: 2018

Examiners: _____ Operators: _____

_____ _____

Initial Conditions: 50% RTP. 'A' RPS bus on reserve power supply, equipment operators clearing tags for restoration of 'A' RPS MG Set during the shift.

Turnover: Perform QCOP 6600-05, "Shared Unit Diesel Generator Start Up." Load the diesel to 1000KW for 1 hour.

Critical Tasks: #1: With a reactor SCRAM required and the reactor not shutdown, initiate ARI to depressurize the SCRAM air header and insert control rods.

#2: Given an operating reactor plant when a station blackout occurs, take actions to monitor plant parameters and restore electrical power using the emergency DGs, SBO DGs, or unit 4KV crossties in accordance with QCOA 6100-04, QCOA 6100-03 and/or QCOP 6500-08.

#3: Given an operating reactor plant with a rupture in the primary containment system and torus level cannot be maintained above 11 feet, PREVENT HPCI operation provided HPCI operation is NOT needed for core cooling.

#4: Given an operating reactor plant with a rupture in the primary containment system and torus level cannot be maintained above 11 feet, INITIATE an emergency depressurization.

Event No.	Position	Event Type*	Event Description
1	BOP	N / TS	Perform QCOP 6600-05 and load the diesel to 1000KW for 1 hour.
2	ATC	C/TS	'A' RPS bus reserve feed fails due faulted EPA breaker opening. ½ scram and ½ containment isolations received. Take actions per QCOA 7000-01, "120 VAC Reactor Protection Bus Failure". Restore RPS bus with QCOP 7000-03, "Unit 1 RPS MG Sets".
3	BOP	C/TS	Report from EO in ½ EDG room indicates starting air leak on EDG. BOP shuts down the ½ EDG IAW QCOP 6600-06, "Diesel Generator ½ Shutdown"..
4	ATC	C	Seismic event results in a turbine trip and an electrical ATWS. Enter QGA 101 and QCOA 0010-09. ARI manual actuation successful at inserting all control rods.
5	Crew	M	After shock seismic event results in Loss of Offsite Power and Torus Leak. Enter QCOA 6100-03 and QCOA 1600-05. Prevent HPCI operation when it is determined that Torus level cannot be maintained above 11 feet. Enter contingency EOP QGA 500-1 due to inability to maintain torus level above 11ft.
6	BOP	C	Unit 1 EDG fails to auto start on LOOP. Manual start will be successful. SBO diesel started to power Bus 13-1/18 per QCOA 6100-04.
7	BOP	C	ERVs D and E actuators fail due to the seismic event. Supplement Emergency Depressurizaton using alternate systems.

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

Event 1: Perform QCOP 6600-05, “Shared Unit Diesel Generator Start Up” and load the diesel to 1000KW for 1 hour. Enters TS 3.8.1.B

Event 2: ‘A’ RPS bus reserve feed fails due faulted EPA breaker opening. ½ scram and ½ containment isolations received. Take actions per QCOA 7000-01, “120 VAC Reactor Protection Bus Failure”. Report to the control room that the ‘A’ RPS MG Set is available. Restore RPS bus with the ‘A’ RPS MG Set IAW QCOP 7000-03, “Unit 1 RPS MG Sets”. Enter TS 3.3.6.2.A and TS 3.3.7.1.A.

Event 3: A report will be received from an EO in the ½ EDG room indicating a starting air leak on the EDG and a recommendation to unload and shutdown the EDG. BOP unloads and shuts down the ½ EDG IAW QCOP 6600-06, “Diesel Generator ½ Shutdown”. Enter TS 3.8.3.D.

Event 4: Seismic event results in a turbine trip and an electrical ATWS. Enter QGA 101, “RPV Control (ATWS) and QCOA 0010-09, “Earthquake.” ARI manual actuation is successful at inserting all control rods.

Event 5: After shock seismic event results in Loss of Offsite Power and Torus Leak. Enter QCOA 6100-03, “Loss of Offsite Power,” QCOA 1600-05, “Torus Leak,” and QGA 200, “Primary Containment Control.” Prevent HPCI operation when it is determined that Torus level cannot be maintained above 11 feet. Enter contingency EOP QGA 500-1 due to inability to maintain torus level above 11ft.

Event 6: Unit 1 EDG fails to auto start on LOOP. Manual start will be successful. SBO diesel manually started to power Busses 13-1/18 per QCOA 6100-04, “Station Blackout.”

Event 7: ERVs D and E actuators fail due to the seismic event. Supplement blowdown using alternate depressurization systems (Detail O).

CRITICAL TASKS:

Critical Task #1: With a reactor SCRAM required and the reactor not shutdown, initiate ARI to depressurize the SCRAM air header and insert control rods.

Critical Task #2: Given an operating reactor plant when a station blackout occurs, take actions to monitor plant parameters and restore electrical power using the emergency DGs, SBO DGs, or unit 4KV crossties in accordance with QCOA 6100-04, QCOA 6100-03 and/or QCOP 6500-08.

Critical task #3: Given an operating reactor plant with a rupture in the primary containment system and torus level cannot be maintained above 11 feet, PREVENT HPCI operation provided HPCI operation is NOT needed for core cooling.

Critical task #4: Given an operating reactor plant with a rupture in the primary containment system and torus level cannot be maintained above 11 feet, INITIATE an emergency depressurization.

EXERCISE PERFORMANCE OBJECTIVES

Objective	Objective Description
SR-6600-K16	Given an Emergency Diesel Generators operating mode and various plant conditions, EVALUATE the following Emergency Diesel Generators indications/responses and DETERMINE if the indication/ response is expected and normal. A. Diesel cooling water pump status B. Generator volts, amps, frequency, kilowatts, and VARS C. Output breaker position status
SR-0002-P04	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-6600-K32	Given Emergency Diesel Generators operability status OR key parameter indications, various plant conditions and a copy of Tech Specs, DETERMINE Tech Spec compliance and required actions, if any.
SR-6600-K20	Given an Emergency Diesel Generators operating mode and various plant conditions, EVALUATE the following Emergency Diesel Generators indications/responses and DETERMINE if the indication/ response is expected and normal. a. Diesel cooling water pump status b. Generator volts, amps, frequency, kilowatts, and VARS c. Output breaker position status
SR-6600-K32	Given Emergency Diesel Generators operability status OR key parameter indications, various plant conditions and a copy of Tech Specs, DETERMINE Tech Spec compliance and required actions, if any
SR-6500-P05	Given an operating reactor plant and a loss of transformer 12, determine if the auto bus transfer has occurred and if tech spec requirements are being met in accordance with QOA 6100-01.
SR-6100-P07	Given an operating reactor plant when a station blackout occurs, take actions to monitor plant parameters and restore electrical power using the emergency DGs, SBO DGs, or unit 4KV crossties in accordance with QCOA 6100-04, QCOA-6100-03 and/or QCOP 6500-08 (SOER 83-6 r4) (PRA Initiating Event (%DLOOP) accounts for 22% of total CDF and initiates 40 of the top 100 Core Damage Sequences)
SR-0500-P03	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-0300-P24	Given a reactor plant at power with a mispositioned control rod, restore the rod to the correct position or insert to 00 in accordance with QCOA 0300-4 or QCOA 0300-11. (SOER 84-r7b)

EXERCISE PERFORMANCE OBJECTIVES

Objective	Objective Description
SR-1600-P23	Given a reactor plant with lowering torus water level, take action to protect personnel, attempt to stop the leak and restore level in accordance with QCOA 1600-05 and QGA 200.
SR-0001-P34	Given a reactor plant with lowering torus water level, trip and/or prevent HPCI operation (unless needed for core cooling) when torus water level cannot be maintained above 11 feet in accordance with QGA 200. (BWROG PC-3.2)
SR-0001-P35	Given a reactor plant with lowering torus water level, verify manual scram, enter/re-enter QGA 100 when torus level drops to 12 feet and, anticipating RPV blowdown, depressurize the RPV using the bypass valves in accordance with QCOA 1600-5 QGA 100 and QGA 200 when torus level drops t o12 feet OR verify/initiate an emergency depressurization when torus water level cannot be maintained above 11 feet in accordance with QGA 200 and QGA 500-1. (BWROG PC-3.1/3.3)

Simulator setup:

1. Reset to IC-19 (Approximately 50% power).
2. Go to **RUN**
4. Verify the following RWM Sequence is loaded: 5PESU2
    a. Mark up the Control Rod Move Sheet to reflect all rods withdrawn up to Step 32.

(Commands to be utilized during this scenario are contained in the CAEP file:
2018 NRC Scenario 4.cae)

5. Insert Commands for setup:

imf ED02 (1)
imf dg04a
imf rd29
imf rp02b
imf rp02d
imf rp03b

Set up complete

Commands to execute during the scenario

irf dg02r 50 Set ½ EDG speed droop to 50
irf dg02r 0 Set ½ EDG speed droop to 0
imf dg03b- insert 1/2 EDG Trip after Crew Shuts it down
imf rp04a- Trip RPS 'A'
dmf rp04a- Restore RPS 'A'
irf rp02r mg_set- Restore RPS 'A'
irf rp29r reset- Restore RPS 'A'
imf TC01- Turbine trip
trg! 1- Initiate Trigger 1 for LOOP
imf PC07 20- Insert Torus Leak/ADS Failure once SBO is Started
imf AD02D- Insert Torus Leak/ADS Failure once SBO is Started
imf AD02E- Insert Torus Leak/ADS Failure once SBO is Started
irf rp02r mg_set Restore RPS A
irf rp29r reset Restore RPS A
irf rp03r mg_set Restore RPS B
irf rp28r reset Restore RPS B
irf sw10r run Start U-1 DGCWP

6. Take the following equipment OOS (hang INFO Card):
    - N/A
7. Complete the following Control Panel setup items:
    - Verify the LOCA TRIP ENABLED labels are above the 1A and 1C Circ Water Pumps.
8. Provide a current revision of the following procedures, signed off as specified:
    - QCOP 6600-05 up to F.2
9. Ensure (1) orange ring is available to provide equipment status.

10. Ensure 2 EST's are available to provide equipment status.

LIST OF POTENTIAL PROCEDURES

Annunciator Procedures

- 901-5 A-15 CHANNEL A MANUAL SCRAM
  901-5 D-15 CHANNEL A REACTOR SCRAM
- 901-5 A-8, GROUP 2 ISOLATION CHANNEL 1(2)A/B TRIPPED
- 901-5 B-7, GROUP 1 ISOLATION CHANNEL 1(2)A/B TRIPPED
- 901-5 B-6, GROUP 3 ISOLATION NOT RESET
- 901-5 C-5, ATWS CHANNEL A OR B MANUAL PB ARMED (when ARI system is initiated)
- 901-5 A-1, SCRAM VALVE AIR SUPPLY LOW PRESSURE (when ARI system is initiated)
- 901-5 A-12, CHANNEL A/B STOP VLVS CLOSE TRIP
- 901-5 D-10, CHANNEL A REACTOR SCRAM
- 901-8 A-7, DIESEL GEN 1 TROUBLE
- 901-8 C-7, DIESEL GEN 1 FAIL TO START
- 901-8 E-2, RESERVE TRANS 12 TRIP
- 901-8 G-2, RESERVE AUX TRANS 12 LOW VOLTAGE
- 901-3 A-13, DW LOW PRESS CNMT SPRAY INHIBITED
- 901-3 A-14, TORUS HIGH/LOW LEVEL
- 901-3 B-14, TORUS TO RX BUILDING NEGATIVE DP
- 901-4 C (& D) 18, RX BLD FLOOR DRAIN SUMP A (& B) HIGH LEVEL

QCOS 6600-46, “Unit ½ Diesel Generator Timed Start Test”
QCOP 6600-05, “Shared Unit Diesel Generator Startup”
QCOP 7000-03, “Unit 1 Reactor Protection MG Sets”
QOA 7000-01, “120 VAC Reactor Protection Bus Failure (One or Both Buses)”
QCOP 6600-06, “Diesel Generator ½ Shut Down”
QGA 100, “RPV Control”
QGA 101, “RPV Control (ATWS)”
QCGP 2-3, “Reactor Scram”
QCOA 6100-03, “Loss of Offsite Power”
QCOP 6500-08, “4KV Bus Crosstie Operation”
QCOA 1600-05, “Leak in Torus”
QGA 200, “Primary Containment Control”
QCOP 1600-12, “Torus Normal Level Control, Fill and Drain Procedure Directory”
QGA 300, “Secondary Containment Control”
QGA 500-1, “RPV Blowdown”
QCOP 1300-02, “RCIC System Manual Startup (Injection/Pressure Control)”
QCOP 1200-17, “RWCU System Coolant Injection”

CREW TURNOVER

1. **Plant Conditions:**

   a.) Unit 1 is at 50% power holding load

   b.) Unit 2 is at 100% power.

   c.) Technical Specification limitations:

      (1) Unit 1: None

      (2) Unit 2: None

   d.) On Line Risk is GREEN.

.

2.) Significant problems/abnormalities:

   a.) 'A' RPS bus is on reserve power, equipment operators are clearing tags for restoration of 'A' RPS MG set during the shift.

3.) Evolutions/maintenance for the oncoming shift:

   a.) Perform QCOP 6600-05 "Shared Unit Diesel Generator Start Up" and load the Diesel to 1000 KW for 1 hour. The System Engineer will perform a walkdown and gather data.

   b.) Holding load for Instrument Maintenance and Operations to complete LP Heater tuning.

Quad Cities 2018 NRC Scenario No. 4 Event No. 1 Page 1 of 1

Event Description: Start the ½ EDG IAW QCOP 6600-05, " Shared Unit Diesel Generator Start Up "

Time	Position	Applicant's Actions or Behavior
SIMOP: None		
Key Parameter Response: None Expected Annunciator(s): None Automatic Actions: None		
	SRO	Orders BOP to perform QCOP 6600-05
	BOP	Acknowledges the order.
	BOP	Contacts EO to place the LTC for the ½ EDG in Manual
	BOP	Contacts EO to perform step F.2.b
SIMOP ROLEPLAY: If contacted as EO at T-12 to place the LTC in manual, wait 1 minute and report to the CR that the LTC is in manual.		
SIMOP ROLEPLAY: If contacted as EO at the ½ EDG to place perform step F.2.b, wait 1 minute and report to the CR that Governor Actuator oil level is near middle of sightglass, DG Lube Oil Circulating Pump is running, and Turbocharger Circulating Pump is running.		
	BOP	Notify plant personnel of impending start of ½ EDG
	BOP	Start ½ EDG by placing the ½ DIESEL GEN CONTROL SWITCH to START.
	BOP	Verify voltage and frequency of the ½ EDG at the 901-8 panel
	BOP	Directs EO at the ½ EDG to perform step F.2.f
SIMOP ROLEPLAY: If contacted as EO at the EDG to perform step F.2.f, wait 1 minute and report to the CR that the ½ EDG Vent Fan is running, Cooling Water Pump is running, and Governor SPEED DROOP is set to 50: **irf dg02r 50**		
	SRO	Enters TS 3.8.1, Condition B. U1/2 EDG inoperable.
	BOP	Adjust frequency of the ½ EDG to 60 Hz with the ½ Diesel Generator GOVERNOR switch.
	BOP	Adjust voltage to approximately 4160 volts with the 1/2 Diesel Generator VOLT REGULATOR switch
	BOP	Synchronize across DIESEL GEN TO BUS 13-1 GCB
	BOP	Gradually load ½ EDG over 2 to 4 minutes to approximately 1000 KW maintaining outgoing VARS approximately one-half the KW value.
	BOP	Inform the Unit Supervisor status of the ½ EDG.
End of Event 1		

Quad Cities 2018 NRC Scenario No. 4 Event No. 2 Page 1 of 2 Event Description: Trip of A RPS MG		
Time	**Position**	**Applicant's Actions or Behavior**
SIMOP: When directed by the Lead Examiner, trip the A RPS MG using: **imf rp04a**		
Key Parameter Response: The 4 (White) RPS Scram Solenoid Group B lights extinguish Expected Annunciator(s): (Not a complete list) 901-5 A-15 CHANNEL A MANUAL SCRAM 901-5 D-15 CHANNEL A REACTOR SCRAM 901-5 A-8, GROUP 2 ISOLATION CHANNEL 1(2)A/B TRIPPED 901-5 B-7, GROUP 1 ISOLATION CHANNEL 1(2)A/B TRIPPED 901-5 B-6, GROUP 3 ISOLATION NOT RESET Automatic Actions: ½ Scram from loss of A RPS, partial Group 1 and Group 2&3 isolations		
	ATC	Responds to annunciators.
	ATC	Diagnoses the loss of A RPS and informs the Unit supervisor.
	SRO	Directs ATC to perform actions of QOA 7000-01.
	ATC	Dispatches EO to the Aux Electric Room to investigate the loss of A RPS.
SIMOP ROLE PLAY: EO dispatched to the AER. Wait 2 minutes and then report that the Reserve EPA 1AB-1 tripped on under frequency.		
	ATC/BOP	Verifies Group II and Group III valve closures
	ATC/BOP	Directs U2 ANSO to install OPRM jumpers per QOP 7000-01
EVALUATOR ROLE PLAY: As U2 ANSO, wait two minutes then report that the OPRM jumpers are installed.		
SIMOP ROLE PLAY: Contact the Control Room as maintenance and inform them that the Normal Supply is available.		
	SRO/ATC	Directs BOP to restore RPS A from Normal Supply
SIMOP ROLE PLAY: As EO dispatched to restore RPS A, wait 3 minutes and re-energize RPS A as directed using the following: **dmf rp04a** **irf rp02r mg_set** **irf rp29r reset**		
Event 2 Continued		

Quad Cities 2018 NRC Scenario No. 4 Event No. 2 Page 2 of 2

Event Description: Trip of A RPS MG

Time	Position	Applicant's Actions or Behavior
	ATC	Resets A channel ½ scram
	ATC	Resets Group 1 Isolation
	ATC	Resets Groups 2 & 3 Isolations
	SRO	Enters TS 3.3.7.1 Condition A and TS 3.3.6.2 Condition A. TS 3.3.7.2 Condition A and TS 3.3.8.2 Condition A are Tracking Only.
End of Event 2		

Quad Cities 2018 NRC Scenario No. 4 Event No. 3 Page 1 of 1 Event Description: Starting Air System Leak		
Time	**Position**	**Applicant's Actions or Behavior**
Key Parameter Response: None Expected Annunciator(s): None Automatic Actions: None		
SIMOP ROLE PLAY: When directed by Lead Evaluator call the Control Room as Field Supervisor and inform them that there is an air leak on the Starting Air System, pressure on all 4 receivers was dropping, mechanical maintenance has been contacted.		
SIM OP ROLE PLAY: If contacted, as the Field Supervisor, inform the BOP that the Starting Air Receiver pressure is 120 psig and lowering at about 10 psig/min. The leak is unisolable.		
	SRO	Directs BOP to secure the ½ EDG IAW QCOP 6600-06
	BOP	Reduce load on the ½ EDG to 0 KW maintaining outgoing VARS approximately one-half the KW value.
	BOP	Opens ½ DIESEL GEN TO BUS 13-1 GCB
	BOP	Call EO to set ½ EDG Governor SPEED DROOP to 0
SIMOP ROLE PLAY: As EO, wait 1 minute and call Control Room informing them that the ½ EDG Governor Speed Droop has been set to 0.		
	BOP	Place the ½ DIESEL GEN CONTROL SWITCH to STOP.
	SRO	Enters TS 3.8.3 Condition D.
End of event 3		

Quad Cities 2018 NRC Scenario No. 4 Event No. 4 Page 1 of 2

Event Description: Seismic Event resulting in a Turbine Trip and Electrical ATWS

Time	Position	Applicant's Actions or Behavior
SIMOP: When directed by the lead evaluator, insert the malfunction to cause the turbine to trip. (**imf TCO1)**		
Key Parameter Response: No control rod movement when turbine trip occurs. 4 RPS SCRAM SOLENOID GROUP indicating lights on 901-5 panel remain lit. Expected Annunciator(s): 901-5 C-5, ATWS CHANNEL A OR B MANUAL PB ARMED (when ARI system is initiated) 901-5 A-1, SCRAM VALVE AIR SUPPLY LOW PRESSURE (when ARI system is initiated) 901-5 A-12, CHANNEL A/B STOP VLVS CLOSE TRIP 901-5 D-10, CHANNEL A REACTOR SCRAM Automatic Actions: None		
EVALUATOR ROLE PLAY: Inform the crew that they have felt rumbling and the control room shakes for ten seconds. Direct SimOp to insert turbine trip at your discretion.		
	SRO	May order QCOA 0010-09 "Earthquake"
	SRO	May ask for United States Geological Surveys National Earthquake data to confirm earthquake.
EVALUATOR ROLEPLAY: If asked for USGS Data, give the following information: "Epicenter was located in Rockford, Illinois and was 5.5 on the Richter Scale."		
SIMOP ROLE PLAY: If asked to retrieve seismograph data, wait 5 minutes then report that the Event Red LED was on and that IMD is in the process of retrieving the data from the accelerometer.		
	ATC	Reports Turbine trip and control rods did NOT insert.
	ATC	Inserts a Manual Scram and takes the Mode Switch to Shutdown.
	ATC	Informs US that there is an Electric ATWS
	SRO	Enters QGA 100, RPV Control and transitions to QGA 101 on failure to scram when above 5% power.
CT1	ATC	Arms and depresses ARI pushbuttons.
	ATC	Injects SBLC by placing the SBLC PUMP SELECT to either SYS 1 or SYS 2. (if control rod motion has not been observed yet)
	ATC	Runs both Recirc Pump speeds to minimum (32%).
Event 4 Continued		

Quad Cities 2018 NRC Scenario No. 4 Event No. 4 Page 2 of 2

Event Description: Seismic Event resulting in a Turbine Trip and Electrical ATWS

Time	Position	Applicant's Actions or Behavior
	BOP	Directs BOP to inhibit ADS.
	BOP	Inhibits ADS by placing AUTO BLOWDOWN INHIBIT switch to INHIBIT.
	SRO	Directs Core Spray Pumps placed in P-T-L.
	BOP	Places both Core Spray Pump control switches in P-T-L.
	ATC	Reports ALL control rods are inserted.
	SRO	Directs ATC to terminate Boron injection.
	ATC	Places SBLC switch to OFF. (if system was injecting)
	SRO	Directs BOP to return AUTO BLOWDOWN INHIBIT switch to the NORMAL position and take Core Spray pump control switches out of P-T-L.
	BOP	Places AUTO BLOWDOWN INHIBIT switch to the NORMAL and takes both Core Spray pump control switches out of P-T-L.
	SRO	Exits QGA 101 and re-enters QGA 100.
	SRO	Directs ATC to enter and perform actions per QCGP 2-3, Reactor Scram.
End of Event 4		

Quad Cities	2018 NRC Scenario No. 4	Event No. 5	Page 1 of 3

Event Description: Seismic Afterschock causes LOOP, Unit EDG fails to start.

Time	Position	Applicant's Actions or Behavior
LEAD EVALUATOR ROLE PLAY: Inform the crew that an "after shock" is now occurring.		
SIM OP: When directed by Lead Evaluator, insert the manual trigger to cause a loss of T12: **Trg! 1**		
Key Parameter Response: 0 Voltage on 4KV Busses, Transformer 12 Breakers to Busses 11, 12, 13, & 14 indicate OPEN, Loss of lighting in Control Room/Simulator Expected Annunciator(s): (Not a complete list) 901-8 A-7, DIESEL GEN 1 TROUBLE 901-8 C-7, DIESEL GEN 1 FAIL TO START 901-8 E-2, RESERVE TRANS 12 TRIP 901-8 G-2, RESERVE AUX TRANS 12 LOW VOLTAGE Automatic Actions: Group 1 Isolation		
	SRO	Directs performance of QCOA 6100-03, Loss of Offsite Power
	BOP	Reports the failure of the U1 EDG to start.
CT2	BOP	Manually starts the U1 EDG.
	BOP	Reports that the U1 EDG successfully started and is powering bus 14-1
SIMOP ROLE PLAY: If contacted about the ½ EDG not starting, inform the CR that the Starting Air Leak prevented the diesel from starting.		
	SRO/BOP	If Bus 13-1 is not energized and power is available from a non-EDG source on Unit 2, attempt to re-energize the bus per QCOP 6500-08, 4KV Bus Crosstie Operation.
	BOP	Attempt to crosstie Bus 13-1 to Bus 23-1 as follows:
	BOP	Take the following Control Switches to PTL: o 1/2 EDG to Bus 13-1 GCB o Bus 13-1 & Bus 61 Tie Breaker o Busses 13 and 13-1 Tie GCB o 1A Core Spray Pump o 1A & 1B RHR Pump
	BOP	Request U2 to close the Bus 23-1 to Bus 13-1 Tie Breaker.
SIMOP ROLE PLAY: If requested to close the Bus 23-1 to Bus 13-1 Tie Breaker, inform U-1 that the breaker will not shut.		
Event 5 Continued		

Quad Cities 2018 NRC Scenario No. 4 Event No. 5 Page 2 of 3

Event Description: Seismic "after-shock" causes LOOP, Unit EDG fails to start.

Time	Position	Applicant's Actions or Behavior
CT2	SRO	Direct starting and loading of the SBO Diesel per the Hard Card to bus 13-1.
	BOP	When directed, energizes Bus 13-1 from the SBO DG per the Hard Card.
	BOP	Places or verifies the following control switches PTL: o 1/2 EDG to Bus 13-1 GCB o Bus 13-1 and 23-1 Tie GCB o Bus 13-1 & Bus 61 Tie Breaker o Busses 13 and 13-1 Tie GCB o 1A Core Spray Pump o 1A & 1B RHR Pump
	BOP	Place the SBO DG Mode Switch in SBO mode.
	BOP	Momentarily place SBO DG C/S to START
SIMOP ROLEPLAY: Once the SBO DG is started insert the following malfunctions: **imf PC07 20** Torus Leak **imf AD02D** 2D Relief Valve failure **imf AD02E** 2E Relief Valve failure		
	BOP	Verify voltage 3900-4580, Freq 56.8-61.2, RPM 900
	BOP	Close the DG BKR on the DCS screen
	BOP	Close the 13-1 & Bus 61 Tie Breaker.
CT2	BOP	Close the Bus 13-1 Feed from the DCS Screen.
	BOP	Verify Buses 13-1 and 18 are energized.
	BOP	Remove ECCS pumps from PTL as directed by the Unit Supervisor.
	BOP	May direct the EO to re-energize RPS A and RPS B Busses per QCOP 7000-01
Event 5 continued		

Quad Cities 2018 NRC Scenario No. 4 Event No. 5 Page 3 of 3 Event Description: Seismic Afterschock causes LOOP, Unit EDG fails to start.		
Time	**Position**	**Applicant's Actions or Behavior**
SIMOP ROLEPLAY: If RPS restoration is requested, Role Play as necessary. Wait 2 minutes and then use the following commands to restore RPS: A RPS: **irf 02r mg_set** and **irf r29r reset** B RPS: **irf 03r mg_set** and **irf r28r reset** Then contact the Control Room to report completion of RPS restoration.		
End of Event 5		

Quad Cities	2018 NRC Scenario No. 4	Event No. 6	Page 1 of 2

Event Description: Torus Leak

Time	Position	Applicant's Actions or Behavior
SIMOP NOTE: None		
Key Parameter Response: Torus Water Level Lowering Expected Annunciator(s): 901-3 A-13, DW LOW PRESS CNMT SPRAY INHIBITED 901-3 A-14, TORUS HIGH/LOW LEVEL 901-3 B-14, TORUS TO RX BUILDING NEGATIVE DP 901-4 C (& D) 18, RX BLD FLOOR DRAIN SUMP A (& B) HIGH LEVEL Automatic Actions: None		
	BOP	Acknowledges annunciator 901-3 A-14, Torus High/Low Level, and reports Torus level and trend
	BOP	(Continuous) Monitors Torus Water Level and adequately reports levels and trends
	ATC/BOP	Dispatches EO to the Reactor Building basement and corner rooms to investigate cause of alarm
SIMOP ROLE PLAY: As EO dispatched to RB basement, wait 4 minutes and report back: • There is a large leak from the Torus ECCS suction header outside of the B RHR Room UPSTREAM of the 1-1001-6B valve. • There is 2 inches of water on the floor. • You have called Mechanical Maintenance for assistance.		
	SRO	Directs actions of QCOA 1600-05, Leak in Torus
	BOP/ATC	May evacuate personnel from Reactor Building
	BOP/ATC	Notifies Radiation Protection to obtain air samples for oxygen content and radioactivity in the Reactor Building basement
	BOP/ATC	May begin de-inerting the Containment
	BOP/ATC	Notifies Radwaste to start processing water from the leak
	BOP/ATC	Attempt to isolate the leak
SIM OP ROLE PLAY: If asked about Maintenance progress on securing leak, report the team thinks they can plug the leak and are still working.		
	BOP/ATC	Identifies QGA 200 entry at Torus level at -2 inches and lowering.
	SRO	Enters QGA 200 and directs actions.
	BOP	Reports containment parameters and starts CAMS
Event 6 continued		

Quad Cities 2018 NRC Scenario No. 4 Event No. 6 Page 2 of 2

Event Description: Torus Leak

Time	Position	Applicant's Actions or Behavior
	SRO	Directs actions of QCOP 1600-12 to fill the Torus
	BOP	May open HPCI min flow valve MO 1-2301-14 to gravity drain from the CCSTs to the Torus per QCOP 2300-02
	BOP	May open RCIC min flow valve MO 1-1301-60 to gravity drain from the CCSTs to the Torus per QCOP 1300-03
	BOP	May direct an Equipment Operator to fill the Torus through Core Spray (QCOP 1400-04) or RHR (QCOP 1000-28)
SIMOP Role Play: Do NOT make this report until the EO has reported reactor building area water levels. If directed to fill the Torus through Core Spray (QCOP 1400-04) or RHR (QCOP 1000-28) report that Radiation Protection has ordered personnel to leave the area due to safety concerns, the Maintenance crew will NOT be able to patch the leak		
	SRO	Before Torus Water Level reaches 11 ft, orders HPCI system "trip latched" to prevent operation
CT3	BOP	Depresses the HPCI system trip pushbutton and latches it in place when directed
	ATC/BOP	Respond to Annunciators 901-4 C-18 and D-18, RX BLD FLOOR DRAIN SUMP A & B) HIGH LEVEL
	ATC/BOP	Dispatch an operator to investigate
SIMOP NOTE: When Torus level reaches 13 ft., if asked, as EO report that "there is approximately 3 inches of water on the Reactor Building basement floor. No standing water in the corner rooms."		
	SRO	Enters QGA 300 and directs actions (if report of 2 inches on Reactor Building basement floor is received)
	BOP/ATC	May dispatch an EO to start the Unit 1 EDG Cooling Water pump for area cooler operation
SIMOP: If dispatched as EO, wait 2 minutes and start the Unit 1 EDG Cooling Water pump: **irf sw10r run**		
End of Event 6		

Quad Cities	2018 NRC Scenario No. 4	Event No. 7	Page 1 of 1

Event Description: QGA 500-1 with Emergency Depressurization

Time	Position	Applicant's Actions or Behavior
SIMOP NOTE: None		
Key Parameter Response: Torus Water Level Lowering, D and E ADS Valves fail to open Expected Annunciator(s): None Automatic Actions: None		
CT4	SRO	Before Torus Water Level reaches 11 feet, Re-enters QGA 100 and enters QGA 500-1
	SRO	Verifies all rods in
	SRO	Orders all 5 ADS valves opened.
CT4	BOP	Opens ADS valves as directed and leaves all switches in the "MAN" position.
	BOP	Informs the US that the D and E ADS Valves failed to open
	SRO	Directs the use of Emergency Depressurization Systems per QGA 500-1 Detail O
	BOP	If directed, starts RCIC IAW QCOP 1300-02
	BOP	If directed, places RWCU in Blowdown Mode IAW QCOP 1200-17
	ATC/BOP	Monitor RPV depressurization and report when RPV pressure is less than 100 psig.
SIMOP: When Blowdown has been performed and/or as directed by the Lead Evaluator, place the simulator in **FREEZE.**		
End of Event 7. End of Scenario.		

Appendix D **Scenario Outline** **Form ES-D-1**

Facility: Quad Cities Scenario No.: 5 Op-Test No.: 2018

Examiners: _____ Operators: _____

_____ _____

Initial Conditions: 10% RTP, Startup in progress per QCGP 1-1, "Normal Unit 1 Startup". 'A' and 'C' CD/CB pumps running with 'B' in standby.

Turnover: IAW QCGP 1-1, step F.6.bb perform QCOS 1300-05, "RCIC Pump Operability Test". Once completed, continue reactor startup with control rods per QCGP 4-1, "Control Rod Movements and Control Rod Sequence".

Critical Tasks: #1: When RPV pressure is below 325 psig, SLOWLY RAISE AND CONTROL INJECTION into the RPV to maintain RPV water level above TAF".

#2: When Torus pressure exceeds 5 psig, INITIATE drywell sprays while in the safe region of the drywell spray initiation limit (DSIL).

Event No.	Position	Event Type*	Event Description
1	BOP	N	Perform QCOS 1300-05, "RCIC Pump Operability Test."
2	BOP	C/TS	RCIC flow controller 1-1340-1 fails downscale. Enter TS 3.5.3.
3	ATC	C	Condensate pump trip with failure of standby pump to auto start. ATC takes actions of QCOA 3300-01.
4	ATC BOP	I/TS	APRM 5 fails high resulting in an incomplete half scram event (not all 4 scram lights on RPS 'B' bus are off). ATC/BOP take actions of QCOA 0500-01. BOP will operate 'B' RPS key lock test switch and ATC will bypass APRM 5. Enter TS 3.3.1.1.
5	BOP	C/TS	Inadvertent HPCI initiation, BOP take actions of QCOA 2300-01. Enter TS 3.5.1.G and 3.5.1.I.
6	Crew	M	Large LOCA on 'A' recirculation loop suction line. Enter QGA 100 and QGA 200. 'A' Core Spray pump fails to start (not recoverable) and MCC 15-2 fails (not recoverable).
7	BOP	C	'B' RHR injection valve fails to open. BOP takes actions of QCOA 1000-04 and QCOP 1000-30.

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

Event 1: Perform QCOS 1300-05, “RCIC Pump Operability Test”. Operators will be informed that equivalent HPCI surveillance is not required to be performed during this startup. Start at step H.3.

Event 2: RCIC flow controller 1-1340-1 fails downscale. Enter TS 3.5.3 Cond. A.

Event 3: 1C condensate/condensate booster pumps trip with a failure of standby pump to auto start. ATC takes actions of QCOA 3300-01, “Loss of Condensate Pump” to start an additional condensate/condensate booster pump.

Event 4: APRM 5 fails upscale, resulting in an incomplete half scram event (not all 4 scram lights on RPS ‘B’ bus are off). ATC takes actions of QCOA 0500-01, “Partial Scram Actuation.” BOP will insert a ½ SCRAM on ‘B’ RPS by operating key for RPS Test Switch. ATC will bypass APRM 5. SRO enters TS 3.3.1.1 Cond. C.

Event 5: Inadvertent HPCI initiation, BOP take actions of QCOA 2300-01, “HPCI Automatic Initiation”. Report from the field indicates that a cleaning staff member bumped a cart into the HPCI initiation logic instrument rack in the reactor building. SRO enters TS 3.5.1.G and then immediately 3.5.1.I because RCIC is already inoperable.

Event 6: Large (20%) LOCA on ‘A’ recirculation loop suction line. Enter QGA 100, “RPV Control” and QGA 200, “Primary Containment Control”. ‘A’ Core Spray pump fails to start on 2.5 psig DW pressure signal (not recoverable) and MCC 15-2 trips resulting in a loss of power to the main feed regulating isolation valves which are in a closed condition (not recoverable).

Event 7: ‘B’ RHR Injection Valve 1-1001-29B fails to open when ECCS low pressure permissive activates (325 psig). BOP takes actions of QCOA 1000-04, “LPCI Auto Initiation” and QCOP 1000-30 “Post Accident RHR Operation” to manually align ‘B’ RHR for LPCI injection. Manual actions will be successful.

CRITICAL TASKS:

Critical Task #1: When RPV pressure is below 325 psig, SLOWLY RAISE AND CONTROL INJECTION into the RPV to maintain RPV water level above TAF.

Critical Task #2: When torus pressure exceeds 5 psig, INITIATE drywell sprays while in the safe region of the Drywell Spray Initiation Limit (DSIL).

EXERCISE PERFORMANCE OBJECTIVES

Objective	Objective Description
SR-1300-P03	Given an operating reactor plant, perform the periodic RCIC pump operability test
SR-1300-K32	Given RCIC System operability status OR key parameter indications, various plant conditions and a copy of Tech Specs, DETERMINE Tech Spec compliance and required actions, if any.
SR-0700-P07	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-0002-P03	Given a reactor plant at power with a reactor scram, place the plant into a stable condition in accordance with QCGP 2-3.
SR-3200-K22	Given a Condensate/Feedwater System operating mode and various plant conditions, PREDICT how key Condensate/Feedwater System/ plant parameters will respond to the following Condensate/Feedwater System component or controller failures: a. Condensate/condensate booster pump trip
SR-0001-P45	Given a reactor plant in a QGA condition, verify the proper actuation of containment isolations and ECCS and emergency DG starts in accordance with QGA 100 or QGA 101.
SR-2300-P07	Given an operating reactor 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-P01	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 E) to attempt to hold RPV water level above -142 inches in accordance with QGA 100. (SOER 86-1 r8)
SR-0001-P02	Given the plant with an inability to maintain RPV water level above -142 inches with an injection source lined-up and running, initiate an emergency depressurization before RPV water level drops to the MSCRWL (Minimum Steam Cooling Reactor Water Level) in accordance with QGA 100 and QGA 500-1. (Important PRA Operator Action - emergency depressurization terminates 15 of top 100 Core Damage Sequences)
SR-0001-P03	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 500-1 and QGA 100.
SR-0001-P26	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 K), 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.

Simulator setup:

1. Reset to IC-14 (Approximately 10% power).
2. Go to **RUN**
3. Verify 1A and 1C Cond't/Cond't Booster Pumps are running
4. Place 1B Cond't/Cond't Booster pump in STBY
5. Verify the following RWM Sequence is loaded: 5PESU1
    a. Mark up the Control Rod Move Sheet to reflect all rods withdrawn up to Step 28.
6. Place Torus Cooling in operation on the "A" loop per QCOP 1000-09.
7. Verify one Main Turbine Bypass valve is open.

(Commands to be utilized during this scenario are contained in the CAEP file: 2018 NRC Scenario 5.cae)

5. Insert Commands for setup:

irf rc05r disengage
irf rc06r 10.5
imf RC06 (1) 0 :30
trgset 6 "zdihs13302B(5)"
trg 6 "dor lohs13302b4"
ior LOIL10590500D ON
ior LOIL10590500M ON
ior LOIL10590500F ON
ior LOIL10590500P ON
trgset 2 "zdihs10590302b.or.zdihs10590302d"
trgset 3 "zdihs10590302b.or.zdihs10590302d"
trgset 4 "zdihs10590302b.or.zdihs10590302d"
trgset 5 "zdihs10590302b.or.zdihs10590302d"
trg 2 "dor LOIL10590500D"
trg 3 "dor LOIL10590500M"
trg 4 "dor LOIL10590500F"
trg 5 "dor LOIL10590500P"
ior DIHS13302 P2A_OFF
ior LOHS13302B4 ON
imf CS01A
imf rh03b
trgset 7 "zdihs13302B(5)"
trg 7 "dor DIHS13302"
trgset 8 "zdihs13302D(5)"
trg 8 "dor DIHS13302"
trgset 9 "zdihs13302D(5)"
trg 9 "dor LOHS13302B4"

Set up is complete

Commands to execute during the scenario

Initiate Trigger 1 to Fail RCIC Flow Controller/Trip RCIC
trg! 1
Trip APRM Channel 5
imf NM08E 100
Trip the 1C Condensate Pump
imf FW17C
Override the 1C Cond/Cond Booster pump C/S in PTL
ior dihs13302C PTL
Inadvertant HPCI Initiation
imf HP10
'A' Recirc Suction Leak
imf RR10a 20
Bus 15-2 Trip
imf ED08b

6. Take the following equipment OOS (hang INFO Card): None

7. Complete the following Control Panel setup items:
   - Verify the LOCA TRIP ENABLED labels are above the 1A and 1C Circ Water Pumps.

8. Provide a current revision of the following procedures, signed off as specified:
   - QCOS 1300-05, up to H.3. Step H.7 is signed off and H.9.a is N/A

9. Provide the RPS Test Switch Key to the Floor Instructor (Key #4).

10. Provide a marked up copy of QCOP 1000-09, Torus Cooling Startup and Operation.

11. Marked up copy of QCGP 1-1 through step F.6.bb.(1).

12. Ensure (1) orange ring is available to provide equipment status.

13. Ensure 2 EST's are available to provide equipment status.

LIST OF POTENTIAL PROCEDURES

Annunciator Procedures

- 901-6, A-6, COND PUMP DISCHARGE LOW PRESSURE
- 901-6, F-5, CONDENSATE BOOSTER PUMP AUTO TRIP
- 901-5, B-11 CHANNEL A/B NEUTRON MONITOR
- 901-5, D-13 CHANNEL 4-6 APRM HI HI OR INOP
- 901-5, D-15 CHANNEL B RX SCRAM
- 901-5, A-6 APRM UPSCALE/HIGH
- 901-5, C-3 ROD OUT BLOCK
- 901-5, H-1 OPRM TROUBLE/INOP
- 901-3 F-9 HPCI OIL FILTER HIGH DP
- 901-3 D-12 HPCI PUMP LOW FLOW
- 901-5 D-7 LPRM HIGH
- 901-5 E-8 RX VESSEL HIGH LEVEL
- 901-3 A-16, PRI CMNT HIGH PRESSURE
- 901-3 G-15,
- 901-4 A-17,
- 901-4 B-17,
- 901-5 D-11,
- 901-5 B-10/B-15

QCOS 1300-05, “RCIC Pump Operability Test”
QCOS 1600-31, “Suppression Pool Temperature Monitoring”
QCOP 1300-05, “RCIC System Shutdown”
QCOA 3300-01, “Loss of Condensate Pump”
QCOA 0500-01 “Partial Scram Actuation”
QCOA 0700-03, “Loss of Neutron Flux Indication
QCOA 2300-01, “HPCI Automatic Initiation”
QCOA 0201-01, “Increasing Drywell Pressure”
QGA 100, “RPV Control”
QGA 200, “Primary Containment Control”
QCGP 2-3, “Reactor Scram”
QGA 500-1, “RPV Blowdown”
QCGP 1-1 “Normal Unit 1 Startup”
QCGP 4-1 “Control Rod Movements and Control Rod Sequence”

CREW TURNOVER

1. **Plant Conditions:**

   a.) Unit 1 is at 10% power, Startup in progress per QCGP 1-1

   b.) Unit 2 is at 100% power.

   c.) Technical Specification limitations:

      (1) Unit 1: None

      (2) Unit 2: None

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2.) Significant problems/abnormalities:

   a.) None

3.) Evolutions/maintenance for the oncoming shift:

   a.) IAW QCGP 1-1, step F.6.bb. perform QCOS 1300-05, “RCIC Pump Operability Test”. An extra RO will be monitoring Torus temperature per QCOS 1600-31.

   b.) Continue reactor startup with control rods per QCGP 1-1 and the ReMA after RCIC is secured.

Quad Cities 2018 NRC Scenario No. 5 Event No. 1 Page 1 of 1

Event Description: Perform QCOS 1300-05, "RCIC Pump Operability Test"

Time	Position	Applicant's Actions or Behavior
SIMOP: None		
Key Parameter Response: None Expected Annunciator(s): None Automatic Actions: None		
	SRO	Directs BOP to perform QCOS 1300-05, starting at step H.3
	BOP	Acknowledges order from SRO
	BOP	Starts RCIC Turbine Vacuum Pump
	BOP	Verifies RCIC Turbine Vacuum Pump pulls a vacuum as indicated on PI 1-1360-8203, RCIC CONDENSER/VACUUM TANK
SIMOP ROLE PLAY: If requested, as EO report that PI 1-1360-8203 indicates the RCIC Turbine Vacuum pump is pulling a vacuum.		
	BOP	Opens MO 1-1301-62, TURB CLG WTR VLV
	BOP/ATC	Makes plant announcement notifying personnel of the impending RCIC start.
	BOP	Opens MO 1-1301-61 to start RCIC Turbine
	BOP	Verifies RCIC Flow comes up on FIC 1-1340-1
	BOP/ATC	Directs EO to locally verify RCIC Turbine and Pump oil levels are acceptable.
SIMOP ROLEPLAY: As EO, inform the CR that RCIC Turbine and Pump oil levels have been verified to be acceptable.		
	BOP	Calculate pump discharge pressure
	BOP	Manually throttle MO 1-1301-53 to establish calculated discharge pressure and RCIC pump flow of $\geq$ 400 gpm.
End of Event 1		

Quad Cities 2018 NRC Scenario No. 5 Event No. 2 Page 1 of 1 Event Description: RCIC speed controller failure causes RCIC pump trip		
Time	**Position**	**Applicant's Actions or Behavior**
SIMOP: When directed by the Lead Examiner, Fail RCIC Flow Controller/Trip RCIC: **trg! 1**		
Key Parameter Response: RCIC Speed Controller setpoint fails low, causing RCIC Speed to lower. Expected Annunciator(s): 901-4 E-16, 901-4 F-15 Automatic Actions: None		
	BOP	Acknowledges annunciator 901-4 E-16, RCIC Low Flow, and informs the Unit Supervisor that RCIC flow is lowering.
	SRO	Orders BOP to secure RCIC per QCOP 1300-05.
	BOP	Acknowledges order and refers to CQOP 1300-05.
	BOP	Trips RCIC using Manual Trip Pushbutton.
	BOP	Informs Unit Supervisor that RCIC has been tripped
	BOP/ATC	Directs EO/Maintenance to investigate cause of RCIC malfunction
SIMOP ROLEPLAY: As EO in the field, informs the CR that RCIC was running very loudly and Instrument Maintenance is getting a package ready.		
	SRO	Determines that RCIC is inoperable and enters TS 3.5.3 Condition A.
Event 2 continued		

Quad Cities 2018 NRC Scenario No. 5 Event No. 3 Page 1 of 1

Event Description: 1C Condensate Pump Trip with a failure of the Standby to autostart

Time	Position	Applicant's Actions or Behavior
SIMOP: When directed by the Lead Examiner, trip the 1C Condensate Pump: **imf FW17C**		
Key Parameter Response: 1C Condensate Pump indication lights off, 1B Condensate pump will not auto start. Expected Annunciator(s): 901-6, A-6, COND PUMP DISCHARGE LOW PRESSURE 901-6, F-5, CONDENSATE BOOSTER PUMP AUTO TRIP Automatic Actions: None		
	ATC	Reports the trip of the 1C Condensate/Condensate Booster Pump with the failure of the 1B Condensate Pump to autostart.
	SRO	Directs the BOP to start the standby Condensate Pump.
	SRO	Directs BOP to take actions from QCOA 3300-01, "Loss of Condensate Pump".
	SRO	May set Scram Criteria for RWL of 11" Lowering and 44" Rising
	ATC	Starts the 1B Condensate Pump.
	ATC/BOP	Dispatches EO to investigate cause of the 1C Condensate Pump. Dispatches Electrical Maintenance to inform them that the 1B Condensate Pump failed to autostart.
SIMOP ROLE PLAY: As the EO wait 3 minutes and inform the CR that the 1C Condensate Pump tripped on overcurrent. Also report you need the control switch in PTL because the EMs are requesting to have the breaker racked out to do an inspection.		
	ATC	Places the 1C Cond/Cond Booster pump C/S in PTL per request from the field to rack out the breaker.
SIM OP: Override the 1C Cond/Cond Booster pump C/S in PTL to simulate the breaker racked out. **ior dihs13302C PTL**		
	ATC	Places the 1D Condensate Pump in Standby by taking the COND PMP SELECTOR switch to the 1D Position.
	ATC	Dispatches EO to secure Hydrogen Water Chemistry to the 1C Condensate Pump and align it to the 1B Condensate Pump
SIMOP ROLE PLAY: As EO, wait 2 minutes and report back that Hydrogen Water Chemistry has been secured to the 1C Condensate pump and aligned to the 1B Condensate pump.		
End of event 3		

Quad Cities 2018 NRC Scenario No. 5 Event No. 4 Page 1 of 2

Event Description: APRM 5 fails upscale, incomplete half scram

Time	Position	Applicant's Actions or Behavior
SIMOP: When directed by the lead evaluator, insert the malfunction to cause APRM 5 to fail upscale. (**imf NM08E)**		
Key Parameter Response: APRM 5 will read upscale. 2 scram RPS B Scram Solenoid Lights will remain lit. Expected Annunciator(s): 901-5, B-11 CHANNEL A/B NEUTRON MONITOR 901-5, D-13 CHANNEL 4-6 APRM HI HI OR INOP 901-5, D-15 CHANNEL B RX SCRAM 901-5, A-6 APRM UPSCALE/HIGH 901-5, C-3 ROD OUT BLOCK 901-5, H-1 OPRM TROUBLE/INOP Automatic Actions: None (B RPS Will fail to scram)		
	ATC	Responds to unexpected annunciators and informs the Unit Supervisor.
	ATC	Notifies Unit Supervisor that APRM 5 failed upscale and there was a Partial half scram on RPS B.
	SRO	Directs ATC to perform QCOA 0500-01 "Partial Scram Actuation"
	SRO	Directs ATC to manually insert a half scram on RPS B.
	ATC	Attempts to manually insert half scram on RPS B
	ATC	Informs Unit Supervisor that manual half scram on RPS B was unsuccessful.
	BOP	Obtains key for RPS Test Switch
	BOP	Places PROTECTION SYS SUBCHANNEL B1 TEST switch to TRIP, then Normal
	BOP	Places PROTECTION SYS SUBCHANNEL B2 TEST switch to TRIP, then Normal
	SRO	Refers to QCOA 0700-03
	SRO	Determines APRM 5 is INOP
SIMOP ROLE PLAY: If contacted, as IMD and/or other support personnel, report: "I will come to the Control Room in a few minutes to take a look at the APRM."		
Event 4 continued		

Quad Cities 2018 NRC Scenario No. 5 Event No. 4 Page 2 of 2

Event Description: APRM 5 fails upscale, incomplete half scram

Time	Position	Applicant's Actions or Behavior
	SRO	Refers to TS and TRM
	SRO	Verifies minimum number of operable channels is met per TS 3.3.1.1 for RPS trip functions and TRM section 3.3.a for Rod Block functions.
	ATC	Positions APRM BYPASS joystick to bypass APRM Channel 5
	ATC	Verifies white BYPASS light comes ON for that APRM
	SRO	Enters TS 3.3.1.1 Condition C for Manual Scram inoperable.
End of Event 4		

Quad Cities	2018 NRC Scenario No. 5	Event No. 5	Page 1 of 1

Event Description: Inadvertent HPCI Initiation

Time	Position	Applicant's Actions or Behavior
SIM OP: At the direction of the Lead Examiner, insert malfunction: **imf hp10** (Inadvertent HPCI Initiation.)		
Key Parameter Response: HPCI Turbine speed ≈4000 rpm, Turb Steam Supply 1-2301-3 Valve open, Pump Discharge 1-2301-8 valve open, RPV water level rising Expected Annunciator(s): 901-3 F-9 HPCI OIL FILTER HIGH DP 901-3 D-12 HPCI PUMP LOW FLOW 901-5 D-7 LPRM HIGH 901-5 E-8 RX VESSEL HIGH LEVEL Automatic Actions: HPCI system responds as designed to an Auto Initiation signal.		
	BOP	Responds to Annunciator 901-3 D-12, HPCI PUMP LOW FLOW.
	BOP	Reports alarm to US; refers to annunciator procedure.
	BOP	Reports HPCI System initiating.
	CREW	Determine that HPCI injection is not necessary: • Report Drywell pressure normal • Reports RPV water level normal by all indicators
	ATC	Monitors RPV water level and APRMs.
	SRO	Directs actions of QCOA 2300-01.
	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.
	BOP	Reports HPCI is tripped.
	BOP	Place MO 1-2301-14 MIN FLOW BYP VLV in P-T-L.
	ATC	May enter QCOA 400-01 if injection occurred.
	BOP	Contacts EMD/IMD to investigate HPCI auto-start.
	SRO	Enters TS 3.5.1 Cond G, HPCI System Inop and TS 3.5.1 Cond. I due to RCIC inop. (Be in Mode 3 in 12 hrs.) Also enters 14 day ATR LCO for HPCI Inoperable.
SIMOP ROLE PLAY: If contacted as Maintenance to investigate the HPCI start, inform the CR you will start a troubleshooting work package. If dispatched as an EO to investigate the HPCI start, wait 5 minutes and report there is no indication for why HPCI started.		
End of Event 5		

Quad Cities	2018 NRC Scenario No. 5	Event No. 6	Page 1 of 2

Event Description: Large LOCA, Bus 15-2 Trip

Time	Position	Applicant's Actions or Behavior
SIMOP NOTE: When directed by the Lead Evaluator, insert the following malfunctions to initiate a LOCA and Bus 15-2 tripping **imf RR10a 20** 'A' Recirc Suction Leak 20% immediately **imf ED08b** Bus 15-2 Trip		
Key Parameter Response: Drywell and Torus pressure/temperature rises, RPV water level lowers, RPV pressure lowers Expected Annunciator(s): 901-3 A-16, 901-3 G-15, 901-4 A-17, 901-4 B-17, 901-5 D-11, 901-5 B-10/B-15 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	May enter and directs actions of QCOA 0201-01. May set scram criteria on high Drywell pressure.
EVALUATOR NOTE: Drywell pressure will rise at an fast rate, and may cause a scram before the crew identifies it.		
	ATC	Informs the Unit Supervisor reactor scrammed on high Drywell Pressure
	ATC	Places Mode Switch to SHUTDOWN
	ATC	Reports all rods in, Mode Switch is in SHUTDOWN, RPV water level < 0 inches and lowering fast, RPV pressure < 1060 psig and lowering fast.
	BOP/ATC	Reports that there was a loss of bus 15-2
SIMOP ROLEPLAY: Wait 2 minutes after the initiation of the LOCA and call the CR as an EO in the field and report that you have discovered Bus 15-2 Feeder Breaker tripped on overcurrent.		
	SRO	Enters QGA 100 on low RPV level and High Drywell Pressure. Enters QGA 200 on high Drywell Pressure.
	ATC	Carries out QCGP 2-3, Reactor Scram, actions.
	ATC/BOP	Verify automatic actions and isolations have occurred.
	BOP	Informs Unit Supervisor that 1A CS Pump Failed
	SRO	Orders BOP to start HPCI
	BOP	Acknowledges order and starts HPCI
	ATC	(Continuous) Updates Unit Supervisor on status on containment parameters.
Event 6 continued		

Quad Cities 2018 NRC Scenario No. 3 Event No. 6 Page 2 of 2

Event Description: Large LOCA, Bus 15-2 Trip

Time	Position	Applicant's Actions or Behavior
SIMOP ROLEPLAY: If contacted to investigate the 1A CS pump, wait two minutes and inform the CR that the 1A CS pump tripped on overcurrent.		
EVALUATOR NOTE: Reactor pressure will drop rapidly, reaching approximately 300 psig in a minute.		
	SRO	Orders BOP to inhibit ADS
	BOP	Inhibits ADS
	SRO	May directs Alternate Systems for Injection
	SRO	May enter QGA 500-1
		Verifies all rods are in
		Verifies Drywell Pressure >2.5 psig
		Directs BOP to Maximize injection to the RPV
		Verifies Torus Level is above 5 ft
		Directs all 5 ADS Valves opened and switches left in Manual
	BOP	May Open all 5 ADS Valves and leaves switches in the Man Position
End of event 6		

Quad Cities	2018 NRC Scenario No. 5	Event No. 7	Page 1 of 1
Event Description: 'B' RHR Injection Valve 1-1001-29B fails to open			

Time	Position	Applicant's Actions or Behavior
SIMOP NOTE: None		
Key Parameter Response: Drywell and Torus pressure/temperature rises, RPV water level lowers, RPV pressure lowers Expected Annunciator(s): None Automatic Actions: 1B CS Injection when RPV Pressure <325 psig		
	BOP	When Reactor Pressure <325 psig announce that 1B CS is injecting into the core and the 'B' RHR Injection Valve 1-1001-29B failed to open.
	SRO	Directs the BOP to attempt to open the 1-1001-29B valve
CT1	BOP	Opens the 1-1001-29B valve
	BOP	Informs the Unit Supervisor that 'B' RHR is injecting into the core.
	ATC	Informs the Unit Supervisor that RWL is rising.
	ATC	Reports RPV water level above -142" 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/BOP	Report RPV water level above 0 inches and controlling in 0 to 48 in. band.
	SRO	Directs BOP to spray the Torus when Torus pressure exceeds 2.5 psig.
	BOP	Starts Torus sprays and monitors containment response.
	BOP	Reports Torus pressure greater than 5 psig. 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.
CT2	BOP	Starts Drywell Sprays and reports containment temperature and pressure are lowering.
SIMOP NOTE: When Containment parameters have been addressed IAW QGA 200, place the simulator in **FREEZE.**		