

**PROGRESS ENERGY CAROLINAS
BRUNSWICK TRAINING SECTION**

SIMULATOR SCENARIO

2010-1 NRC Exam Scenario #1

Facility: BrunswickScenario No.: 2010-1 #1Op-Test No.: Draft

Examiners: _____ Operators: _____

Initial Conditions: Plant is operating max power MOC. PT-02.3.1A is in progress with the one hour wait complete. Torus-DW Vacuum Breaker D indication unavailable. RHR SW Pump 2A is under clearance.

Turnover: Complete PT-02.3.1A.

Event No.	Malf. No.	Event Type*	Event Description
1		N-BOP N-SRO	Vacuum Breaker Testing PT-02.3.1A – Alternate method
2	ES022F	I-RO I-SRO	Inadvertent RCIC initiation (TS)
3	EE043F	R-RO R-SRO	Switchyard Line trip requiring Power reduction
4	K4521A Off	C-BOP C-SRO	RBCCW pump trip with failure of standby to auto start
5	ES013F	C-RO C-SRO	Blown HPCI logic fuse (TS)
6	EE020F	C-RO C-SRO	SAT trip; manual scram fails requiring ARI
6 (Con't)	DG005F	I-BOP I-SRO	DG 4 failures
7	NB009F	M-All	Small break LOCA
7 (Con't)	ES044F ES045F ES046F	C-RO C-SRO	LP ECCS initiation logic failure
8		NA	Emergency depressurization

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

SCENARIO DESCRIPTION

The plant is operating at maximum power, Middle of Cycle.

- Event 1 RHR SW Pump 2A is under clearance. Suppression Chamber to Drywell Vacuum Breaker D indication is unavailable. PT-02.3.1A, Vacuum Breaker Position Check Alternate Method is in progress. The one hour wait is complete. The crew will complete PT-02.3.1A.
- Event 2 RCIC will inadvertently initiate. The crew should respond per 0AOP-03.0 and trip RCIC.
- Event 3 230 kV Line 30 will trip. The Load Dispatcher will request power be reduced to <800 MWe. Power must be reduced using ENP-24.5.
- Event 4 The B RBCCW pump will trip with the standby pump failing to auto start. 0AOP-16.0 should be entered and the standby pump started to recover system pressure.
- Event 5 The HPCI logic power fuse will blow requiring HPCI AOP to be secured per the APP and declared Inoperable. With RCIC also Inoperable, Tech Specs requires a plant shutdown.
- Event 6 The SAT will trip resulting in loss of Recirculation Pumps requiring a manual scram. Manual scram push button B will fail. Rods can be inserted using ARI. Off-site power is lost when the turbine trips. Diesel Generator #3 will start, tie to E3, then trip on over current. Diesel Generator #4 will fail to auto start and tie, but can be manually auto started and manually tied to energize E4. The crew will respond per AOP-36.1 and EOP-01-RSP. Bus E3 cannot be cross-tied due to the electrical fault, but 480V E7 can be cross-tied to E8. SRVs will be available for pressure control. RCIC can be restarted with an initiation signal following trip to provide inventory makeup to the RPV. CRD flow can be maximized (1 pump) and SLC can be aligned for demin water injection (1 pump until E7 is cross-tied, then both).
- Event 7 A small Recirculation line break will occur. Available injection sources will be unable to stabilize RPV level. RPV level will drop to LL3 resulting in actuation of ADS timers. The crew may allow ADS to automatically initiate, or manually initiate ADS when level drops below TAF. Low pressure ECCS initiation logic will fail at LL3 requiring manual actions to start available pumps and align injection when RPV pressure drops below 400 psig.
- Event 8 When the RPV has been depressurized and RPV level restored to the normal band, the scenario may be terminated.

OBJECTIVES

SRO

344205B402, Direct Shift Response To A Moderator Temperature Decrease Per AOP-03.0

344237B402, Direct Actions For A Loss of Any 4KV Buses Per AOP-36.1

344231B502, Direct Actions For A Reactor Scram With MSIVs Closed And Reactor Power Less Than 4% Per EOP-01-RSP

344217B502, Direct Actions To Control RPV Level Per EOP-01-RVCP

344218B502, Direct Actions To Control Reactor Pressure Per EOP-01-RVCP

344220B502, Direct Actions To Emergency Depressurize The RPV Per EOP-01-RVCP

344214B502, Direct Actions To Control Primary Containment Pressure Per EOP-02-PCCP

344215B502, Direct Actions To Control Primary Containment Temperature Per EOP-02-PCCP

344216B502, Direct Actions To Control Suppression Pool Temperature Per EOP-02-PCCP

RO

202202B101, Decrease Reactor Recirculation Pump Speed/Reactor Power Using The Manual Control Station Per OP-02

217200B401, Restart The RCIC System After Auto Initiation And Turbine Trip Per OP-16

217204B401, Shutdown The RCIC System with an Automatic Initiation signal present Per OP-16

262002B401, Respond To A Loss Of Off-Site Power Per AOP-36.1

262007B401, Crosstie Emergency 480 VAC Buses Per AOP-36.1

264009B401, Manually Start A DG With An Auto Start Signal Present With A Failure Of The DG To Start

209007B501, Manually Operate Core Spray To Maintain Reactor Water Level

203006B501, Manually Operate LPCI To Control Reactor Water Level

200049B501, Spray The Drywell Per EOP-01-SEP-02

200062B501, Spray The Suppression Pool Per EOP-01-SEP-03

205014B101, Start Up RHR In Suppression Pool Cooling Mode Per OP-17

SIMULATOR SETUP

Initial Conditions

IC-13

Event Triggers

Event	Trigger Description
0	Normal Ops (Vacuum Breaker PT)
1	Manually Initiated (Inadvertent RCIC Initiation)
2	Manually Initiated (230 kV Line Trip)
3	Manually Initiated (2B RCC Pump Trip)
4	Manually Initiated (HPCI Bus A Logic Fails)
5	Manually Initiated (SAT Trip)
6	Manually Initiated (Small Break LOCA)
7	Auto Initiated (DG4 Auto Mode Start Depressed, deletes DG005F)(K4G14AB8)
8	Auto Initiated (DG3 to E3 Breaker Red=True, activates DG# Trip)(Q4226UR8)

Malfunctions

Event	Sys	Tag	Title	Value (Ramp)	Activate Time	Deactivate Time
A	DG	DG005F	DG4 Auto Start Fail	NA	0 SEC	NA
A	ES	ES044F	Core Spray B Auto Start Fail	NA	0 SEC	NA
A	ES	ES045F	RHR A Auto Start Fail	NA	0 SEC	NA
A	ES	ES046F	RHR B Auto Start Fail	NA	0 SEC	NA
E1	ES	ES022F	Inadvertent RCIC Start	NA	0 SEC	NA
E2	EE	EE043F	230 kV Line 30 Trip	NA	0 SEC	NA
E4	ES	ES015F	HPCI Power Supply Failure	NA	0 SEC	NA
E5	EE	EE020F	SAT Relay Failure	NA	0 SEC	NA
E6	NB	NB009F	Small Recirc Line Rupture	10% 5 MIN	0 SEC	NA
E8	DG	DG026F	DG3 Differential Fault	NA	5 SEC	NA

Switch

Event	Panel	Tag	Title	Value	Activate	Deactivate
A	XU-2	K2503A	Rx Manual Scram B	OFF	0 SEC	NA
A	XU2	K4522A	RBCCW Pump C Auto	Off	0 Sec	NA
E3	XU2	K4521A	RBCCW Pump B Off	On	0 Sec	NA

Lamps

Event	Panel	Tag	Title	Value (Ramp)	Activate Time	Deactivate Time
A	XU-2	Q4B212R4	NSW Pump B On Red	ON		
3	XU2	Q4521LG4	RBCCW Pump B Off G	Off		
A	P601	Q1D23SWN	RHR A Init Sig White	OFF		
A	P601	Q1J39SWN	RHR 2 Init Sig White	OFF		
A	XU-2	Q4804DGP	SP-DW Vac Bkr D Grn	OFF		
A	XU-2	Q4804URP	SP-DW Vac Bkr D Red	OFF		
A	P601	Q1C22SWL	Init Sig Seal In – White	OFF		
A	P601	Q1J32SWL	Init Sig Seal In – White	OFF		

Remote Functions

Event	System	Tag	Title	Status	Act./Ramp
A	ED	IABKCF15	DC Control Fuses RHR SW 2A	OUT	
A	ED	IABKCF13	DC Control Fuses NSW 2B	OUT	
10	CA	IABSG02A	RB Purge Fan 2A Bkr	In	
11	RD	RDVF034	Charging Water Isol Valve F034	1.0	Over 5 sec
12	SW	VHSW146L	CSW to RBCCW Hxs V146	Open	
13	ED	ZIEDH08	Pnl 2AB to Alternate	Alt	1 min
13	ED	ZIEDHX0	Pnl 32AB to Alternate	Alt	2 min
13	ED	ZIEDH11	Pnl 2AB-RX to Alternate	Alt	3 min
14	RP	IAEPAMGA	RPS MG Set AEPA Bkrs	Set	
14	RP	IARPSA	Restart RPS MG Set A	Reset	5 sec.
15	ED	IARKA10	X-Tie Bkr E8-E7 A10	In	2.5 min
15	ED	IARKAX5	X-Tie Bkr E7-E8 AX5	In	5 min
16	EP	IACS993P	DW Clr A/D Override	Stop	
16	EP	IACS994P	DW Clr B/C Override	Stop	

SPECIAL INSTRUCTIONS

Ensure simulator exam security measures in place.

Perform actions of OPT-02.3.1A as necessary to increase drywell pressure to between 0.5 and 1.0 psig using nitrogen injection with the suppression chamber being vented. Secure nitrogen injection and mark up OPT-02.3.1A to last drywell pressure check (@ 60 minutes).

Ensure CAC 4409/4410 in service.

Advance all chart recorders to indicate steady state conditions.

Place all SPDS displays to the Critical Plant Variable display (#100).

Ensure appropriate keys have blanks in switches.

Exit shutdown screen on RWM and place the RWM key in the key locker.

Reset alarms on SJAE, MSL, and RWM NUMACs.

Ensure reference material is in appropriate location.

Verify any log books have blank sheets only and procedures are not marked.

Load scenario file if available.

Load malfunctions/overrides if scenario file is unavailable.

In command line type trc:7, mfd:dg005f (if scenario file is unavailable)

Place red cap on RHR SW Pump A.

Verify U2CO_C099, Avg Hotwell Temp <115°F, or start the third condensate pump.

Ensure 0ENP-24.5 for IC-13 @ P603.

SHIFT BRIEFING

Plant Status

The plant is operating at maximum power, Middle of Cycle.

Equipment Out of Service

RHR SW Pump 2A is under clearance for breaker repair and is expected to be returned to service in two hours.

Suppression Chamber to Drywell Vacuum Breaker D position indication is unavailable. OPT-02.3.1A, Suppression Chamber To Drywell Vacuum Breaker Position Check Alternate Method, is in progress to comply with LCO 3.6.1.6.

CAC-PI-2685-1 (XU-51) is being used to monitor drywell pressure.

No other equipment is out of service

Plan of the Day

Maintain maximum power.

OPT-02.3.1A is complete up to the last pressure reading at the 60 minute time period. When shift turnover is complete, take the final drywell pressure reading and complete OPT-02.3.1A.

SCENARIO TRAINING INFORMATION

Instructor Notes

This guide is designed to meet the requirements of an examination scenario for Initial License as outlined in NUREG-1021, Rev.9, Supp.1 ES-301 and Appendix D.

During the execution of this scenario, the students should be rated on the performance of the objectives, compliance with general simulator performance standards, and for overall team skills in accordance with TAP-409 and NUREG-1021, ES-302.

Common Student Problems/Errors

None

Simulator Deficiencies

There are no known simulator deficiencies applicable to this scenario.

Critical Tasks (Critical Tasks are identified to ensure scenario validity and do not constitute pass/fail criteria for Initial License.)

- Insert control rods
- Manually start and tie Diesel generator #4
- Restore and maintain RPV level above LL4.

EVENT 1 VACUUM BREAKER TEST

The crew will complete shift turnover and perform OPT-02.3.1A.

Objectives:

SCO - Directs performance of OPT-02.3.1A to be completed.

RO - Completes OPT-02.3.1A.

Success Path:

Drywell pressure remains constant indicating all vacuum breakers closed.

Simulator Operator Actions:

- ☐ If asked as I&C, spare limit switches for vacuum breaker D are unavailable.
- ☐ When requested, initiate **Trigger 10** to turn Purge Fan A breaker ON.
- ☐ When directed by the lead examiner, proceed to the next event.

Required Operator Actions

Normal Ops – Perform Vacuum Breaker OPT-02.3.1A.

SRO

Time	Action	Notes
	Direct PT-02.3.1A to be completed.	
	Determine acceptance criteria is met	
	May direct venting of the DW after completion of the PT. (IAW 2OP-10)	

RO

Time	Action	Notes
	Plant Monitor	
	May be asked to perform IV for steps in OPT-02.3.1A.	

EVENT 1 (Cont'd) VACUUM BREAKER TEST

BOP

Time	Action	Notes
	Complete OPT-02.3.1A	
	Records the 60 minute interval reading (Step 7.9.7)	
	Record final pressure reading	
	Compute ratio (Final reading divided by Initial reading)	
	Compare ratio obtained in Step 7.10.2 to 0.5 and check ratio greater than 0.5 space	
	Close <i>TORUS PURGE EXH VLV, CAC-V8</i>	
	Close <i>TORUS PURGE EXH VLV, CAC-V7</i>	
	Momentarily place control switches for both Purge Exhaust Fans in <i>OFF</i>	
	Dispatch AO to confirm Purge Exhaust Fan A(B) Suction Valve, <i>M-BFV-RB (K-BFV-RB)</i> , indicates closed at MCC	
	Dispatch AO to confirm Purge Exhaust Fan A(B) Discharge Valve, <i>J-BFV-RB (L-BFV-RB)</i> , indicates closed at MCC	
	Ensure breaker for the following Purge Exhaust Fan is closed: <i>A PURGE EXHAUST FAN</i>	
	Close <i>PURGE EXHAUST FANS SUCTION VALVE, I-BFV-RB</i>	

EVENT 1 (Cont'd) VACUUM BREAKER TEST

BOP cont'd

	Close <i>PURGE EXHAUST FANS INBOARD EXHAUST HEADER ISOLATION VALVE, N-BFV-RB</i>	
	Close <i>PURGE EXHAUST FANS OUTBOARD EXHAUST HEADER ISOLATION VALVE, A-BFV-RB</i>	
	Open <i>SBGT TRAIN A REACTOR BUILDING SUCTION VALVE, VA-D- BFV-RB</i>	
	Open <i>SBGT TRAIN B REACTOR BUILDING SUCTION VALVE, VA-H- BFV-RB</i>	
	Ensure the suppression pool oxygen concentration is less than 4% oxygen	
	Ensure the required information has been recorded on the cover page	
	Notifies the Unit SCO when this test is complete SAT	

EVENT 2 INADVERTENT RCIC INITIATION

The crew will respond to an inadvertent RCIC initiation.

Objectives:

SCO - Direct shift response to a moderator temperature decrease.

RO – Shutdown the RCIC system with an automatic initiation signal present.

Success Path:

RCIC shutdown and Technical Specifications reviewed.

Simulator Operator Actions:

- ☐ When the directed by the lead examiner, initiate **Trigger 1** to inadvertently start RCIC.
- ☐ If RCIC has been running for >5 minutes, and crew has not recognized RCIC running, call control room as AO and ask why RCIC is running.
- ☐ If asked as I&C to investigate, acknowledge the request
- ☐ If asked as NE to monitor thermal limits, acknowledge the request.
- ☐ If asked as chemistry for Rx Coolant Sample, acknowledge the request.
- ☐ When directed by the lead examiner, proceed to the next event.

Required Operator Actions

Tech Specs – 3.5.3 RCIC System

Condition A Verify HPCI is OPERABLE and restore RCIC to OPERABLE status within 14 days.

SRO

Time	Action	Notes
	Direct entry into 0AOP-03.0.	
	Direct RCIC operation to be terminated.	
	May contact NE to monitor thermal limits due to the cold water injection from RCIC.	
	Contact I&C to investigate RCIC logic.	
	Tech Spec 3.5.3 RCIC System Determine Condition A applies Required Action A.1, Immediately verify HPCI is OPERABLE Required Action A.2, Restore RCIC to OPERABLE within 14 days	

EVENT 2 (Cont'd) INADVERTENT RCIC INITIATION

RO

Time	Action	Notes
	Recognize and report RCIC injection	
	Enter and announce 0AOP-03.0	
	Verify inadvertent initiation by two independent indications and trip RCIC.	
	Depress <i>TURBINE TRIP, E51-S17</i> , push button to trip the RCIC turbine	
	Monitor reactor power and thermal limits.	
	<i>A-03 3-5, RCIC TURBINE STM LINE DRN POT LEVEL HI</i> will annunciate requiring the operator to perform the following if it has been in for 5 minutes: <i>Close TURBINE TRIP & THROTTLE VLV, E51-V8</i> , motor operator.	

BOP

Time	Action	Notes
	Plant Monitor	

EVENT 3 SWITCHYARD TRANSMISSION LINE 30 TRIP

The crew will respond to a trip of Transmission Line 30 and reduce power to less than 800 MWe as directed by the Load Dispatcher.

Objectives:

SCO - Direct power reduction in accordance with ENP-24.5 to 800 MWe using recirc.

RO – Decrease reactor recirculation pump speed/reactor power.

Success Path:

Power is reduced to less than 800 MWe.

Simulator Operator Actions:

- ☐ When directed by the lead examiner, initiate **Trigger 2** to trip transmission line 30.
- ☐ If asked as Outside AO, acknowledge request to investigate switchyard alarms.
- ☐ If asked as TB AO, inform crew that the PSS system is in service.
- ☐ If asked as the Load Dispatcher, inform the crew that there is a problem on the line and that Unit 2 should be reduced to 800 MWe (Net). Auto reclosures for Line 30 are to be placed in Manual. No estimate at this time of the duration of the down power.
- ☐ If contacted as the RE for power reduction guidance, inform crew to use ENP-24.5 guidance.
- ☐ If contacted as the RE to monitor power reduction, inform crew that you will monitor core performance on the computer.
- ☐ If contacted as the RE for guidance on operation above the MELL line, inform crew to take the appropriate actions per ENP-24.5 to get below or on the MELL.
- ☐ When directed by the lead examiner, proceed to the next event.

Required Operator Actions

Reactivity – Reduces reactor recirculation pump speeds to reduce to power less than 800 MWe.

SRO

Time	Action	Notes
	Notify Load Dispatcher of transmission line failure.	
	Direct power reduction to <800 MWe.	

BOP

Time	Action	Notes
	Plant Monitor	
	May request Outside AO to investigate alarms in the switchyard.	

EVENT 3 (Cont'd) SWITCHYARD TRANSMISSION LINE 30 TRIP

RO

Time	Action	Notes
	Perform power reduction using reactor recirculation pump speed controller to less than 800 MWe.	
	May reference 2OP-02 section 7.1	
	Request peer checker / reactivity team.	
	Reduces power using ENP-24.5 using recirculation flow to 800 MWe.	
	Reduce flow on one RR Pump (~2%) at a time to stay within mismatch criteria (3.5×10^6 Mlbs jet pump flow).	
	Continues alternating Recirc pump reductions until 800 MWe.	
	Verifies operation on the Power to Flow map.	
	Recognizes operation above the MELLL line and informs SCO.	
	Inserts control rods using ENP-24.5 to get below the MELLL line.	
	Turns control rod power on.	
	Selects control rod (22-19) in accordance with ENP-24.5 sheet. May also insert 30-35, 30-19, or 22-35. (in this order in order to establish a margin to the MELLL line)	
	Continuously drives selected rod in using RMCS.	

EVENT 4 RBCCW PUMP TRIP

The crew will respond to a trip of the 2B RCC pump and pressure will lower. C RCC Pump will fail to auto start and the low pressure alarm will be received. Starting the 2C RCC pump will restore pressure to normal.

Objectives:

SCO – Directs BOP to enter and execute 0AOP-16.0: RBCCW System Failure

BOP – Refers to 2-UA-3 2-5 and 0AOP-16.0 to respond to the 2C Pump failure to start

Success Path:

Starting the 2C RCC pump will restore pressure to normal.

Simulator Operator Actions:

- ☐ At the discretion of the lead evaluator, initiate **Trigger 3** to trip the 2B RCC Pump.
- ☐ If directed as the RB AO to investigate RCC low pressure, report RCC Pump 2B Motor is hot to the touch, breaker is tripped.
- ☐ If contacted as the RB AO, inform the control room prestart checks of the 2C RCC pump are complete.
- ☐ If directed to investigate as I&C acknowledge the request.
- ☐ When directed by the lead examiner, proceed to the next event.

Required Operator Actions

Component failure – starting 2C RCC pump.

SRO

Time	Action	Notes
	Directs BOP operator to enter Annunciator response for 2-UA-3 2-5, <i>RBCCW PUMP DISCH HEADER PRESS LOW</i> , and refers to 0AOP-16.0.	
	Directs start of 2C RBCCW pump.	
	Directs Maintenance to investigate 2C RBCCW pump auto start failure.	
	Notifies Maintenance of 2B RBCCW Pump trip.	

EVENT 4 (Cont'd) RBCCW PUMP TRIP

RO

Time	Action	Notes
	Plant Monitoring	

BOP

Time	Action	Notes
	Manually starts 2C RBCCW Pump.	
	Refers to Annunciator Response UA-3 2-5, <i>RBCCW PUMP DISCH HEADER PRESS LOW.</i>	
	May Reference 0AOP-16.0	
	Dispatches AO to investigate cause of 2B Pump trip.	
	Places 2B RBCCW Pump switch to OFF.	
	Verifies RBCCW System is operating normally.	

EVENT 5 HPCI POWER SUPPLY FUSE

The crew will respond to a HPCI power supply fuse blowing which will require HPCI AOP to be secured per the APP and declared Inoperable. With RCIC also Inoperable, Tech Specs will require a plant shutdown.

Objectives:

SCO – Determines HPCI TS call.

BOP – Securing of HPCI AOP.

Success Path:

Securing of HPCI AOP and TS 3.5.1 declaration.

Simulator Operator Actions:

- ☐ When directed by the lead evaluator, initiate **Trigger 4** to activate HPCI power supply failure.
- ☐ If asked as AO to investigate, report all circuit breakers in DC Panel 4A are closed.
- ☐ If asked as I&C to investigate, report fuse E41-F25 in panel P601 is blown (blows again if replaced).
- ☐ When directed by the lead examiner, proceed to the next event.

Required Operator Actions

Tech Specs - 3.5.1 ECCS Operating

Condition D Verify RCIC is OPERABLE and restore HPCI to OPERABLE status within 14 days

Condition I Be in Mode 3 within 12 hours and reduce reactor steam dome pressure to <150 psig within 36 hours.

EVENT 5 (Cont'd) HPCI POWER SUPPLY FUSE

SRO

Time	Action	Notes
	Direct actions of 2APP-A-01 (2-5) <i>HPCI FIC POWER LOSS</i> .	
	Direct HPCI AOP to be placed in pull-to-lock per A-01 2-5, <i>HPCI FIC POWER LOSS</i> .	
	Contact I&C to investigate HPCI power supply failure.	
	<p>Tech Spec 3.5.1 ECCS Operating Determine Condition D applies Required Action D.1, Immediately verify RCIC is OPERABLE</p> <p>Required Action D.2, Restore HPCI to OPERABLE within 14 days.</p> <p>Determine condition I applies, Be in Mode 3 within 12 hours and reduce reactor steam dome pressure to <150 psig within 36 hours</p>	

BOP

Time	Action	Notes
	Plant Monitoring	

RO

Time	Action	Notes
	Diagnose and report HPCI power supply failure	
	Perform actions for A-01 2-5, <i>HPCI FIC POWER LOSS</i>	
	Place HPCI AOP in pull-to-lock.	

EVENT 6 LOSS OF SAT/SCRAM

The SAT will trip resulting in loss of Recirculation Pumps requiring a manual scram. This will start all DGs except DG4. Manual scram push button B will fail. Rods can be inserted using ARI. Off-site power is lost when the turbine trips. Diesel Generator #3 will tie to E3, then trip on over current. Diesel Generator #4 will fail to auto start and tie, but can be manually auto started (control room manual mode) and manually tied to energize E4. The crew will respond per AOP-36.1 and EOP-01-RSP. SRVs will be available for pressure control. RCIC can be restarted with an initiation signal following trip to provide inventory makeup to the RPV. CRD flow can be maximized (1 pump) and SLC can be aligned for demin water injection (1 pump until E7 is cross-tied, then both).

Objectives:

SCO – Directs actions for a Reactor Scram, LPC, and 0AOP-36.1.

RO – Insert a reactor scram with no recirc pumps running.

BOP – Start DG4, tie to E4 and perform 0AOP-36.1 actions.

Success Path:

Start and tie DG4 to E4. Rods inserted with ARI.

Simulator Operator Actions:

- ☐ When directed by the lead evaluator, initiate **Trigger 5** to activate SAT failure.
- ☐ If contacted as load dispatcher, report line crews are being dispatched to investigate.
- ☐ If asked as Outside AO, acknowledge request to monitor DGs.
- ☐ If asked to perform actions to maximize CRD flow with 1 pump per SEP-09, wait 4 minutes and report the actions complete.
- ☐ If requested to open CRD charging header isolation valve, initiate **Trigger 11**, wait 2 minutes and report actions complete.
- ☐ If asked as Unit 1 for status of the air system, report 1D is carrying the load.
- ☐ If asked to transfer RCC to CSW, initiate **Trigger 12**, wait 5 minutes and report actions complete.
- ☐ If requested to transfer 2AB, 32AB and 2AB-RX, initiate **Trigger 13** and after 3 minutes report transfers complete (each one will sequence on every 1 minute).
- ☐ If asked to restart RPS, initiate **Trigger 14**, wait 3 minutes and report actions complete.
- ☐ If requested to perform field actions for UAT back-feed, acknowledge the request.
- ☐ When directed by the lead examiner, proceed to the next event.

Required Operator Actions

Insert control rods.

Start DG4 and tie to E4.

EVENT 6 (Cont'd) LOSS OF SAT / SCRAM

SRO

Time	Action	Notes
	Direct insertion of manual scram due to loss of the recirc pumps.	
	Enter and direct EOP-01-RSP.	
	May enter LPC.	
	May direct <i>Initiation of ARI.</i>	
	Direct entry into 0AOP-36.1 for loss of Off-Site Power and loss of E3/E7	
	Directs a pressure band of 800-1000#	
	Direct reactor water level band of 170-200 inches. CRD (SEP-09) RCIC	
	When suppression pool temperature reaches 95°F or DW temperature reaches 150°F, enter EOP-02-PCCP.	
	Direct RHR Loop B to be placed in suppression pool cooling.	

EVENT 6 (Cont'd) LOSS OF SAT / SCRAM

RO

Time	Action	Notes
	Recognize failure of manual scram channel B	
	Initiates ARI per the Scram Hard Card.	
	<p>Perform immediate actions for Reactor scram</p> <p>After steam flow is less than 3×10^6 lb/hr, place the reactor mode switch to shutdown</p> <p>When APRM downscale trip, then Trip the main turbine</p> <p>Ensure the master reactor level controller setpoint is +170 inches</p>	
	Operate SRVs as directed to stabilize pressure and control pressure as directed by the SCO.	
	<p>Start RCIC following turbine trip with initiation signal per the OP.</p> <p>Ensure the E51-V8 (valve position) and E51-V8 (motor operator) are closed</p> <p>Place RCIC flow control in MANUAL (m) and adjust output to 0%.</p> <p>Jog open E51-V8 until the turbine speed is controlled by the governor</p> <p>Fully open E51-V8</p> <p>Slowly increase turbine speed until flow rate of at least 120 gpm</p> <p>Ensure E51-F019 is closed with flow above 80 gpm</p>	

EVENT 6 (Cont'd) LOSS OF SAT / SCRAM

RO (Cont'd)

	<p>Slowly adjust flow rate using RCIC flow control in Auto (A)</p> <p>Ensure Barometric Cndsr Vacuum Pump has started</p>	
	<p>Start CRD per SEP-09 (RO should perform Hard Card then dispatch an AO for procedure actions.</p> <p><u>SEP-09 Hard Card Actions</u></p> <p>Ensure CRD Flow Control, C12-FC-R600, in MAN</p> <p>Close in-service Flow Control Vlv, C12-F002A(F002B)</p> <p>Start a CRD pump.</p> <p>Throttle the following valves to maintain charging water header pressure greater than or equal to 1000 psig but as low as possible:</p> <ul style="list-style-type: none">• In-service Flow Control Vlv, C12-F002A(F002B)• Drive Pressure Vlv, C12-PCV-F003 <p><u>SEP-09 Procedure Actions</u></p> <p>Dispatch AO to perform SEP-09 for one CRD with the Reactor Building Accessible.</p> <p>Throttle the following valves to maintain charging water header pressure greater than or equal to 800 psig but as low as possible:</p> <ul style="list-style-type: none">• In-service Flow Control Vlv, C12-F002A(F002B)• Drive Pressure Vlv, C12-PCV-F003• Charging Water Header Throttle Valve, C12-F034	
	<p>Operate RCIC/CRD to restore/maintain Reactor water level +170-200 inches</p>	

EVENT 6 (Cont'd) LOSS OF SAT / SCRAM

RO (Cont'd)

	<p>Place RHR Loop B into suppression pool cooling.</p> <p>Open SW-V105</p> <p>Close SW-V143</p> <p>If LOCA signal is present place RHR SW Booster Pumps B & D LOCA override switch to manual override</p> <p>Start RHR SW Pmp</p> <p>Adjust E11-PDV-F068B (1 pump 2000 - 4000 gpm) (2 pumps 5000 - 8000 gpm)</p> <p>Supply Clg Wtr to Vital Hdr</p> <p>Verify spray logic is made up</p> <p>Start Loop B RHR Pmp</p> <p>Open E11-F028B</p> <p>Throttle E11-F024B (1 pump 6000 - 10000 gpm) (2 pumps 6000 - 11500 gpm)</p> <p>Throttle E11-F048B</p>	
--	---	--

EVENT 6 (Cont'd) LOSS OF SAT / SCRAM

BOP

Time	Action	Notes
	Diagnose failure of DG4 to auto start	
	<p><i>Start and manually tie DG4 to E4.</i></p> <p>Depresses the AUTO Start pushbutton.</p> <p>Places the DG4 to E4 control switch to close.</p>	
	Determine trip of DG3 is due to electrical fault.	
	Announce and enter 0AOP-36.1.	
	Determine UAT back-feed available and direct field actions.	
	Ensure NSW 2B running, start CSW 2B and 2C.	
	Start Control Room and Battery Room HVAC.	
	Restore Drywell cooling (Dispatch an AO to transfer RCC to CSW header).	
	Direct RPS to be restarted.	
	Close SW-V3 for suppression pool cooling when required.	

EVENT 7 SMALL BREAK LOCA

A small Recirculation line break will occur. Available injection sources will be unable to stabilize RPV level. RPV level will drop to LL3 resulting in actuation of ADS timers. The crew may allow ADS to automatically initiate, or manually initiate ADS when level drops below TAF. Low pressure ECCS initiation logic will fail at LL3 requiring manual actions to start available pumps and align injection when RPV pressure drops below 400 psig. Bus E3 cannot be cross-tied due to the electrical fault, but 480V E7 can be cross-tied to E8.

Objectives:

SCO – Directs actions for a Reactor Scram, LPC, and 0AOP-36.1.

RO – Insert a reactor scram with no recirc pumps running.

BOP – Start DG4, tie to E4 and perform 0AOP-36.1 actions.

Success Path:

Start and tie DG4 to E4. Rods inserted with ARI.

Simulator Operator Actions:

- ☐ When directed by the lead evaluator, initiate **Trigger 6** to activate small break LOCA.
- ☐ If requested to transfer SLC suction to demin water, initiate **Trigger 9**, wait two minutes and report actions complete.
- ☐ If requested to perform actions for E7-E8 cross-tie per 0AOP-36.1, Initiate **Trigger 15** and wait 5 minutes and report breakers are racked in.
- ☐ If requested to stop drywell coolers, initiate **Trigger 16**.
- ☐ If asked as I&C to investigate ECCS logics, acknowledge request
- ☐ When directed by the lead examiner, proceed to the next event.

Required Operator Actions

EVENT 7 (Cont'd) SMALL BREAK LOCA

SRO

Time	Action	Notes
	Recognize rising drywell temperature and pressure, diagnose as LOCA.	
	Enter and direct EOP-01-RVCP, if not already in.	
	Direct reactor water level band of 170-200 inches. CRD (SEP-09) RCIC SLC (LEP-01)	
	Direct initiation of suppression chamber spray.	
	Direct drywell spray when suppression chamber pressure >11.5 psig.	
	Direct E7-E8 cross-tied.	
	Informs crew on decision of inhibiting or not inhibiting ADS	
	Direct LL3 actuations verified	
	Directs Low Pressure ECCS pumps be started	

EVENT 7 (Cont'd) SMALL BREAK LOCA

RO

Time	Action	Notes
	Recognize rising drywell temperature and pressure, diagnose as LOCA	
	<p>Perform LEP-01 for SLC injection with demin water</p> <p>Dispatch an AO to perform infield actions.</p> <p>When in field actions complete, starts B SLC Pump.</p>	
	<p>Initiate suppression chamber spray per SEP-03.</p> <p>If necessary, then place Loop B 2/3 CORE HEIGHT LPCI INITIATION OVERRIDE SWITCH, E11-CS-S18B, in Manual Overrd.</p> <p>If the CTMT SPR OVRD light for the Loop B CONTAINMENT SPRAY VALVE CONTROL SWITCH, E11-CS-S17B is not on, then momentarily place Loop B CONTAINMENT SPRAY VALVE CONTROL SWITCH, E11-CS-S17B, to Manual</p> <p>Ensure at least one RHR Loop B Pump is operating</p> <p>Ensure TORUS DISCHARGE ISOL VLV, E11-F028B, is open</p> <p>Open TORUS SPRAY ISOL VLV, E11-F027B.</p>	

EVENT 7 (Cont'd) SMALL BREAK LOCA

RO (Cont'd)

	<p>Initiate drywell spray per SEP-02</p> <p>Ensure WELL WATER TO VITAL HEADER VLV, SW-V141, is closed</p> <p>Ensure both reactor recirculation pumps are tripped</p> <p>Place all drywell cooler control switches to OFF (L/O)</p> <p>May request Drywell Cooler override switches to STOP.</p> <p>Confirm the following:</p> <ul style="list-style-type: none">• Drywell pressure and drywell temperature are in the "SAFE" region of the DSIL graph.• Suppression pool water level is below +21 inches. <p>Open Loop B DRYWELL SPRAY INBD ISOL VLV, E11-F021B</p> <p>Throttle open Loop B DRYWELL SPRAY OTBD ISOL VLV, E11-F016B, to obtain between 8,000-10,000 gpm flow</p>	
	<p>Inhibits ADS if directed by SCO</p>	
	<p>Start all available low pressure ECCS pumps at 400 psig in reactor:</p> <p>2B CS 2B RHR 2C RHR 2D RHR</p>	

EVENT 7 (Cont'd) SMALL BREAK LOCA

BOP

Time	Action	Notes
	<p>Cross-tie E7-E8 when directed by SCO.</p> <p>Obtain permission from both Units' SCO to close the 480V E bus cross-tie breakers</p> <p>Dispatch AO to Rack in the 480V Crosstie breakers.</p> <p>Place SUB E7 480V Main Breaker, breaker AZ1, in trip.</p> <p>Place BUS E3 TO SUB E7, breaker AJ0 in trip.</p> <p>Place and hold BUS E7 TIE TO BUS E8, breaker AX5 and A10 in close until both cross-tie breakers indicate closed.</p>	

EVENT 8 REACTOR DEPRESSURIZATION

Depressurization may be automatic or manually performed when level drops below TAF.

Objectives:

SCO – Directs actions Emergency Depressurization and restoration of reactor water level.

RO – Performs action for emergency Depressurization and restoration of reactor water level.

Success Path:

Restore reactor water level to 170-200 inches.

Simulator Operator Actions:

- ☐ If requested to re-align SLC to the boron tank, wait 4 minutes and modify Remote Function SL_IASLCTST, NORM
- ☐ When RPV level is being controlled >+170", the scenario may be terminated
- ☐ When directed by the lead evaluator place the simulator in FREEZE.

Required Operator Actions

Restore and maintain RPV level above LL4

SRO

Time	Action	Notes
	Determine ED is required.	
	Direct placing 7 ADS valve switches to open.	
	Direct re-alignment of RHR for LPCI injection	
	Direct low pressure ECCS injection valves opened	
	Direct RPV level be restored and maintained +170-200 inches	
	Direct Alternative Source Term actions (SLC, CREV, SEP-11)	

EVENT 8 (Cont'd) REACTOR DEPRESSURIZATION

RO / BOP

Time	Action	Notes
	Places 7 ADS valve control switches	
	Re-align RHR for LPCI injection. Ensures Drywell Sprays / SP Sprays / Torus Cooling removed from service	
	Manually perform any failed LPCI initiation actions Open 2B CS injection valve Open 2A RHR Loop Injection Valve Open 2B RHR Loop Injection Valve	
	Close Recirc Discharge and Discharge Bypass valves	
	<i>Operate LP ECCS to restore and maintain RPV level 170-200 inches.</i>	
	Re-align SLC for SLC Tank Injection (Alternate Source Term Action)	
	Start CREV (Alternate Source Term Action)	
	Perform SEP-11 (Alternate Source Term Action)	

Simulator Operator Activities:

WHEN directed by the lead examiner, place the simulator in **FREEZE**.

CAUTION

**DO NOT RESET THE SIMULATOR PRIOR TO RECEIPT
OF CONCURRENCE TO DO SO FROM THE LEAD
EXAMINER**



Progress Energy

BRUNSWICK NUCLEAR PLANT

C
Continuous
Use

DATE COMPLETED _____

UNIT _____ % PWR _____ GMWE _____

SUPERVISOR _____

REASON FOR TEST (check one or more):

____ Routine surveillance

____ W/O # _____

____ Other (explain) _____

FREQUENCY:

A. When the position indicator of any Drywell -
Suppression Chamber vacuum breaker is
inoperable, perform as below:

- At least once per 14 days
- Within 6 hours after any discharge of
steam to the suppression chamber from
any source
- Within 6 hours following an operation that
causes any of the vacuum breakers to
open.

PLANT OPERATING MANUAL

VOLUME X

PERIODIC TEST

UNIT
0

OPT-02.3.1a

SUPPRESSION POOL TO DRYWELL VACUUM BREAKER POSITION CHECK (ALTERNATE METHOD)

REVISION 19

1.0 PURPOSE

- 1.1 This test is the alternate method performed to determine the operability of the suppression pool to drywell vacuum breakers in conformance with the requirements specified in Technical Specifications Section SR 3.6.1.6.1.
- 1.2 This test involves observation of differential pressures between the drywell and suppression pool to verify proper position.

2.0 REFERENCES

- 2.1 Technical Specification
- 2.2 FSAR, Section 6.2
- 2.3 1(2)OP-10, Standby Gas Treatment System Operating Procedure
- 2.4 1(2)OP-11, Radiation Monitoring System Operating Procedure
- 2.5 1(2)OP-24, Containment Atmosphere Control System
- 2.6 OOP-40, Auxiliary Steam System
- 2.7 System Description SD-24, Containment Atmospheric Control System

3.0 PRECAUTIONS AND LIMITATIONS

- 3.1 Drywell pressure should be maintained between -0.5 psig (-14 in. H₂O) and 1.65 psig (46 in. H₂O).
- 3.2 If drywell pressure increases to greater than 1.7 psig (47 in. H₂O), a reactor SCRAM will occur.
- 3.3 This procedure establishes nitrogen flow to the Drywell without a vent path. There is a potential to cause rapid increases in Drywell pressure.

4.0 PREREQUISITES

- 4.1 No other testing or maintenance is in progress that will adversely affect the performance of this test.
- 4.2 SBT System is aligned for standby in accordance with 1(2)OP-10.
- 4.3 An auxiliary steam supply is available and ready to supply steam.

4.0 PREREQUISTIES

Initials

4.4 *MAIN STACK RADIATION MONITOR, D12-RM-4599-1*, is in service in accordance with 1(2)OP-11, and *CAC PURGE VENT ISOL OVRD, CAC-CS-5519*, is in *OFF* on Panel XU51.

4.5 A Purge Exhaust Fan is available to vent the suppression chamber.

5.0 SPECIAL TOOLS AND EQUIPMENT

NOTE: If an inch of water test gauge is used, pressure values are in parenthesis. If different data points are desired, convert psig to inches of H₂O by dividing the psig value by .0361 to get inches of water.

5.1 0-100 inch water test gauge or a 0-15 psig test gauge if required.

5.1.1 Test gauge identification number N/A

5.1.2 Test gauge calibration date N/A

5.1.3 Test gauge calibration due date N/A

6.0 ACCEPTANCE CRITERIA

This test may be considered satisfactory when the following criteria are met:

6.1 A vacuum breaker is verified in the closed position by establishing a differential pressure between the drywell and suppression pool.

6.2 The differential pressure between the drywell and suppression pool remains greater than one-half the initial differential pressure for 1 hour without nitrogen makeup.

7.0 PROCEDURAL STEPS

Initials

7.1 **OBTAIN** permission from the Unit SCO to perform this test. RO

7.2 **ENSURE** prerequisites listed in Section 4.0 are met. RO

7.3 **ENSURE** the required data has been recorded in Section 5.0. RO

7.0 PROCEDURE STEPS

Initials

- 7.4 **CONFIRM** Drywell Pressure Indicator, CAC-PI-2685-1, is operable **OR** test gauge installed at CAC-PSH-2684 INSTRUMENT DRAIN VALVE, CAC-IV-696 (drywell penetration X57D). RO
- 7.4.1 **IF** a test gauge was installed, **THEN UNLOCK AND OPEN** CAC-PSH-2684 INSTRUMENT DRAIN VALVE, CAC-IV-696. NA
- 7.5 **VENT** the Suppression Chamber using the Purge Exhaust Fans as follows: RO
- 7.5.1 **OBTAIN** permission from E&RC to vent Primary Containment through the Purge Exhaust Fans. RO
- 7.5.2 **OPEN** the following valves:
1. *PURGE EXHAUST FANS SUCTION VALVE, I-BFV-RB.* RO
 2. *PURGE EXHAUST FANS INBOARD EXHAUST HEADER ISOLATION VALVE, N-BFV-RB.* RO
- 7.5.3 **CLOSE** the following valves:
1. Reactor Building SGBT Inlet Valve, VA-D-BFV-RB. RO
 2. Reactor Building SGBT Inlet Valve, VA-H-BFV-RB. RO
- 7.5.4 **OPEN** *PURGE EXHAUST FANS OUTBOARD EXHAUST HEADER ISOLATION VALVE, A-BFV-RB.* RO
- 7.5.5 **OPEN** the following breaker for the selected Purge Exhaust Fan.
1. *PURGE EXHAUST FAN, A-PS-EF-RB* MCC 1(2)XG Compt. EG7 RO
 2. *PURGE EXHAUST FAN, B-PS-EF-RB* MCC 1(2)XH Compt. EK3 NA

7.0 PROCEDURE STEPS

Initials

- | | | |
|--------|---|-----------|
| 7.5.6 | PLACE the control switch for the selected Purge Exhaust Fan in either <i>SLOW</i> or <i>FAST</i> . | <u>RO</u> |
| 7.5.7 | CONFIRM Purge Exhaust Fan A(B) Suction Valve, <i>M-BFV-RB (K-BFV-RB)</i> , indicates open at MCC 1(2)XG Compt. EH6 (MCC 1(2)XH Compt. EM2). | <u>RO</u> |
| 7.5.8 | CONFIRM Purge Exhaust Fan A(B) Discharge Valve, <i>J-BFV-RB (L-BFV-RB)</i> , indicates open at MCC 1(2)XG Compt EH5 (MCC 1(2)XH Compt. EM1). | <u>RO</u> |
| 7.5.9 | OPEN <i>TORUS PURGE EXH VLV, CAC-V7.</i> | <u>RO</u> |
| 7.5.10 | OPEN <i>TORUS PURGE EXH VLV, CAC-V8.</i> | <u>RO</u> |

NOTE: Venting maintains the suppression pool at atmospheric pressure and is required for the duration of this test to ensure drywell pressure is equivalent to the differential pressure between the drywell and the suppression pool.

CAUTION

IF drywell pressure increases to greater than 1.7 psig (47 in. H₂O), THEN a reactor SCRAM will occur.

- 7.6 PERFORM the following to increase drywell pressure to 1.0 psig (27.7 in. H₂O) on indicator identified in Step 7.4.

NOTE: IF the CAC inerting system is not available, THEN the drywell may be pressurized using the CAD System in accordance with 1(2)OP-24, Containment Atmosphere Control System. IF the CAD System is used, THEN CAD tank level must remain greater than 4350 gallons.

- | | | |
|-------|--------------------------------------|-----------|
| 7.6.1 | OPEN INERTING N2 INLET VLV, CAC-V58. | <u>RO</u> |
| 7.6.2 | OPEN INERTING N2 INLET VLV, CAC-V4. | <u>RO</u> |
| 7.6.3 | OPEN DW N2 INLET VALVE, CAC-V6. | <u>RO</u> |

7.0 PROCEDURE STEPS

Initials

- 7.6.4 **ENSURE STEAM TO CAC VAPORIZER, 2-HS-V502,**
is open.

RO

CAUTION

Cryogenic liquids will cause severe burns if they contact the skin. To prevent injury when working with these liquids, the following precautions should be followed:

1. Ventilate the area - do not breathe the vapor.
2. Do not catch and confine bleedoff in a closed container.
3. Wear loose fitting gloves and outer garments, non-porous preferred.
4. Do not touch uninsulated pipes with bare skin.

- 7.6.5 **ENSURE** auxiliary steam supply is in operation and is
ready to supply steam for inerting.

RO

NOTE: 1-AS-V437 is located on the 21' elevation in the equipment laydown area near the sump.

- 7.6.6 **OPEN DRAIN VALVE TO SUMP, 1-AS-V437,** to drain
the auxiliary steam line between the auxiliary boiler
and the Augmented Off-Gas Building.

RO

- 7.6.7 **WHEN** sufficient time has passed for the line to be
drained and steam can be heard passing through the
drain line, **THEN CLOSE 1-AS-V437.**

RO

NOTE: Steam pressure to the Inerting Vaporizer can be controlled by either
1-AS-PCV-3103 **OR** 2-AS-PCV-3103. 1-AS-PCV-3103 is normally in
service.

- 7.6.8 **IF** it is desired to control the steam pressure to the
Inerting Vaporizer by using 1-AS-PCV-3103, **THEN**
PERFORM the following:

1. **ENSURE INLET ISOLATION VALVE TO**
1-AS-PCV-3103, 1-AS-V408, is open.

RO

7.0 PROCEDURE STEPS

Initials

2. **ENSURE OUTLET ISOLATION VALVE TO**
1-AS-PCV-3103, 1-HS-V501, is open.

RO

7.6.9 **IF** it is desired to control the steam pressure to the
Inerting Vaporizer by using 2-AS-PCV-3103, **THEN**
PERFORM the following:

1. **CLOSE INLET ISOLATION VALVE TO**
1-AS-PCV-3103, 1-AS-V408.
2. **ENSURE OUTLET ISOLATION VALVE TO**
2-AS-PCV-3103, 2-HS-V500, is open.
3. **SLOWLY OPEN INLET ISOLATION VALVE TO**
2-AS-PCV-3103, 2-AS-V408.

RO

RO

RO

NOTE: 2-HS-V503 has two control switches, one on Unit 1 RTGB and one on Unit 2 RTGB.

- 7.6.10 **OPEN AUX STEAM SPLY TO PURGE VAP,**
2-HS-V503.

RO

CAUTION

Damage to *AIR CONTROLLER*, 2-CAC-HIC-2695 can occur with pressures greater than 15 psig.

- 7.6.11 **ADJUST LN2 VAPORIZER STEAM INLET CONTROL**
VALVE, 2-CAC-HV-2695, air signal as necessary,
using 2-CAC-HIC-2695.

RO

7.0 PROCEDURE STEPS

Initials

CAUTION

IF nitrogen temperature leaving the vaporizer is maintained above 150°F, THEN damage to the polyethylene pipe may occur.

NOTE: 2-CAC-HV-2683 has two control switches, one on Unit 1 RTGB and one on Unit 2 RTGB. The control switch for the unit increasing Drywell pressure should be used to open the 2-CAC-HV-2683.

NOTE: 2-CAC-HV-2683 will auto close on the following signals:

- Drywell pressure high 1.25 psig
- Nitrogen temperature low 10°F
(measured at inerting vaporizer outlet)

- | | | |
|--------|---|-----------|
| 7.6.12 | ADJUST air pressure to LN2 VAPORIZER N2 INLET CONTROL VALVE, 2-CAC-HV-2683, to 0 psig, using 2-CAC-HIC-2683. | <u>RO</u> |
| 7.6.13 | ENSURE Unit 1 control switch for PURGE VAP LN2 INLET VLV, 2-CAC-HV-2683, is in NEUT. | <u>RO</u> |
| 7.6.14 | ENSURE Unit 2 control switch for PURGE VAP LN2 INLET VLV, 2-CAC-HV-2683, is in NEUT. | <u>RO</u> |
| 7.6.15 | MOMENTARILY PLACE Unit 1(2) control switch for PURGE VAP LN2 INLET VLV, 2-CAC-HV-2683, in OPEN. | <u>RO</u> |

7.0 PROCEDURE STEPS

Initials

CAUTION

Steam should be admitted to the vaporizer before nitrogen is admitted to prevent cold nitrogen gas from entering the containment and prevent rupturing the nitrogen line.

CAUTION

The following steps have the potential to cause a rapid increase in Drywell pressure.

- 7.6.16 **OPEN CAC INERTING VESSEL NITROGEN OUTLET VALVE, 2-CAC-HV44.** RO
- 7.6.17 **SLOWLY INCREASE LN2 flow** by increasing the air signal to *LN2 VAPORIZER INLET CONTROL VALVE, 2-CAC-HV-2683*, using *2-CAC-HIC-2683*. RO

NOTE: When establishing the desired flow rate, consideration should be given for initial drywell pressure, recognizing pressure can increase rapidly with a high flow rate. Past experience has shown 1000 to 2000 scfm is adequate. When drywell pressure is 1.0 psig (27.7 in. H₂O), the *CAC INERTING VESSEL NITROGEN OUTLET VALVE, 2-CAC-HV44*, should be closed quickly to stop the pressure increase.

- 7.6.18 **ESTABLISH** a flow rate less than or equal to 4000 scfm as indicated on *CAC-FI-2568-2* or *CAC-FI-2567-1*. RO
- 7.6.19 **IF** purge vaporizer outlet line ices up, **THEN CLOSE** *CAC INERTING VESSEL NITROGEN OUTLET VALVE, 2-CAC-HV44*, and correct any problems before opening the valve to continue. RO

7.0 PROCEDURE STEPS

Initials

7.7 **WHEN** drywell pressure is 1.0 psig (27.7 in. H₂O), **THEN**
STOP drywell pressurization as follows:

7.7.1 **CLOSE** CAC INERTING VESSEL NITROGEN
OUTLET VALVE, 2-CAC-HV44, **AND WAIT** 5 minutes
to allow the liquid nitrogen to vaporize.

RO

7.7.2 **PLACE** Unit 1 Control Switch for *PURGE VAP LN2*
INLET VLV, 2-CAC-HV-2683 in *CLOSED*.

RO

7.7.3 **PLACE** Unit 2 Control Switch for *PURGE VAP LN2*
INLET VLV, 2-CAC-HV-2683 in *CLOSED*.

RO

7.7.4 **CLOSE** INERTING N2 INLET VALVE, CAC-V58.

RO

7.7.5 **CLOSE** INERTING N2 INLET VALVE, CAC-V4.

RO

7.7.6 **CLOSE** DW N2 INLET VALVE, CAC-V6.

RO

7.7.7 **CLOSE** AUX STEAM SPLY TO PURGE VAP,
2-HS-V503.

RO

7.7.8 **CLOSE** LN2 VAPORIZER STEAM INLET CONTROL
VALVE, 2-CAC-HV-2695.

RO

7.7.9 **MONITOR** purge vaporizer to ensure CAC INERTING
VESSEL NITROGEN OUTLET VALVE, 2-CAC-HV44,
is not leaking by its seat.

RO

7.7.10 **IF** CAC INERTING VESSEL NITROGEN OUTLET
VALVE, 2-CAC-HV44, is leaking by its seat, **THEN**
OPEN AUX STEAM SPLY TO PURGE VAP,
2-HS-V503, **AND** LN2 VAPORIZER STEAM INLET
CONTROL VALVE, 2-CAC-HV-2695.

RO

7.8 **OBSERVE** drywell pressure indicator identified in Step 7.4
for 5 minutes to confirm that drywell pressure has stabilized.

RO

7.0 PROCEDURE STEPS

Initials

CAUTION

IF containment temperatures change **OR** any evolution occurs which has the potential for changing drywell or suppression pool temperature, **THEN** this test is invalid and should be performed after conditions stabilize.

7.9 **RECORD** the following data at 10-minute intervals for 1 hour. _____

Date: _Today_____

Time Started: _60 minutes ago_____

	Time (Minutes)	Drywell Pressure Reading (psig) or (in. H ₂ O)
7.9.1	0 (Initial)	<u>1.1</u>
7.9.2	10	<u>1.1</u>
7.9.3	20	<u>1.1</u>
7.9.4	30	<u>1.1</u>
7.9.5	40	<u>1.1</u>
7.9.6	50	<u>1.1</u>
7.9.7	60 (Final)	<u> </u>

7.0 PROCEDURE STEPS

Initials

7.10 **CONFIRM** final drywell pressure reading is at least greater than one half the initial pressure by dividing the final pressure by the initial pressure as follows:

7.10.1 **RECORD** final pressure reading. _____

7.10.2 **COMPUTE** ratio. $\frac{\text{psig (in. H}_2\text{O) final}}{\text{psig (in. H}_2\text{O) initial}} =$ _____

7.10.3 **COMPARE** ratio obtained in Step 7.10.2 to 0.5 **AND CHECK** appropriate space: _____

Ratio greater than 0.5. _____

Ratio less than 0.5. _____

7.11 **SECURE** Suppression Chamber venting as follows:

7.11.1 **CLOSE** *TORUS PURGE EXH VLV, CAC-V8.*

Ind.Ver.

7.11.2 **CLOSE** *TORUS PURGE EXH VLV, CAC-V7.*

Ind.Ver.

7.11.3 **MOMENTARILY PLACE** control switches for both Purge Exhaust Fans in *OFF*:

7.11.4 **CONFIRM** Purge Exhaust Fan A(B) Suction Valve, *M-BFV-RB (K-BFV-RB)*, indicates closed at MCC 1(2)XG Compt. EH6 (MCC 1(2)XH Compt. EM2).

Ind.Ver.

7.11.5 **CONFIRM** Purge Exhaust Fan A(B) Discharge Valve, *J-BFV-RB (L-BFV-RB)*, indicates closed at MCC 1(2)XG Compt. EH5 (MCC 1(2)XH Compt. EM1).

Ind.Ver.

7.0 PROCEDURE STEPS

Initials

7.11.6 **ENSURE** breakers for the following Purge Exhaust Fans are closed:

- | | | | |
|----|--|--------------------------|----------------------------|
| 1. | <i>PURGE EXHAUST FAN,
A-PS-EF-RB</i> | MCC 1(2)XG
Compt. EG7 | <u> / </u>
Ind.Ver. |
| 2. | <i>PURGE EXHAUST FAN,
B-PS-EF-RB</i> | MCC 1(2)XH
Compt. EK3 | <u> N/A </u>
Ind.Ver. |

7.11.7 **CLOSE** the following valves:

- | | | |
|----|--|--------------------------|
| 1. | <i>PURGE EXHAUST FANS SUCTION VALVE,
I-BFV-RB.</i> | <u> / </u>
Ind.Ver. |
| 2. | <i>PURGE EXHAUST FANS INBOARD EXHAUST
HEADER ISOLATION VALVE, N-BFV-RB.</i> | <u> / </u>
Ind.Ver. |
| 3. | <i>PURGE EXHAUST FANS OUTBOARD EXHAUST
HEADER ISOLATION VALVE, A-BFV-RB.</i> | <u> / </u>
Ind.Ver. |

7.11.8 **OPEN** the following valves:

- | | | |
|----|--|--------------------------|
| 1. | <i>SBGT TRAIN A REACTOR BUILDING SUCTION
VALVE, VA-D-BFV-RB.</i> | <u> / </u>
Ind.Ver. |
| 2. | <i>SBGT TRAIN B REACTOR BUILDING SUCTION
VALVE, VA-H-BFV-RB.</i> | <u> / </u>
Ind.Ver. |

7.12 **IF** required, **THEN CLOSE AND LOCK** CAC-PSH-2684 INSTRUMENT DRAIN VALVE, CAC-IV-696. NA
Ind.Ver.

7.13 **IF** required, **THEN REMOVE** the test gauge installed in Step 7.4. NA
Ind.Ver.

7.14 **ENSURE** the suppression pool oxygen concentration is less than 4% oxygen. _____

7.15 **ENSURE** the required information has been recorded on the cover page. _____

7.16 **NOTIFY** the Unit SCO when this test is complete or found to be unsatisfactory. _____

ATTACHMENT 1
Page 1 of 1
Certification and Review Form

General Comments and Recommendations: _____

	<u>Initials</u>	<u>Name (Print)</u>
Performed by:	_____	_____
	_____	_____
	_____	_____
	_____	_____
	_____	_____

Exceptions to satisfactory performance: _____

Corrective action required: _____

Test procedure has been satisfactorily completed:

Unit SCO: _____	_____
Signature	Date

Test procedure has **NOT** been satisfactorily completed:

Unit SCO: _____	_____
Signature	Date

Test has been reviewed by:

Shift Manager: _____	_____
Signature	Date

REVISION SUMMARY

Revision 19 incorporates TS Amendments 251 and 279 which requires a vacuum breaker position check within 6 hours following an operation that causes any of the vacuum breakers to open, replaced Shift Superintendent with Shift Manager

Revision 18 deletes actions to operate 1-AS-V432. This valve has been changed to a normally open valve, it will no longer need to be operated to drain the aux. steam line.

Revision 17 implements Tech Spec Amendments 223 (U1) and 248 (U2) by changing the frequency from 2 hrs. to 6 hrs. after any discharge of steam to the suppression chamber from any source.

Revision 16 incorporates ESR 00-00283 which designates CAC-IV-696 as a locked closed valve. The procedure now requires unlocking and opening this valve when using a test gauge, then restoring it to locked closed. This revision also improves the test gauge selection to include use of a 0-15 psig gauge instead of a 0-30 psig gauge. Inches of water values were provided for specified psig values and a conversion factor provided if additional values are desired. A step was added to ensure the test gauge is valved in if used.

Revision 15 contains several enhancements to make the PT more consistent with OP-24 for establishing nitrogen flow to the drywell and adds a note to clarify expected system response.

Revision 14 implements Tech Spec Amendments 203(U1) and 233(U2) by changing the reference and frequency. Adds term "Alternate Method" to title for clarification and includes minor OAP-05 format changes.

**PROGRESS ENERGY CAROLINAS
BRUNSWICK TRAINING SECTION**

SIMULATOR SCENARIO

2010-1 NRC EXAM SCENARIO #2

Appendix D	Scenario Outline	Form ES-D-1	
Facility: <u>BRUNSWICK</u> Scenario No.: <u>2010-1 # 2</u> Op-Test No.: <u>DRAFT</u>			
Examiners: _____ Operators: _____			
(SRO)			
(RO)			
(BOP)			
Initial Conditions: The plant is operating at 100% power with Condensate Pump 2C out of service for maintenance. CWIP 2B needs to be removed from service to support motor oil replacement.			
Turnover: Reduce reactor power to 90% to support shifting CWIPs IAW 2OP-29.			
Event No.	Malfunction No.	Event Type*	Event Description
1	N/A	R-RO R-SRO	Power reduction to support removal of CWIP 2A
2	N/A	N-BOP N-SRO	Shift CWIPs to remove 2B from service.
3	ES014F	I-RO I-SRO	Inadvertent HPCI initiation (TS)
4	K4B39B ZUA1761 ZUA118	C-BOP C-SRO	2A CSW pump trip (TS)
5	K4B41A	I-BOP I-SRO	2C CSW pump auto start failure
6	RW013F	M-All	RWCU leak in reactor building 77 ft.
7	EE030M	C-BOP C-SRO	Loss of MCC 2XC
8	RW016F	C-RO C-SRO	2-G31-F004 motor overload
9	N/A	M-All	Manual reactor Scram prior to MSOT/L
10	K4101B	C-BOP C-SRO	BOP bus 2D fault fail to transfer
11	ES041F	I-RO I-SRO	RCIC auto start failure
12	ZUA1214		SRHR water level Hi-HI (2 areas above Max Safe Operating Water Level) Emergency Depressurization required
13			RPV depressurized with level in the normal band.
* (N)ormal, (R)eactivity, (I)nstrument, (C)omponent, (M)ajor			

SCENARIO DESCRIPTION

The plant is operating at 100% power with Condensate Pump 2C out of service for maintenance. CWIP 2B needs to be removed from service to support motor oil replacement.

- Event 1 Reduce reactor power to 90% to support CWIP shift IAW 2OP-29 (third Condensate Pump is not available, power reduction required).
- Event 2 Shift CWIPs IAW 2OP-29, Section 8.14
- Event 3 HPCI will inadvertently initiate. The crew will respond per AOP-03.0 and terminate HPCI operation.
- Event 4 CSW Pump 2A will trip. CSW header pressure will lower below 40 psig.
- Event 5 CSW Pump 2C will fail to auto start. The crew will respond per AOP-19.0 and manually start CSW Pump 2C. CSW header pressure will recover.
- Event 6 A line rupture will develop in the RWCU system in the 77' elevation.
- Event 7 MCC 2XC will de-energize due to fault (loss of power to G31-F001)
- Event 8 G31-F004 will thermally trip. 0AOP-05 will be entered and the Reactor Building temperatures and water levels will rise requiring a manual scram.
- Event 9 Manual Scram prior to reaching the Maximum Safe Operating Temperature or Level.
- Event 10 When the turbine is tripped, BOP Bus 2D will fail to auto transfer to the SAT. DG3 will auto start and energize E3. DG1 will auto start on Loss BOP Bus 2D with UAT de-energized. Loss of BOP Bus 2D will require entry into 0AOP-36.1 and causes a loss of FW injection. Reactor water level will drop due to the inventory loss through the leak.
- Event 11 If level drops to the LL2 initiation, RCIC will fail to auto initiate, but can be manually started. With RCIC injection maximized, LEP-01 alternate coolant injection systems, along with SEP-09 CRD flow maximized (RB inaccessible) RPV level will be maintained above TAF.
- Event 12 Area temperatures and water levels will rise. South Core Spray will exceed Max Normal, then Max Safe Operating Water Level. Then South RHR will exceed Max normal then Max Safe Operating Water Level. The crew is directed to consider anticipating emergency depressurization as soon as EOP-03-SCCP directs inserting a manual scram. If the crew does not anticipate emergency depressurization (rapid depressurization to the main condenser) a second area will exceed Max Safe Operating Water Level requiring Emergency Depressurization.
- Event 13 Once the reactor is depressurized and RPV level is being maintained +170-200", the scenario may be terminated.

OBJECTIVES

SRO

1. 344207B502, Direct Actions To Control Secondary Containment Area Temperatures Per EOP-03-SCCP
2. 344208B502, Direct Actions To Control Secondary Containment Area Radiation Levels Per EOP-03-SCCP
3. 344209B502, Direct Actions To Control Secondary Containment Water Level Per EOP-03-SCCP
4. 344233B502, Direct Actions To Anticipate Emergency Depressurization Per EOP-01-RVCP
5. 344217B502, Direct Actions To Control RPV Level Per EOP-01-RVCP
6. 344227B502, Direct Actions To Control An Unmonitored Radioactive Release With The Release Rate Less Than That Requiring An Alert Declaration Per EOP-04-RRCP

RO

1. 217003B101, Manually Startup the RCIC System Per OP-16
2. 200065B501, Monitor Reactor Water Level Instrumentation Per EOP Caution 1
3. 200601B401, Respond to radioactive spills, high radiation and airborne activity per AOP-5.0
4. 200603B501, Perform immediate actions for a reactor scram
5. 200219B501, Rapidly Depressurize the Reactor Using the Bypass Valves per EOP-01-RVCP

REFERENCES

- A. OP-29
- B. AOP-03.0
- C. AOP-05.0
- D. AOP-19.0
- E. AOP-36.1
- F. OI-50
- G. EOP-01-RSP
- H. EOP-01-RVCP
- I. EOP-02-PCCP
- J. EOP-03-SCCP
- K. EOP-04-RRCP
- L. EOP-LEP-01
- M. EOP-01-SEP-09
- N. Conduct Of Operations Manual
- O. Technical Specifications
- P. Plant Emergency Procedures
- Q. Annunciator Panel Procedures

SIMULATOR SETUP

A. Initial Conditions

1. IC 13
2. Rx Pwr 100%
3. Core Age EOC

B. Event Triggers

Event	Trigger Description
0	Normal Operation (Reduce reactor power and shift CWIPs)
1	Manually Initiated (ES014F HPCI Inadvertent Initiation)
2	Manually Initiated (CSW Pump A trip)
	Auto Initiated (CSW Pump C fails to auto start)
3	Manually Initiated (RWCU Rupture)
4	Auto initiated (Loss of MCC 2XC - G31-F001)
5	Auto Initiated (G31-F004 Green = TRUE, overrides on F004)
	Auto Initiated (Loss of BOP bus 2D fail to transfer)
	Auto Initiated (S RHR Flood Hi-Hi Alarm)

C. Malfunctions

Malfunctions Summary

Malf ID	Mult ID	Description	Current Value	Target Value	Rmptime	Actime	Dactime	Trig
ES014F		HPCI Inadvertent Initiate	FALSE	TRUE				1
RW013F		RWCU BRK TRIANGLE ROOM 77'		50%	10 MIN			3
ES041F		RCIC FAILURE TO AUTO START	TRUE	TRUE				
RW015F		2-G31-F001 Fails to Isolate	TRUE	TRUE				
RW016F		2-G31-F004 Fails to Isolate	TRUE	TRUE				

Remotes Summary

Remf ID	Mult ID	Description	Current Value	Target Value	Rmptime	Actime	Trig
ZVRW004M		G31-F004					
EE030M		MCC 2XC Bus Failure					4

SIMULATOR SETUP

D. Overrides

Switches

Tag ID	Description	Position/ Target	Actual Value	Override Value	Rmptime	Actime	Dactime	Trig
K4B41A	CONV HDR SW PMP C DISCH VLVS	AUTO	ON	OFF				
K4101B	SAT INC LINE TO BUS 2D ON	NORMAL	ON	OFF				
K4101B	SAT INC LINE TO BUS 2D ON	CLOSE	OFF	OFF				
K4101B	SAT INC LINE TO BUS 2D ON	TRIP	OFF	ON				
K4B39	CONV HDR SW PMP A DISCH VLVS	START	OFF	OFF				2
K4B39	CONV HDR SW PMP A DISCH VLVS	STOP	OFF	ON				2

Lamps

Tag ID	Description	Position/ Target	Actual Value	Override Value	Rmptime	Actime	Dactime	Trig
Q1410RRK	RWCU VLV G31-F004 RED	ON/OFF	ON	ON				
Q1410LGK	RWCU VLV G31-F004 GREEN	ON/OFF	OFF	ON				2
Q4B391G4	CONV SW PMP A PMP OFF GREEN	ON/OFF	ON	OFF	10 SEC			

Annunciator Summary

Event	Panel	Tag	Title	Value (ramp rate)	Activate Time (sec)	Deactivate Time (sec)	Trig
	P601	ZA255	OUTBD NSSS Vlv Ovld	ON	0 SEC	NA	5
	XU-3	ZUA1214	S RHR Flood Hi-Hi	ON	0 SEC	NA	6

E. Materials

ENP-24 for IC-13

F. Special Instructions

1. Ensure "Exam In Progress" Stop Signs posted at all simulator entrances.
2. Advance all chart recorders to indicate steady state conditions.
3. Place all SPDS displays to the Critical Plant Variable display (#100).
4. Ensure appropriate keys have blanks in switches.
5. Exit shutdown screen on RWM and place the RWM key in the key locker.
6. Reset alarms on SJAE, MSL, and RWM NUMACs.
7. Ensure reference material is in appropriate location.
8. Verify all log books have blank sheets only.
9. Place red cap on Condensate Pump 2C and ensure Unit Trip Load Shed plaque is updated for the current line-up.
10. Ensure LOCA Load Shed plaque reflects 2A CWIP enabled (2C Disabled).
11. Ensure ENP-24 for IC-13 @ P603.
12. Ensure Hotwell Temperature is below 115°F (CO99) to allow 2 Condensate pump operation. (OP-32 P&L)
13. Load scenario file, 2010 Scenario 2.scn, if required.

SHIFT BRIEFING

Plant Status

Unit 2 is operating at 100% power, Middle of Cycle.

Equipment Out of Service

Condensate Pump 2C is under clearance for pump impeller replacement and is expected to remain out of service for five days.

No other equipment is out of service

Plan of the Day

CWIP 2B needs to be removed from service to support motor oil replacement.

Reduce reactor power to 90% to support shifting CWIPs.

SCENARIO TRAINING INFORMATION

A. Instructor Notes

1. This guide is designed to meet the requirements of an examination scenario for Initial License as outlined in NUREG-1021, Revision 9, ES-301 and Appendix D.
2. During the execution of this scenario, the students should be rated on the performance of the objectives, compliance with general simulator performance standards, and for overall team skills in accordance with TAP-409 and NUREG-1021, ES-303.

B. Common Student Problems/Errors

None

C. Simulator Deficiencies

There are no known simulator deficiencies applicable to this scenario.

D. CREW CRITICAL TASKS

(Critical Tasks are identified to ensure scenario validity and do not constitute pass/fail criteria for Initial License.)

1. Manually scram the Reactor before an area reaches Maximum Safe Operating value.
2. Depressurize the RPV by performing or anticipating Emergency Depressurization.
3. Maintain RPV level above LL4

EVENT 1 SHIFT TURNOVER, REDUCE POWER

Reduce reactor power to 90% to support CWIP shift IAW 2OP-29 (third Condensate Pump is not available, power reduction required).

Objectives:

SCO - Directs power to be reduced in order to shift CWIPs.

RO - Performs power reduction in accordance with ENP-24.5.

Success Path:

Power reduced to less than or equal to 90% power.

Simulator Operator Actions:

- ☐ If contacted as the NE for power reduction guidance, inform crew to use ENP-24.5 guidance.
- ☐ If contacted as the NE to monitor power reduction, inform crew that you will monitor core performance on the computer.
- ☐ If contacted as the Load Dispatcher, acknowledge report that Brunswick Unit 2 will be lowering power.
- ☐ If contacted as the NE for guidance on operation above the MELL line, inform crew to take the appropriate actions per ENP-24.5 to get below or on the MELL.
- ☐ When directed by the lead examiner, proceed to the next event.

Required Operator Actions

Reactivity Manipulation – Reduce Power to 90% to support CWIP shift.

SRO

Time	Action	Notes
	Directs power to be reduced in accordance with ENP-24.5 using recirculation flow in order to swap CWIPs.	
	Directs RO to insert control rods to get below the MELL line.	
	May direct OGP-12 reference due to control rod movements.	

EVENT 1 SHIFT TURNOVER, REDUCE POWER

RO

Time	Action	Notes
	May reference 2OP-02, Section 7.1	
	Request peer checker / reactivity team.	
	<p>Reduces power IAW ENP-24.5 using recirculation flow to 90% power.</p> <p>Reduce flow on one RR Pump (~2%) at a time to stay within mismatch criteria (3.5×10^6 Mlbs jet pump flow).</p> <p>Continues alternating Recirc pump speed reductions until 90% power.</p> <p>Verifies operation on the Power to Flow map.</p>	
	Recognizes operation above the MELLL line and informs SCO.	
	<p>Inserts control rods using ENP-24.5 to get below the MELLL line. (Should only need to insert one control rod 22-19)</p> <p>Turns control rod power on.</p> <p>Selects control rod (22-19) in accordance with ENP-24.5 sheet. May also insert 30-35, 30-19, or 22-35. (in this order in order to establish a margin to the MELLL line)</p> <p>Continuously drives selected rod full in using RMCS.</p>	

BOP

Time	Action	Notes
	Monitors the plant.	

EVENT 2 CWIP SHIFT

Shift CWIPs IAW 2OP-29, Section 8.14

Objectives:

SCO - Directs shifting CWIPs.

BOP - Performs CWIP shift in accordance with 2OP-29, Section 8.14.

Success Path:

2C CWIP in service and 2B CWIP shutdown with the *CW ISOL VALVES MODE SELECTOR* in position C.

Simulator Operator Actions:

- ☐ If contacted as E&RC, acknowledge CWIP pump shift.
- ☐ If contacted as Radwaste, acknowledge CWIP pump shift.
- ☐ If contacted as Outside AO, report prestart checks satisfactory for CWIP 2C.
- ☐ If contacted as Outside AO to monitor circulating water traveling screen differential pressure, acknowledge request.
- ☐ If contacted as Unit One, report 3 CWIP and 3 CWOD pumps in service on U1.
- ☐ When 2C CWIP is started, contact BOP as Outside AO to report 2C CWIP satisfactory start and normal traveling screen differential pressures.
- ☐ When directed by the lead examiner, proceed to the next event.

Required Operator Actions

Normal Operation – 2OP-29, Section 8.14 (Shifting Circulating Water Intake Pumps).

SRO

Time	Action	Notes
	Directs placing 2C CWIP in service and shutting down 2B CWIP.	
	Directs RO to monitor the plant.	

RO

Time	Action	Notes
	Monitors the plant.	
	Monitors reactor recirculation pump speed during CWIP start.	

EVENT 2 CWIP SHIFT

BOP

Time	Action	Notes
	Obtains 2OP-29, Section 8.14 (Shifting Circulating Water Intake Pumps).	
	Reviews 2OP-29 precautions and limitations: Change in CWIP combination and circulating pump mode switch shall be recorded in the log. (P&L 3.9) The time four CWIPs are in operation during pump swaps should be limited to approximately two minutes. (P&L 3.20)	
	Verifies Circulating Water System operation 3 sets of intake and discharge pumps operating. (May call U1 to verify U1 Circ Water alignment)	
	Verifies mean sea level greater than 0 feet indicated on <i>INTAKE/DISCHARGE CANAL LEVEL</i> recorder, <i>SCW-LR-285/CW-LR-761</i> , or Computer Point, L125.	
	Notifies Radwaste of pending CWIP shift to ensure proper operation of Chlorination System.	
	Recognizes power reduction to 90% is required and is met.	
	Ensures RW Radioactive Release is not occurring and that routine CWIP shift will not impact release.	

EVENT 2 CWIP SHIFT

BOP

Time	Action	Notes
	Ensures RO monitors reactor recirculation pump speeds during CWIP start.	
	Places <i>CW ISOL VALVES MODE SELECTOR</i> switch <i>in</i> position <i>D</i> . Monitors water box outlet valve positions. (4 Pump Only light lit)	
	Starts 2C CWIP. Makes PA announcement Contact OS AO for proper start	
	Stops 2B CWIP Makes PA announcement Contact OS AO for proper stop	
	Ensures condenser vacuum is being maintained in the normal operating range.	
	Places <i>CW ISOL VALVES MODE SELECTOR</i> switch in position <i>C</i> . Monitors water box outlet valve positions (April requires "C") May use PPC Screen # 405	
	LOCA Load Shed should already be enabled on 2A CWIP and was not Enabled for 2C CWIP	
	Informs SRO CWIP shift is complete, 2B CWIP is shutdown.	

EVENT 3 INADVERTENT HPCI INITIATION

HPCI will inadvertently initiate. The crew will respond per AOP-03.0 and terminate HPCI operation.

Objectives:

SCO - Directs 2AOP-03.0 entry

Address Technical Specifications for HPCI inoperability

RO – Diagnose inadvertent HPCI initiation and terminate HPCI operation.

Success Path:

HPCI operation terminated and TS addressed

Simulator Operator Actions:

- ☐ When directed by lead examiner, initiate **Trigger 1** to initiate HPCI.
- ☐ If contacted as I&C to investigate, acknowledge the request
- ☐ If contacted as NE, positive reactivity event and thermal limits will be evaluated.
- ☐ If contacted as Chemistry for Reactor Coolant Sample for fuel failure, acknowledge the request
- ☐ When directed by the lead examiner, proceed to the next event.

Required Operator Actions

Instrument Failure – Enter 2AOP-03.0, Positive Reactivity Addition and terminate HPCI operation.

SRO

Time	Action	Notes
	Direct entry into 2AOP-03.0	
	Direct termination of HPCI operation	
	Direct reduction of reactor power if necessary	
	Directs BOP to monitor the plant.	
	Contact I&C to investigate HPCI failure	
	May contact Chemistry to sample Rx Coolant for fuel failure.	
	Refer to Tech Spec 3.5.1. Determine Actions D1 (Immediately verify RCIC operability) and D2 (Restore HPCI within 14 days) apply.	

EVENT 3 INADVERTENT HPCI INITIATION RO

Time	Action	Notes
	Diagnose and report inadvertent HPCI initiation	
	Enter and announce AOP-03.0, Positive Reactivity Addition	
	Verify by two independent methods the initiation is not valid or adequate core cooling is ensured	
	Terminate HPCI operation 1. Depress and hold the HPCI turbine trip push button. 2. When HPCI Turbine Speed is 0 RPM, and the HPCI Turbine Control Valve, E41-V9 is closed, place the HPCI Auxiliary Oil Pump Control Switch in the Pull To Lock position. 3. When the HPCI Turb Brg Oil Press Lo annunciator (A-01 4-2) is alarming, release the HPCI turbine trip push button. 4. Verify the HPCI Turbine Stop Valve, E41-V8, and HPCI Turbine Control Valve, E41-V9, remain closed and the turbine does not restart.	
	Responds to the following alarms: A-1 1-4 <i>HPCI FLOW LO</i> 3-5 <i>HPCI ISOL TRIP SIG A INITIATED</i> 4-1 <i>HPCI TURB TRIP SOL ENER</i> 3-1 <i>HPCI TURB TRIP</i> 5-3 <i>HPCI VACUUM TANK LVL HI</i>	
	Notifies SRO HPCI operation has been terminated and whether injection did or did not occur. (Flow indication on flow controller with injection valve open = Injection)	
	Notifies the duty Reactor Engineer.	

BOP

Time	Action	Notes
	Monitors the plant and Reduces power if directed by SCO	
	May announce AOP-03.0, Positive Reactivity Addition, entry	
	Monitors for power oscillations LPRMs, SRMs, SRM Period, APRMs	

EVENT 4/5 2A CSW PUMP TRIP/ 2C CSW PUMP AUTO START FAILURE

CSW Pump 2A will trip on over current. CSW header pressure will lower below 40 psig. CSW Pump 2C will fail to auto start. The crew will respond per AOP-19.0 and manually start CSW Pump 2C. CSW header pressure will recover.

Objectives:

SCO

Directs 0AOP-19.0 entry

Address Technical Specifications for CSW pump inoperability

BOP

Diagnose CSW pump failures and manually start 2C CSW pump.

Success Path:

2C CSW manually started restoring CSW header pressure.

Simulator Operator Actions:

- ☐ When directed by lead examiner, initiate **Trigger 2** to initiate 2A CSW pump trip.
- ☐ If contacted as I&C, Maintenance, or OS AO to investigate, acknowledge the request
- ☐ When directed by the lead examiner, proceed to the next event.

Required Operator Actions

Component & Instrument Failure – Enter 0AOP-19.0, Conventional Service Water System Failure and manually start 2C CSW pump.

SRO

Time	Action	Notes
	Direct entry into 0AOP-19.0, Conventional Service Water System Failure	
	Direct manually starting 2C CSW pump	
	Contacts maintenance for 2A CSW trip and 2C CSW auto start failure.	
	Refer to Tech Spec 3.7.2 Service Water (SW) System and Ultimate Heat Sink (UHS). Determine Actions C1 (Immediately Verify the one OPERABLE CSW pump and one OPERABLE Unit 2 NSW pump are powered from separate 4.16 kV emergency buses) and C2 (Restore required CSW pump to OPERABLE status within 7 days) apply.	BASES: The SW System is considered OPERABLE when it has two OPERABLE CSW pumps (specifically the CSW 2A and CSW 2C pumps), three site NSW pumps (any combination of Unit 1 and Unit 2 NSW pumps), and an OPERABLE flow path capable of taking suction from the intake structure and transferring the water to the ECCS equipment and the DGs. For a CSW pump to be considered OPERABLE, it must be capable of supplying the CSW header and the NSW header. The CSW 2A and CSW 2C pumps must be OPERABLE to ensure that two pumps can supply the CSW header with one specific postulated single failure, Loss of Division II power. This failure disables both the flow path from the NSW header to the RHRSW pumps and it disables the CSW 2B pump.

EVENT 4/5 2A CSW PUMP TRIP/ 2C CSW PUMP AUTO START FAILURE

RO

Time	Action	Notes
	Monitors the plant	

BOP

Time	Action	Notes
	Acknowledges & reports UA-01 annunciator: 1-9 CONV HDR SERV WATER PRESS-LOW	
	Diagnose and report trip of CSW Pump 2A.	
	Enter and announce 0AOP-19.0, Conventional Service Water System Failure	
	Contacts Outside AO to investigate	
	Contacts I&C to investigate	
	Contacts Maintenance to investigate	
	Recognizes 2C CSW pump auto start failure and manually starts pump. Note: Pump may be manually started IAW APP or AOP.	
	If conventional service water header pressure remains below 40 psig for 70 seconds, then the SW-V3 & V4 close to a throttled position. (Reduced TBCCW cooling, AOP-17.0 entry) Note: If SW-V3 or V4 throttles, CSW header will restore. Once 2C CSW pump is started, these valves are re-opened IAW AOP-19.	

EVENT 6/7/8**RWCU Leak – 77' RB, MCC 2XC LOSS, G31-F004 FAILURE**

A line rupture will develop in the RWCU system in the 77' elevation. MCC 2XC will de-energize due to fault (loss of power to G31-F001) and G31-F004 will thermally trip. 0AOP-05 will be entered and the 77' elevation temperature and radiation levels will rise requiring a manual scram.

(SOUTH CS RM FLOOD LEVEL HI alarms 10 minutes, followed by SOUTH CS RM FLOOD LEVEL HI-HI at 14 minutes, and SOUTH RHR RM FLOOD LEVEL HI at 17 minutes without cooling down.)

Objectives:**SCO**

Directs 0AOP-5.0 entry

Directs EOP-03-SCCP entry

Directs Reactor Scram with Unisolable Primary leak in Secondary Containment

BOP

Perform AOP-05 actions

RO

Diagnose RWCU rupture and isolation failure

Success Path:

Manual reactor scram inserted prior to reaching Max Safe Operating Temp or Level

Simulator Operator Actions:

- ☐ When the crew has stabilized the plant after the CSW failure and directed by lead examiner, initiate **Trigger 3** to start the RWCU rupture
- ☐ When Rx Bldg ARM alarms, report as RBAO steam on 50' elevation and you have left the building
- ☐ If requested to close PIV-33, wait 3 minutes and report closed
- ☐ If contacted as Engineering, Chem, HP, Maintenance, I&C, OSAO, acknowledge report
- ☐ When directed by the lead examiner, proceed to the next event.

Required Operator Actions

Major – Enter 0AOP-05.0, Radioactive Spills, High Radiation, And Airborne Activity and upon recognition of RWCU isolation not available insert reactor scram.

SRO

Time	Action	Notes
	Direct entry into AOP-05.0	
	Enter and direct EOP-03-SCCP	
	Direct verification of auto actions RB Vent Exh rise above 4m ³ /hr – RB HVAC isolations and SBGT auto start.	
	Direct evacuation of the reactor building	
	Diagnose leak from RWCU and direct RWCU isolation	

EVENT 6/7/8**RWCU Leak – 77' RB, MCC 2XC LOSS, G31-F004 FAILURE****SRO**

Time	Action	Notes
	Direct RHR room coolers be started	
	Direct service water aligned to the vital header	
	Evaluate Level instrument operability using Caution 1 (Wide Range - N026s inop with Temperature on the Reactor Building 50' above 140°F)	
	Contact engineering to perform EQ evaluation	
	Direct manual Scram prior to Max Safe Temperature or Level.	

RO

Time	Action	Notes
	Monitors the plant	
	Diagnose RWCU leak and attempt to manually isolate,	
	Recognize and report RWCU inboard valve failure – Loss of MCC 2XC inability to isolate RWCU	
	Recognize and report RWCU outboard valve failure and inability to isolate RWCU <i>A-2 5-5 OTBD NSSS VALVES MTR OVERLOAD</i>	
	Align service water to the vital header (SW-V117 or SW-V111) if not already done	

BOP

Time	Action	Notes
	Acknowledge and report UA-03 2-7 <i>AREA RAD RX BLDG HIGH</i>	

EVENT 6/7/8**RWCU Leak – 77' RB, MCC 2XC LOSS, G31-F004 FAILURE****BOP**

Time	Action	Notes
	Enters and announce AOP-05.0 entry	
	Evacuates the U2 Reactor building. Sounds RB evacuation alarm	
	Verifies Secondary Containment and Group 6 isolation and SGBT initiation if Rx Bldg Vent exhaust Hi-Hi rad alarms	
	Directs PIV-33 to be closed	
	Ensures the RHR room coolers are running	
	May Align service water to the vital header (SW-V117 or SW-V111) if not already done due to <i>FAN CLG UNIT CS PUMP RM A INL PRESS LO</i> annunciator	
	Monitors Reactor Building pressure, reports if pressure goes positive. (Blue bar annunciator <i>RX BLDG STATIC PRESS DIFF-LOW</i>)	
	Acknowledges & reports UA-17 3-2 <i>SUB E7 FDR TO MCC-2XC BKR TRIP</i> 1. May refer to 00I-50.3 for loss of loads. 2. Should not direct Auxiliary Operator to the Reactor Building to check for fault(s) in MCC-2XC. 3. May direct Auxiliary Operator to Substation E7, Breaker AY0, to check for fault(s). 4. May contact maintenance to investigate.	
	Notifies E&RC to perform the following as necessary: - Area radiation survey - Air sampling - Smear survey - Post the affected area as necessary - Control access to reduce exposure and contamination.	
	Recognize and report to SRO alarms A-2 6-8 <i>RB 50/20 ft Temp Hi.</i> UA-12 2-3 <i>SOUTH CS RM FLOOD LEVEL HI</i> UA-12 1-3 <i>SOUTH CS RM FLOOD LEVEL HI-HI</i>	

EVENT 9/10/11 REACTOR SCRAM, RCIC Failure, 2D Bus

A Manual Scram is inserted prior to reaching the Maximum Safe Operating Temperature or Level. When the turbine is tripped, BOP Bus 2D will fail to auto transfer to the SAT. DG3 will auto start and energize E3. DG1 will auto start on Loss BOP Bus 2D with UAT de-energized. Loss of BOP Bus 2D will require entry into 0AOP-36.1 and causes a loss of FW injection. Reactor water level will drop due to the inventory loss through the leak. If level drops to the LL2 initiation, RCIC will fail to auto initiate, but can be manually started. With RCIC injection maximized, LEP-01 alternate coolant injection systems, along with SEP-09 CRD flow maximized (RB inaccessible) RPV level will be maintained above TAF.

Objectives:

SCO - Directs manual Reactor Scram
Enters RSP, RVCP

BOP – Diagnose Bus 2D fails to transfer
Enters AOP-36.1.

RO - Diagnose RCIC auto start failure
Execute AOP and EOP actions as directed by SRO
Perform SCRAM actions
Control reactor parameters post SCRAM

Success Path:

Maintain RPV water level above LL4 and depressurizing the RPV.

Simulator Operator Actions:

- ☐ If contacted as I&C, Maintenance, or OS AO to investigate, acknowledge the request
- ☐ If contacted as AO for SEP-09 or LEP-01, wait 2 minutes and report Reactor Building is inaccessible per RP.
- ☐ If contacted as AO to restart RPS A, wait 2 minutes and initiate batch file to restart RPS A
- ☐ If contacted as Unit 1 SRO to perform PEP-3.4.7, acknowledge request.
- ☐ When directed by the lead examiner, proceed to the next event.

Required Operator Actions

Major – Enter RSP and RVCP, perform alternate coolant injection and CRD flow max, anticipate and or ED.

SRO

Time	Action	Notes
	Before South Core Spray reaches max safe level, directs a manual reactor scram	
	Enters and directs EOP-01-RSP	
	If reactor building loses negative pressure, enter and execute RRCP for unmonitored release, and request field surveys	

EVENT 9/10/11 REACTOR SCRAM, RCIC Failure, 2D Bus**SRO**

Time	Action	Notes
	Directs entry into 0AOP-36.1 for loss of Bus 2D	
	Determines entry into EOP-01-RVCP is required	
	Directs verification : <ul style="list-style-type: none">• Group Isolations• ECCS Initiations• Diesel Generator Auto Starts	
	Directs restoring and maintaining reactor water level between +170 and +200 inches with one or more of the systems listed in Table 1 <ul style="list-style-type: none">• CRD (SEP-09)• RCIC	
	May direct pressure control using EHC and pressure band of 800-1000#	
	Directs starting RCIC to maintain level	
	May direct utilizing SLC aligned to Demin Water (LEP-01).	
	May direct restoring RBHVAC per SEP-04	
	Directs commencing normal cooldown not to exceed 100° F / hr	
	Directs Anticipating Emergency Depressurization Cautions not to close MSIVs (Gp1)	

EVENT 9/10/11 REACTOR SCRAM, RCIC Failure, 2D Bus

RO

Time	Action	Notes
	Inserts a manual scram as directed by SRO	
	<p>Performs scram immediate actions:</p> <ol style="list-style-type: none"> 1. Unit 2 Only: After steam flow is less than 3 x 106 lb/hr, PLACE the reactor mode switch to SHUTDOWN. 2. IF reactor power is below 2% (APRM downscale trip), THEN TRIP the main turbine. 3. ENSURE the master reactor level controller setpoint is +170". 4. IF two reactor feed pumps are running, and reactor vessel level is above +160" and rising, then trip one. 	
	<p>Maintains RPV level 170-200"</p> <p>Reports when out of band and actions to address recovery.</p>	
	Diagnoses loss of Feedwater flow to RPV	
	Diagnoses RCIC failure to auto start	
	Manually starts RCIC to maintain RPV level	
	Performs SEP-09, CRD Flow Maximization with procedure or Hardcard.	
	<p>May request SLC aligned for DW injection IAW LEP-01.</p> <p>Rx Bldg is inaccessible.</p>	
	Recognizes and reports no direct RPV level indication available below 150" w/ RR pumps operating.	
	<p>Trips Recirc pumps if directed by SCO</p> <p>Should have tripped at LL2.</p>	
	Commences normal cooldown not to exceed 100° F / hr Utilizing BPVs	
	<p>Anticipates ED</p> <p>Opens BPVs with the BPV Opening Jack maintaining Steam Flow below isolation setpoint.</p> <p>Does not to close MSIVs (Gp1)</p>	

EVENT 9/10/11 REACTOR SCRAM, RCIC Failure, 2D Bus

BOP

Time	Action	Notes
	Diagnoses loss of Feedwater flow to RPV	
	Enters and announces AOP-36.1	
	Dispatches an AO to monitor DGs	
	Dispatches an AO to investigate Bus 2D	
	Verifies air compressor alignment	
	May place 2C TBCCW pump in service on U2.	
	May direct AO to restart RPS MG set.	
	Verifies CWIPs in service and maintains main condenser available. SPE and steam seals	
	Recognize and report to SRO alarms A-2 6-8 <i>RB 50/20 ft Temp Hi.</i> UA-12 2-3 <i>SOUTH CS RM FLOOD LEVEL HI</i> UA-12 1-3 <i>SOUTH CS RM FLOOD LEVEL HI-HI</i>	
	May perform SCRAM Hardcard actions. 1. Ensure Scram Valves Are Open By Manual Scram or ARI Initiation 2. Control Reactor Pressure Between 800 and 1000 psig 3. Control Reactor Water Level Between +170 and +200 Inches 4. Place SULCV in Service 5. Insert Nuclear Instrumentation 6. Ensure Turbine Oil System Operating 7. Place Recirc Pump Speed Controllers to 10% and Ensure Pump Speed Lowers 8. Ensure Heater Drain Pumps Tripped	

EVENT 12 REACTOR DEPRESSURIZATION

Area temperatures and water levels will rise. South Core Spray will exceed Max Normal, then Max Safe Operating Water Level. Then South RHR will exceed Max normal then Max Safe Operating Water Level. The crew is directed to consider anticipating emergency depressurization as soon as EOP-03-SCCP directs inserting a manual scram. If the crew does not anticipate emergency depressurization (rapid depressurization to the main condenser) a second area will exceed Max Safe Operating Water Level requiring Emergency Depressurization. Depressurization may be Anticipated or manually performed when two area exceed Max Safe.

Objectives:

SCO

Directs actions Emergency Depressurization and restoration of reactor water level.

RO

Performs actions for emergency Depressurization and restoration of reactor water level.

BOP

Monitors and reports RB Flood level alarms.

Success Path:

Restore reactor water level to 170-200 inches.

Simulator Operator Actions:

Instructor Activities

- ☐ If crew decides not to anticipate ED, after S RHR Flood Hi has alarmed, 3 minutes later verify **Trigger 6** activates to override S RHR Flood Hi-Hi alarm
- ☐ When RPV level is being controlled above 170", the scenario may be terminated
- ☐ When directed by the lead evaluator, place the simulator in FREEZE.

Required Operator Actions

Restore and maintain RPV level above LL4

SRO

Time	Action	Notes
	If two areas exceed MSOWL, direct emergency depressurization	
	Directs controlling condensate injection when RPV pressure is less than 440 psig. (may require closing FW isolations due to power loss)	
	Directs controlling Low Pressure ECCS injection when RPV pressure is less than 400 psig	

EVENT 12 REACTOR DEPRESSURIZATION

SRO

Time	Action	Notes
	Directs opening 7 ADS valves (ED)	
	Directs restoring and maintaining RPV level 170-200 inches.	

RO / BOP

Time	Action	Notes
	Recognize/report S RHR Flood level Hi (and Hi-Hi if alarms)	
	Places 7 ADS valve control switches	
	<i>Operates LP ECCS to restore and maintain RPV level 170-200 inches.</i>	

Termination Cue

When RPV water level is being maintained above 170 inches with the reactor depressurized, by direction of the Lead examiner, the scenario may be terminated.

Simulator Operator Activities:

WHEN directed by the lead examiner, place the simulator in **FREEZE**.

CAUTION

**DO NOT RESET THE SIMULATOR PRIOR TO RECEIPT
OF CONCURRENCE TO DO SO FROM THE LEAD
EXAMINER**

**PROGRESS ENERGY CAROLINAS
BRUNSWICK TRAINING SECTION**

SIMULATOR SCENARIO

2010-1 NRC Exam Scenario #3

Facility: BrunswickScenario #: 2010-1 #3OP-Test No.: Draft

Examiners: _____

Operators: _____

Initial Conditions: The plant is operating at ~50% power during startup following a refuel outage. No equipment is out of service

Turnover: Following shift turnover, raise power to 60%, perform alternate power verification and prepare to place the second feed pump in service.

Event No.	Malf. No.	Event Type*	Event Description
1	N/A	R-BOP R-SRO	Raise power to 60%
2	N/A	N-SRO N-BOP	Perform verification of Reactor Power level using Alternate Indications
3	EE030M	C-BOP C-SRO	Main Stack Rad Monitor power failure. (TS)
4	K4517A	C- BOP C- SRO	2B TCC Pump trip
5	P2740A1I	C- RO C- SRO	2B Recirc Pump speed control failure (TS)
6	MS031F	I-BOP I-SRO	MTLO controller failure
7	MS017F	M-ALL	Turbine high vibration requiring turbine trip and scram resulting in an ATWS condition requiring entry to LPC.
8	K2119A Off	C-RO C-SRO	SLC pumps will not start due to switch failure.
9	RD036F	C-RO C-SRO	Scram discharge volume vents and drains fail closed.
10			All Rods In

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

SCENARIO DESCRIPTION

Unit 2 is operating at ~50% power during startup following a refuel outage.

- Event 1 Continue with startup to 60% power using recirc flow.
- Event 2 Performs a verification of reactor power level using alternate indications per OGP-04 Attachment 1.
- Event 3 Power to the Main Stack Rad Monitor will be lost. The power results in Group 6 isolation and Secondary containment.
- Event 4 TCC Pump 2B will trip and TBCCW low header pressure will alarm. The crew will respond per OAOP-17.0 and place 2C TBCCW pump in service.
- Event 5 2B Recirc Pump control speed will fail resulting in lowering reactor power. The crew will respond per OAOP-03.0 and lock the scoop tube.
- Event 6 The main turbine lube oil controller will fail closed causing the lube oil to heat up and vibrations to occur on the main turbine. This will require the main turbine to be tripped (>12 mils on bearing 1-8 and >10 mils on bearings 9/10) and the reactor to be scrammed.
- Event 7 Most control rods will fail to insert on the scram. The crew will respond to the ATWS per EOP-01-LPC.
- Event 8 When SLC initiation is attempted, neither SLC pump will start due to switch failure. The crew will enter LEP-03 and align for alternate boron injection using CRD.
- Event 9 When scram jumpers are installed the scram discharge vents and drains will fail to open which will result in inability to insert control rods by resetting RPS and inserting additional manual scrams.
- Event 10 When level has been lowered and level band has been established, the scram discharge volume vents and drains will be repaired. Control rods can then be inserted by manual scram. When all control rods are inserted and level is being maintained 170 to 200 inches the scenario may be terminated.

Simulator Setup

Initial Conditions:

IC

ENP-24.5 for IC 9

Rx Power 60%

Core Age EOC

Events:

Event #	Trigger	Description
3	1	Manual Main Stack Rad Monitor Power Failure
4	2	Manual Trip 2B TBCCW Pump
5	3	Manual MTLO controller failure
6	4	Auto Turbine high vibration causing the crew to scram the plant with an ATWS condition
8	NA	SLC switch failure
9	5	Auto Scram Discharge Vents and Drains fail closed

Malfunctions Summary

Shaded entries are Active

Malf. ID	Mult ID	Description	Current Value	Target Value	Ramp Time	Act. Time	Deact Time	Trig
RP010F		ATWS 3	True	True				
RD036F		Scram Disc Vol Drn Fails Closed	False	True				5 - on Scram
MS031F		MTLO Temp Cntrlr Fails	False	True				3
MS017F	4	Turbine Bearing Vibration	0	5	5 min			Auto on UA23 1-6
MS017F	5	Turbine Bearing Vibration	0	5	5 min			Auto on UA23 1-6
MS017F	6	Turbine Bearing Vibration	0	5	5 min			Auto on UA23 1-6
MS008F		Main Turbine Trip	False	True				6
RP005F		Auto Scram Defeat	False	True				7

Remotes Summary

Remote ID	Mult. ID	Description	Current Value	Target Value	Trig
EP_IAEOPJP1		Bypass LL3 Group I Isol	Off	On	8
MS_VMS5005D		MVD-5005 Mn Stm Drn Hdr Isolation	0	1	9
EP_IACS993U		DW CLR A&D Override – Normal/Run	Normal	Run	10
EP_IACS994U		DW CLR B&C Override – Normal/Run	Normal	Run	10
EP_IASW5997		SW-V106 LOCA Override	Normal	Bypass	10
EP_IASW5998		SW-V103 LOCA Override	Normal	Bypass	10
ED_IAUPB2A6		UPS 2A to Sample Detection Skid	Closed	Open	1
SL_IALEP03		Alt = Sub Pump / Hose Lineup	Normal	Alt	11

Switches Summary

Switch ID	Description	Target Position	Override Value	Trig
K4517A	TBCCW Pump B	On	Off	2
Q4517LG4	TBCCW Pump B Green	On/Off	Off	2
K2119A	S/B Liq Pump A-B	Stop	On	
K2119A	S/B Liq Pump A-B	Pump A	Off	
K2119A	S/B Liq Pump A-B	Pump AB	Off	
K2119A	S/B Liq Pump A-B	Pump B	Off	
K6103B	SBGT Sys B	Pref	Off	
K4313A	RFP A Recirc Vlv Auto	Close	Off	Auto on RFP A Trip (Q43164WY = true)
K4307A	RFP B Recirc Vlv Auto	Close	Off	Auto on RFP B Trip (Q43104WY = true)

Special Instructions:

Ensure ENP-24.5 for IC-9 at P603 panel.
 Reduce power to ~50% using recirc flow.
 Place 2B TCC pump in service.
 Verify APRM GAFs are ≤ 1.00
 Mark-up OGP-04, Attachment 1, for 30, 40 and 50% power.
 Have the computer on the Heat Balance page 1.

Shift Briefing

Plant Status

The plant is operating at ~50% power during startup following a refuel outage.

GP-04 is complete up to step 5.2.22.

Equipment Out of Service

No equipment is out of service

Plan of the Day

Raise power to 60%, perform alternate power verification and prepare to place the second feed pump in service.

Scenario Information

Critical Tasks (bolded/italicized in the required operator action statements)

- Terminate and prevent HPCI/Feedwater during the ATWS (CS/RHR when LOCA signal received)
- Direct LEP-03, Alternate Boron Injection, using CRD.
- Perform LEP-02, Alternate Rod Insertion using RMCS.

EVENT 1 SHIFT TURNOVER, RAISE REACTOR POWER TO 60%

The crew will complete shift turnover and raise reactor power to ~60%.

Malfunctions required: None.

Objectives:

SCO - Directs reactor power to be raised using Recirc pump speed control.

RO – Performs power increase using recirc flow control.

Success Path:

Power is raised to ~60% power.

Simulator Operator Actions:

- ☐ If contacted as the RE for power increase guidance, inform crew to raise power using Reactor Recirc flow.
- ☐ If contacted as the RE to monitor power increase, inform crew that you will monitor core performance.
- ☐ When directed by the lead examiner, proceed to the next event.

Required Operator Actions

Reactivity Manipulation – Raise power 10% using recirc pump speed controls.

SRO

Time	Action	Notes
	Directs Power to be raised to ~60% power.	

RO

Time	Action	Notes
	Raises power using recirculation flow to ~60% power.	
	Raise flow on one RR Pump (~2%) at a time to stay within mismatch criteria (7.5×10^6 Mlbs jet pump flow if < than 58 Mlbs or 3.5×10^6 Mlbs if > than 58 Mlbs).	
	Continues alternating Recirc pump increases until power is ~60%.	
	Verifies operation on the Power to Flow map.	

BOP

Time	Action	Notes
	Plant Monitoring	

EVENT 2 REACTOR POWER LEVEL VERIFICATION USING ALTERNATE INDICATIONS

Performs 0GP-04, Attachment 1, Verification of Reactor Power Level Using Alternate Indications

Malfunctions required: None.

Objectives:

SCO - Directs Verification of Reactor Power Level Using Alternate Indications.

RO - Performs Verification of Reactor Power Level Using Alternate Indications IAW 0GP-04.

Success Path:

Verification of Reactor Power Level Using Alternate Indications within 5% of Heat Balance.

Simulator Operator Actions:

- ☐ If contacted as the RE to monitor core performance, inform crew that you will monitor core performance on the computer.
- ☐ When directed by the lead examiner, proceed to the next event.

Required Operator Actions

Normal Operations – Verification of Reactor Power Level Using Alternate Indications IAW 0GP-04, Attachment 1.

SRO

Time	Action	Notes
	Directs Verification of Reactor Power Level Using Alternate Indications.	

RO

Time	Action	Notes
	Plant Monitoring	

BOP

Time	Action	Notes
	Performs GP-04 Attachment 1	
	Obtain valid Heat Balance (Display 820) and record heat balance % power in Table 1.	
	Obtain LPRM % PWR (Display 861) Filtered LPRM Readings Edit, and record in Table 1.	
	Goes to step 4 to obtain steam flow % power.	

EVENT 2 (Cont'd) REACTOR POWER LEVEL VERIFICATION USING ALTERNATE INDICATIONS

BOP (Cont'd)

Time	Action	Notes
	<p>Perform the following at the prompt on the ERFIS terminal:</p> <p>Select Screen 6 by typing 6</p> <p>Select 1 for Normal FW Heater Lineup</p>	
	Record Steam Flow equivalent % power on Table 1 (from RE program).	
	Compare the Heat Balance (%) with the other alternate indications (%).	
	<p>If the heat balance is greater than all alternate indications (conservative as is) OR</p> <p>One or more alternate indications are within 5% of the heat balance (normal acceptance),</p> <p>Then Power Ascension may continue.</p>	

EVENT 3 MAIN STEAM LINE RAD MONITOR FAILURE

Power to the Main Stack Rad Monitor will be lost. The power results in Group 6 isolation, Secondary containment Isolation but SBGT fails to auto start. The crew must manually start SBGT to maintain Secondary Containment integrity.

Malfunctions required:

UPS 2A to Sample Detection Skid breaker open.

Objectives:

SCO - Determine actions required for LCO per Technical Specifications.

BOP – Respond to a process radiation monitoring downscale/inop annunciator.

Success Path:

Technical Specification / TRM

- 3.3.6.1 PCIS Instrumentation, determine Function 2c is inoperable, determine actions A and B apply (single channel), then C and F after 1 hour.
- TRM 3.4 Post Accident Monitoring, determine Function 5 is inoperable and condition A applies
- ODCM 7.2 Gaseous Effluent Monitoring, determine function 1 is inoperable and notify E&RC.
- 3.6.4.3 SBGT, Determine Condition A1, restore in 7 days

Simulator Operator Actions:

- ☐ Insert **Trigger 1** at the discretion of the lead evaluator.
- ☐ Ensure SBGT start when switches are taken to ON.
- ☐ If asked to investigate, report UPS Panel 2A to the Stack Rad Monitor is tripped.
- ☐ If contacted as I&C to investigate, acknowledge the request, if asked do not recommend transfer to the alternate power supply until the cause of the trip is investigated.
- ☐ When directed by the lead examiner, proceed to the next event.

Required Operator Actions

Tech Spec Declaration – 3.3.6.1 condition A and B, TRM 3.4 condition A, ODCM 7.2, and 3.6.4.3 condition A1.

EVENT 3 (cont'd) MAIN STEAM LINE RAD MONITOR FAILURE**SRO**

Time	Action	Notes
	Direct actions of the APPS for the Main Stack Rad Monitor	
	Direct manual start of SBGT.	
	Direct I/C to investigate loss of UPS 2A.	
	Refer to Tech Specs. 3.3.6.1, Determine function 2c is inoperable (Condition A and B), then C and F after 1 hour. TRM 3.4 Determine function 5 is inoperable (Condition A, 31 days) ODCM 7.2, Determine function 1 is inoperable and notify E&RC. 3.6.4.3 SBGT, Determine Condition A1, restore in 7 days.	

RO

Time	Action	Notes
	Plant Monitoring .	
	May open the SW-V111 or V117 to supply cooling water to the vital header IAW 2APP-UA-05 1-9 or 2-9.	

EVENT 3 (cont'd) MAIN STEAM LINE RAD MONITOR FAILURE

BOP

Time	Action	Notes
	<p>Report loss of Main Stack Rad Monitor.</p> <p><u>UA-03</u></p> <p>5-4, PROCESS OG VENT PIPE RAD HI-HI</p> <p>6-3, PROCESS SMPL OG VENT PIPE DNSC/INOP</p> <p>6-4, PROCESS OG VENT PIPE RAD - HI</p> <p><u>UA-05</u></p> <p>3-5, SBTG SYS B FAILURE</p> <p>4-6, SBTG SYS A FAILURE</p> <p>6-10, RX BLDG ISOLATED</p>	
	<p>Report TS review for the SCO from the Annunciator reviews.</p> <ul style="list-style-type: none"> • 3.6.4.3 • 3.3.6.1 Table 3.3.6.1-1, Function 2C • ODCM 7.3.2 Table 7.3.2-1 Function 1, 7.3.7, and 7.3.13 • TRM 3.4, Table 3.4.2 Function 5 	
	Determine SBTG Train B did not auto start and manually start	
	Dispatch AO to investigate UPS 2A condition.	
	May open the SW-V111 or V117 to supply cooling water to the vital header IAW 2APP-UA-05 1-9 or 2-9.	

EVENT 4 TBCCW PUMP B TRIP

TCC Pump 2B will trip and TBCCW low header pressure will alarm. The crew will respond per 0AOP-17.0 and place a TBCCW pump in service

Malfunctions required:

Trip of 2B TCC pump

Objectives:

SCO – Direct entry into 0AOP-17.0.

RO – Restoration of TCC pressure

Success Path:

2C TBCCW pump started and TCC pressures restored to normal.

Simulator Operator Actions:

- ☐ Insert **Trigger 2** at the discretion of the lead evaluator.
- ☐ If contact as the TB AO, wait one minute and report that 2B TCC pump is hot to the touch and the breaker is tripped.
- ☐ If contacted as Unit One CRS, report Unit One is not using the 2C TCC Pump.
- ☐ Acknowledge request as I&C to do troubleshooting/repair for the 2B TCC Pump.
- ☐ When directed by the lead examiner, proceed to the next event.

Required Operator Actions

SRO

Time	Action	Notes
	Direct entry into 0AOP-17.0.	
	Direct start of a TCC Pump.	
	Direct I/C to investigate loss of 2B TCC pump.	

RO

Time	Action	Notes
	Plant Monitoring .	

EVENT 4 (Cont'd) TBCCW PUMP B TRIP

BOP

Time	Action	Notes
	Report loss of 2B TCC Pump and refer to APPs. 2APP-UA-03 (2-4) TBCCW PUMP DISCH HEADER PRESS LOW	
	Enter 0AOP-17.0.	
	Dispatch AO to investigate 2B TCC Pump condition.	
	May dispatch AO to perform prestart checks for 2A or 2C TCC Pump.	
	Starts a TCC pump. (May start two pumps) (Depending on the amount of time that no TCC pump is operating, one pump may not immediately restore TCC pressure due to the system loads TCC temperature control valves being wide open.)	
	If needed, Verify Unit One is not using 2C TCC pump and start pump.	

EVENT 5/6 MTLO CONTROLLER FAILURE/TURBINE VIBRATIONS HIGH

Malfunctions Required:

Main Turbine lube oil cooler controller fails closed. When high temperature alarm annunciates activate trigger to accelerate turbine vibrations.

Objectives:

Respond to an abnormal turbine vibration per UA-23 6-1 and UA-23 6-3.

Success Path:

The MTLO controller on XU-2 indicates 100% output (full closed) and turbine lube oil temperature will rise. Dispatch AO and I&C to investigate.

Simulator Operator Actions:

- ☐ At the discretion of the lead evaluator, insert **Trigger 3** to fail the MTLO controller closed.
- ☐ If asked as the TB AO to investigate, report that the temperature control valve to the MTLO is closed. (There is no bypass valve).
- ☐ Verify turbine vibrations on 4, 5, and 6 begin to rise after receiving UA-23 1-6.
- ☐ If asked as I&C to investigate acknowledge the request.
- ☐ When directed by the lead examiner, proceed to the next event.

Required Operator Actions

SRO

Time	Action	Notes
	Direct actions of APP's.	
	When vibrations rise to above the TSI setpoint, direct manual scram and turbine trip per the vibration APP. (12 mils on bearings 1-8, 10 mils on bearings 9-10) (As conservative decision making may insert before setpoint).	

RO

Time	Action	Notes
	Plant Monitoring .	
	When directed by the SRO, insert a manual scram and trip the main turbine.	
	Recognize and report an ATWS.	

EVENT 5/6 (Cont'd) MTLO CONTROLLER FAILURE/TURBINE VIBRATIONS HIGH

BOP

Time	Action	Notes
	Recognize and report rising lube oil temperatures.	
	Dispatch TB AO to investigate TCV.	
	Perform actions of APPs <u>UA-23</u> 1-6 TURB OR RFP BRG TEMP HIGH 6-1 TURBINE VIBRATION HIGH 6-3 TSI HIGH VIBRATION TRIP	
	Monitor turbine bearing temperatures and vibrations (PC display 630).	
	May place the Main Turbine Lube Oil controller in manual and attempt to operate the valve.	

EVENT 7/8**ATWS ACTIONS**

Most control rods will fail to insert on the scram. The crew will respond to the ATWS per EOP-01-LPC. When SLC initiation is attempted, neither SLC pump will start due to switch failure. The crew will enter LEP-03 and align for alternate boron injection using CRD

Malfunctions Required:

Scram discharge volume vents and drain fail closed on the scram.
SLC switch is failed in the off position.

Objectives:

SCO – Direct actions for a reactor scram per EOP-01-RSP.

Direct actions to control reactor power per EOP-01-LPC.

RO/BOP – Perform immediate actions for a reactor scram.

Perform actions for an ATWS per EOP-01-LPC.

Success Path:

Controls reactor pressure using the SRV's. Performs actions of LPC, recognizes failure of SLC and performs alternate boron injection.

Simulator Operator Actions:

- ☐ If crew does not trip the main turbine by the time SLC initiation is directed, initiate **Trigger 6** to trip the main turbine.
- ☐ If requested to perform alternate boron injection using CRD, acknowledge the request. (will be performed after RPV injection is re-started)
- ☐ Acknowledge request as I&C to investigate failure of SLC.
- ☐ When directed by the lead examiner, proceed to the next event.

Required Operator Actions

SRO

Time	Action	Notes
	Enter RSP and transition to LPC.	
	Direct mode switch to shutdown when steam flow < 3 Mlbs/hr.	
	Direct ARI initiation.	
	Direct Recirc Pump speeds reduced to 10%.	
	Direct Recirc Pumps Tripped.	

EVENT 7/8

ATWS ACTIONS

SRO Continued

Time	Action	Notes
	Direct SLC initiation.	
	<i>Direct LEP-03, Alternate boron injection.</i>	
	Direct ADS inhibited.	
	Direct RWCU isolation.	
	<i>Direct LEP-02, Alternate Rod Insertion.</i>	

BOP

Time	Action	Notes
	Places ADS in inhibit.	
	Isolates RWCU. Closes RWCU Outboard Isol Valve G31-F004.	

RO

Time	Action	Notes
	Place mode switch to shutdown when steam flow < 3×10^6 lb/hr.	
	Initiates ARI.	
	Places Recirc Pump speeds reduced to 10%.	
	Trips Recirc Pumps.	
	Initiates SLC.	
	Recognizes failure of SLC and reports to SCO.	

RO (cont'd)

Time	Action	Notes
	<i>Performs LEP-03, Alternate Boron Injection.</i>	
	<i>Direct AO to perform LEP-03, Section 1, Alternate Boron Injection using CRD.</i>	
	<i>Performs LEP-02, Alternate Rod Insertion. (RMCS Section)</i>	
	<i>Insert IRMs.</i>	
	<i>When < range 3 on IRMs insert SRMs.</i>	
	<i>Start both CRD pumps.</i>	
	<i>Place CRD Flow Controller to Manual.</i>	
	<i>Throttle open flow controller to establish ≥ 260 drive water psid.</i>	
	<i>Bypass RWM.</i>	
	<i>Selects control rods and drives in using Emerg rod in notch override.</i>	
	Performs alternate rod insertion per LEP-02 Section 3.	
	Request jumpers for LEP-02 Section 3.	

The crew will terminate and prevent injection, re-injection will start when level is at 90 inches due to table 3 conditions not met. If RFPs are tripped they will be unavailable for level control as the Recirc Valves will fail in the closed position not allowing the RFPs to be restarted. HPCI will be available for level control.

Objectives:

SCO – Direct actions to lower reactor vessel level when the conditions of Table 3 are not met per EOP-01-LPC.

RO/BOP – Control reactor level during an ATWS per EOP-01 LPC.

Success Path:

Continues actions in the LPC procedure, terminate and prevent injection, drive rods using RMCS.

Simulator Operator Actions:

- ☐ If requested to defeat Group I LL3, wait 2 minutes, initiate **Trigger 8** and inform the SCO that the jumpers are installed.
- ☐ If requested to install LEP-02, Section 3 jumpers, wait until level has been terminated and prevented or 5 minutes whichever is longer, insert **Trigger 7** and inform the SCO that the jumpers are installed.
- ☐ If requested as I&C to investigate the failure of the scram discharge volume vents and drains, acknowledge the request.
- ☐ If requested to open the MVD-5005, wait 5 minutes, initiate **Trigger 9** and inform the control room that the valve is open.
- ☐ If requested to defeat Drywell Cooler LOCA Lockout, wait three minutes, initiate **Trigger 10** and inform the SCO that the jumpers are installed.
- ☐ When injection to the RPV has been re-established and if requested to line up boron to the CRD system initiate **Trigger 11**.
- ☐ When directed by the lead examiner, proceed to the next event.

Required Operator Actions

SRO

Time	Action	Notes
	Direct Group 10 switches to override reset.	
	<i>Direct terminate and prevent HPCI/Feedwater (CS/RHR when LOCA signal received).</i>	
	When level reaches +90 inches, evaluate Table 3: <ul style="list-style-type: none">• If not met, establishes a level band of LL4 to +90 inches.	
	Directs Drywell cooling restored per SEP-10.	
	Evaluate TAF and LL4 indicated levels using Caution 1 graphs.	
	Direct injection established to maintain RPV level LL4 to 90 inches (should try to keep level above the LL3 setpoint, most likely will establish a level band of 60-90 inches)	

RO

Time	Action	Notes
	Continues to select control rods and drive in using Emerg rod in notch override.	
	Monitor APRMs for downscale.	
	Performs LEP-02 Section 3 after jumpers are installed.	
	Inhibit ARI	
	Places ARI Initiation Switch to INOP	
	Places ARI Reset Switch to RESET and maintains for 5 seconds.	
	Verifies red TRIP light above ARI Initiation is OFF	
	Reset RPS when scram jumpers installed.	
	Ensures Disch Vol Vent & Drain Test switch is in Isolate.	
	Confirms Disch Vol Vent Valves V139 and CV-F010 are closed	
	Confirms Disch Vol Drain valves V140 and CV-F011 are closed.	
	Resets RPS.	
	Place Disch Vol Vent & Drain Test switch to Normal	
	Recognize/report failure of scram discharge volume vents and drains.	

BOP

Time	Action	Notes
	Places Group 10 switches to override / reset	
	<i>Terminate and prevent injection to RPV.</i>	
	<i>HPCI - Places HPCI Aux Oil Pump to Pull to Lock.</i>	
	<i>FW - Can be performed a couple of ways.</i>	
	<i>1. Trip RFP Turbines OR</i>	
	<i>2. Adjust discharge pressure of pump down to below RPV pressure to prevent injection.</i>	
	<i>Ensures MSTR RFPT SP/RX LVL CTL in manual and SULCV closed.</i>	
	<i>ECCS - Turns OFF low pressure ECCS pumps if they start.</i>	
	May place Feedwater in service for level control when directed by the SCO.	
	Raise RFP discharge pressure above RPV pressure	
	Open SULCV to obtain desired level	

EVENT 8/9

ATWS ACTIONS - CONTINUED

BOP Continued

Time	Action	Notes
	May place HPCI in service for level control during ATWS when directed by the SCO.	
	Place HPCI in manual (M) and adjust output demand to approximately 40% using the manual lever.	
	Adjust HPCI setpoint to approximately 1000 GPM.	
	Start auxiliary oil pump.	
	When HPCI turbine speed stops increasing, then raise HPCI pump flow to approximately 1000 GPM using the manual lever on HPCI.	
	Ensure E41-F012 is closed when flow has increased above 800 GPM.	
	Transfer HPCI from Manual (M) TO Auto (A).	
	Adjust HPCI setpoint to maintain desired reactor water level	

EVENT 10**ALL RODS IN**

When level has been lowered and level band has been established, the scram discharge volume vents and drains will be repaired. Control rods can then be inserted by manual scram. When all control rods are inserted and level is being maintained 170 to 200 inches the scenario may be terminated

Malfunctions Required:

Success Path:

When actions are taken to control reactor water level during the ATWS after terminating and preventing, the SDV vents and drains will be repaired and rods can be inserted. When all rods are inserted and level is being controlled 170 - 200 inches the scenario may be terminated.

Simulator Operator Actions:

- ☐ When directed by the lead evaluator, delete the following commands:
 - ☐ Malfunction - RD036F, Scram Disc Vol Drn Fails Closed
 - ☐ Malfunction – RP010F, ATWS 3 (Make sure **RPS is reset** before deleting)
- Inform the SCO that a loose wire was found on the SDV vent and drain logic and have been fixed.
- ☐ If contacted as the RB AO to secure Alternate Boron Injection delete remote SL_IALEP03.
- ☐ When directed by the lead examiner, proceed to the next event.

Required Operator Actions

SRO

Time	Action	Notes
	Exit LPC and enter RVCP when all rods are in.	
	Direct securing Alternate Boron Injection.	
	Direct level restored to 170 - 200 inches after rods are all in.	

EVENT 10**ALL RODS IN****RO**

Time	Action	Notes
	Continues to drive rods using RMCS	
	Confirms Disch Vol. Vent & Drains are open when reported fixed.	
	Inserts a scram after discharge volume has drained for ~2 minutes.	
	Reports all rods in.	
	Directs AO to secure Alternate Boron Injection.	

BOP

Time	Action	Notes
	Maintains reactor pressure as determined by the SCO.	
	Maintains level as directed by the SCO.	
	Restores level to 170 - 200 inches after all rod inserted.	
	Increases RCIC controller to 500 gpm.	
	Increases HPCI controller to raise reactor water level.	
	Raises feedwater flow to raise reactor water level, if RFPs were not tripped.	

Simulator Operator Activities:

WHEN directed by the lead examiner, place the simulator in **FREEZE**.

CAUTION

**DO NOT RESET THE SIMULATOR PRIOR TO RECEIPT
OF CONCURRENCE TO DO SO FROM THE LEAD
EXAMINER**

**PROGRESS ENERGY CAROLINAS
BRUNSWICK TRAINING SECTION**

SIMULATOR SCENARIO

2010-1 NRC Exam Scenario #3

Facility: BrunswickScenario #: 2010-1 #3OP-Test No.: Draft

Examiners: _____

Operators: _____

Initial Conditions: The plant is operating at ~50% power during startup following a refuel outage. No equipment is out of service

Turnover: Following shift turnover, raise power to 60%, perform alternate power verification and prepare to place the second feed pump in service.

Event No.	Malf. No.	Event Type*	Event Description
1	N/A	R-BOP R-SRO	Raise power to 60%
2	N/A	N-SRO N-BOP	Perform verification of Reactor Power level using Alternate Indications
3	EE030M	C-BOP C-SRO	Main Stack Rad Monitor power failure. (TS)
4	K4517A	C- BOP C- SRO	2B TCC Pump trip
5	P2740A1I	C- RO C- SRO	2B Recirc Pump speed control failure (TS)
6	MS031F	I-BOP I-SRO	MTLO controller failure
7	MS017F	M-ALL	Turbine high vibration requiring turbine trip and scram resulting in an ATWS condition requiring entry to LPC.
8	K2119A Off	C-RO C-SRO	SLC pumps will not start due to switch failure.
9	RD036F	C-RO C-SRO	Scram discharge volume vents and drains fail closed.
10			All Rods In

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

SCENARIO DESCRIPTION

Unit 2 is operating at ~50% power during startup following a refuel outage.

- Event 1 Continue with startup to 60% power using recirc flow.
- Event 2 Performs a verification of reactor power level using alternate indications per OGP-04 Attachment 1.
- Event 3 Power to the Main Stack Rad Monitor will be lost. The power results in Group 6 isolation and Secondary containment.
- Event 4 TCC Pump 2B will trip and TBCCW low header pressure will alarm. The crew will respond per OAOP-17.0 and place 2C TBCCW pump in service.
- Event 5 2B Recirc Pump control speed will fail resulting in lowering reactor power. The crew will respond per OAOP-03.0 and lock the scoop tube.
- Event 6 The main turbine lube oil controller will fail closed causing the lube oil to heat up and vibrations to occur on the main turbine. This will require the main turbine to be tripped (>12 mils on bearing 1-8 and >10 mils on bearings 9/10) and the reactor to be scrammed.
- Event 7 Most control rods will fail to insert on the scram. The crew will respond to the ATWS per EOP-01-LPC.
- Event 8 When SLC initiation is attempted, neither SLC pump will start due to switch failure. The crew will enter LEP-03 and align for alternate boron injection using CRD.
- Event 9 When scram jumpers are installed the scram discharge vents and drains will fail to open which will result in inability to insert control rods by resetting RPS and inserting additional manual scrams.
- Event 10 When level has been lowered and level band has been established, the scram discharge volume vents and drains will be repaired. Control rods can then be inserted by manual scram. When all control rods are inserted and level is being maintained 170 to 200 inches the scenario may be terminated.

Simulator Setup

Initial Conditions:

IC

ENP-24.5 for IC 9

Rx Power 60%

Core Age EOC

Events:

Event #	Trigger	Description
3	1	Manual Main Stack Rad Monitor Power Failure
4	2	Manual Trip 2B TBCCW Pump
5	3	Manual MTLO controller failure
6	4	Auto Turbine high vibration causing the crew to scram the plant with an ATWS condition
8	NA	SLC switch failure
9	5	Auto Scram Discharge Vents and Drains fail closed

Malfunctions Summary

Shaded entries are Active

Malf. ID	Mult ID	Description	Current Value	Target Value	Ramp Time	Act. Time	Deact Time	Trig
RP010F		ATWS 3	True	True				
RD036F		Scram Disc Vol Drn Fails Closed	False	True				5 - on Scram
MS031F		MTLO Temp Cntrlr Fails	False	True				3
MS017F	4	Turbine Bearing Vibration	0	5	5 min			Auto on UA23 1-6
MS017F	5	Turbine Bearing Vibration	0	5	5 min			Auto on UA23 1-6
MS017F	6	Turbine Bearing Vibration	0	5	5 min			Auto on UA23 1-6
MS008F		Main Turbine Trip	False	True				6
RP005F		Auto Scram Defeat	False	True				7

Remotes Summary

Remote ID	Mult. ID	Description	Current Value	Target Value	Trig
EP_IAEOPJP1		Bypass LL3 Group I Isol	Off	On	8
MS_VMS5005D		MVD-5005 Mn Stm Drn Hdr Isolation	0	1	9
EP_IACS993U		DW CLR A&D Override – Normal/Run	Normal	Run	10
EP_IACS994U		DW CLR B&C Override – Normal/Run	Normal	Run	10
EP_IASW5997		SW-V106 LOCA Override	Normal	Bypass	10
EP_IASW5998		SW-V103 LOCA Override	Normal	Bypass	10
ED_IAUPB2A6		UPS 2A to Sample Detection Skid	Closed	Open	1
SL_IALEP03		Alt = Sub Pump / Hose Lineup	Normal	Alt	11

Switches Summary

Switch ID	Description	Target Position	Override Value	Trig
K4517A	TBCCW Pump B	On	Off	2
Q4517LG4	TBCCW Pump B Green	On/Off	Off	2
K2119A	S/B Liq Pump A-B	Stop	On	
K2119A	S/B Liq Pump A-B	Pump A	Off	
K2119A	S/B Liq Pump A-B	Pump AB	Off	
K2119A	S/B Liq Pump A-B	Pump B	Off	
K6103B	SBGT Sys B	Pref	Off	
K4313A	RFP A Recirc Vlv Auto	Close	Off	Auto on RFP A Trip (Q43164WY = true)
K4307A	RFP B Recirc Vlv Auto	Close	Off	Auto on RFP B Trip (Q43104WY = true)

Special Instructions:

Ensure ENP-24.5 for IC-9 at P603 panel.
 Reduce power to ~50% using recirc flow.
 Place 2B TCC pump in service.
 Verify APRM GAFs are ≤ 1.00
 Mark-up OGP-04, Attachment 1, for 30, 40 and 50% power.
 Have the computer on the Heat Balance page 1.

Shift Briefing

Plant Status

The plant is operating at ~50% power during startup following a refuel outage.

GP-04 is complete up to step 5.2.22.

Equipment Out of Service

No equipment is out of service

Plan of the Day

Raise power to 60%, perform alternate power verification and prepare to place the second feed pump in service.

Scenario Information

Critical Tasks (bolded/italicized in the required operator action statements)

- Terminate and prevent HPCI/Feedwater during the ATWS (CS/RHR when LOCA signal received)
- Direct LEP-03, Alternate Boron Injection, using CRD.
- Perform LEP-02, Alternate Rod Insertion using RMCS.

EVENT 1 SHIFT TURNOVER, RAISE REACTOR POWER TO 60%

The crew will complete shift turnover and raise reactor power to ~60%.

Malfunctions required: None.

Objectives:

SCO - Directs reactor power to be raised using Recirc pump speed control.

RO – Performs power increase using recirc flow control.

Success Path:

Power is raised to ~60% power.

Simulator Operator Actions:

- ☐ If contacted as the RE for power increase guidance, inform crew to raise power using Reactor Recirc flow.
- ☐ If contacted as the RE to monitor power increase, inform crew that you will monitor core performance.
- ☐ When directed by the lead examiner, proceed to the next event.

Required Operator Actions

Reactivity Manipulation – Raise power 10% using recirc pump speed controls.

SRO

Time	Action	Notes
	Directs Power to be raised to ~60% power.	

RO

Time	Action	Notes
	Raises power using recirculation flow to ~60% power.	
	Raise flow on one RR Pump (~2%) at a time to stay within mismatch criteria (7.5×10^6 Mlbs jet pump flow if < than 58 Mlbs or 3.5×10^6 Mlbs if > than 58 Mlbs).	
	Continues alternating Recirc pump increases until power is ~60%.	
	Verifies operation on the Power to Flow map.	

BOP

Time	Action	Notes
	Plant Monitoring	

EVENT 2 REACTOR POWER LEVEL VERIFICATION USING ALTERNATE INDICATIONS

Performs 0GP-04, Attachment 1, Verification of Reactor Power Level Using Alternate Indications

Malfunctions required: None.

Objectives:

SCO - Directs Verification of Reactor Power Level Using Alternate Indications.

RO - Performs Verification of Reactor Power Level Using Alternate Indications IAW 0GP-04.

Success Path:

Verification of Reactor Power Level Using Alternate Indications within 5% of Heat Balance.

Simulator Operator Actions:

- ☐ If contacted as the RE to monitor core performance, inform crew that you will monitor core performance on the computer.
- ☐ When directed by the lead examiner, proceed to the next event.

Required Operator Actions

Normal Operations – Verification of Reactor Power Level Using Alternate Indications IAW 0GP-04, Attachment 1.

SRO

Time	Action	Notes
	Directs Verification of Reactor Power Level Using Alternate Indications.	

RO

Time	Action	Notes
	Plant Monitoring	

BOP

Time	Action	Notes
	Performs GP-04 Attachment 1	
	Obtain valid Heat Balance (Display 820) and record heat balance % power in Table 1.	
	Obtain LPRM % PWR (Display 861) Filtered LPRM Readings Edit, and record in Table 1.	
	Goes to step 4 to obtain steam flow % power.	

EVENT 2 (Cont'd) REACTOR POWER LEVEL VERIFICATION USING ALTERNATE INDICATIONS

BOP (Cont'd)

Time	Action	Notes
	<p>Perform the following at the prompt on the ERFIS terminal:</p> <p>Select Screen 6 by typing 6</p> <p>Select 1 for Normal FW Heater Lineup</p>	
	Record Steam Flow equivalent % power on Table 1 (from RE program).	
	Compare the Heat Balance (%) with the other alternate indications (%).	
	<p>If the heat balance is greater than all alternate indications (conservative as is) OR</p> <p>One or more alternate indications are within 5% of the heat balance (normal acceptance),</p> <p>Then Power Ascension may continue.</p>	

EVENT 3 MAIN STEAM LINE RAD MONITOR FAILURE

Power to the Main Stack Rad Monitor will be lost. The power results in Group 6 isolation, Secondary containment Isolation but SBGT fails to auto start. The crew must manually start SBGT to maintain Secondary Containment integrity.

Malfunctions required:

UPS 2A to Sample Detection Skid breaker open.

Objectives:

SCO - Determine actions required for LCO per Technical Specifications.

BOP – Respond to a process radiation monitoring downscale/inop annunciator.

Success Path:

Technical Specification / TRM

- 3.3.6.1 PCIS Instrumentation, determine Function 2c is inoperable, determine actions A and B apply (single channel), then C and F after 1 hour.
- TRM 3.4 Post Accident Monitoring, determine Function 5 is inoperable and condition A applies
- ODCM 7.2 Gaseous Effluent Monitoring, determine function 1 is inoperable and notify E&RC.
- 3.6.4.3 SBGT, Determine Condition A1, restore in 7 days

Simulator Operator Actions:

- ☐ Insert **Trigger 1** at the discretion of the lead evaluator.
- ☐ Ensure SBGT start when switches are taken to ON.
- ☐ If asked to investigate, report UPS Panel 2A to the Stack Rad Monitor is tripped.
- ☐ If contacted as I&C to investigate, acknowledge the request, if asked do not recommend transfer to the alternate power supply until the cause of the trip is investigated.
- ☐ When directed by the lead examiner, proceed to the next event.

Required Operator Actions

Tech Spec Declaration – 3.3.6.1 condition A and B, TRM 3.4 condition A, ODCM 7.2, and 3.6.4.3 condition A1.

EVENT 3 (cont'd) MAIN STEAM LINE RAD MONITOR FAILURE**SRO**

Time	Action	Notes
	Direct actions of the APPS for the Main Stack Rad Monitor	
	Direct manual start of SBGT.	
	Direct I/C to investigate loss of UPS 2A.	
	Refer to Tech Specs. 3.3.6.1, Determine function 2c is inoperable (Condition A and B), then C and F after 1 hour. TRM 3.4 Determine function 5 is inoperable (Condition A, 31 days) ODCM 7.2, Determine function 1 is inoperable and notify E&RC. 3.6.4.3 SBGT, Determine Condition A1, restore in 7 days.	

RO

Time	Action	Notes
	Plant Monitoring .	
	May open the SW-V111 or V117 to supply cooling water to the vital header IAW 2APP-UA-05 1-9 or 2-9.	

EVENT 3 (cont'd) MAIN STEAM LINE RAD MONITOR FAILURE

BOP

Time	Action	Notes
	<p>Report loss of Main Stack Rad Monitor.</p> <p><u>UA-03</u> 5-4, PROCESS OG VENT PIPE RAD HI-HI 6-3, PROCESS SMPL OG VENT PIPE DNSC/INOP 6-4, PROCESS OG VENT PIPE RAD - HI</p> <p><u>UA-05</u> 3-5, SBTG SYS B FAILURE 4-6, SBTG SYS A FAILURE 6-10, RX BLDG ISOLATED</p>	
	<p>Report TS review for the SCO from the Annunciator reviews.</p> <ul style="list-style-type: none"> • 3.6.4.3 • 3.3.6.1 Table 3.3.6.1-1, Function 2C • ODCM 7.3.2 Table 7.3.2-1 Function 1, 7.3.7, and 7.3.13 • TRM 3.4, Table 3.4.2 Function 5 	
	Determine SBTG Train B did not auto start and manually start	
	Dispatch AO to investigate UPS 2A condition.	
	May open the SW-V111 or V117 to supply cooling water to the vital header IAW 2APP-UA-05 1-9 or 2-9.	

EVENT 4 TBCCW PUMP B TRIP

TCC Pump 2B will trip and TBCCW low header pressure will alarm. The crew will respond per 0AOP-17.0 and place a TBCCW pump in service

Malfunctions required:

Trip of 2B TCC pump

Objectives:

SCO – Direct entry into 0AOP-17.0.

RO – Restoration of TCC pressure

Success Path:

2C TBCCW pump started and TCC pressures restored to normal.

Simulator Operator Actions:

- ☐ Insert **Trigger 2** at the discretion of the lead evaluator.
- ☐ If contact as the TB AO, wait one minute and report that 2B TCC pump is hot to the touch and the breaker is tripped.
- ☐ If contacted as Unit One CRS, report Unit One is not using the 2C TCC Pump.
- ☐ Acknowledge request as I&C to do troubleshooting/repair for the 2B TCC Pump.
- ☐ When directed by the lead examiner, proceed to the next event.

Required Operator Actions

SRO

Time	Action	Notes
	Direct entry into 0AOP-17.0.	
	Direct start of a TCC Pump.	
	Direct I/C to investigate loss of 2B TCC pump.	

RO

Time	Action	Notes
	Plant Monitoring .	

EVENT 4 (Cont'd) TBCCW PUMP B TRIP

BOP

Time	Action	Notes
	Report loss of 2B TCC Pump and refer to APPs. 2APP-UA-03 (2-4) TBCCW PUMP DISCH HEADER PRESS LOW	
	Enter 0AOP-17.0.	
	Dispatch AO to investigate 2B TCC Pump condition.	
	May dispatch AO to perform prestart checks for 2A or 2C TCC Pump.	
	Starts a TCC pump. (May start two pumps) (Depending on the amount of time that no TCC pump is operating, one pump may not immediately restore TCC pressure due to the system loads TCC temperature control valves being wide open.)	
	If needed, Verify Unit One is not using 2C TCC pump and start pump.	

EVENT 5/6 MTLO CONTROLLER FAILURE/TURBINE VIBRATIONS HIGH

Malfunctions Required:

Main Turbine lube oil cooler controller fails closed. When high temperature alarm annunciates activate trigger to accelerate turbine vibrations.

Objectives:

Respond to an abnormal turbine vibration per UA-23 6-1 and UA-23 6-3.

Success Path:

The MTLO controller on XU-2 indicates 100% output (full closed) and turbine lube oil temperature will rise. Dispatch AO and I&C to investigate.

Simulator Operator Actions:

- ☐ At the discretion of the lead evaluator, insert **Trigger 3** to fail the MTLO controller closed.
- ☐ If asked as the TB AO to investigate, report that the temperature control valve to the MTLO is closed. (There is no bypass valve).
- ☐ Verify turbine vibrations on 4, 5, and 6 begin to rise after receiving UA-23 1-6.
- ☐ If asked as I&C to investigate acknowledge the request.
- ☐ When directed by the lead examiner, proceed to the next event.

Required Operator Actions

SRO

Time	Action	Notes
	Direct actions of APP's.	
	When vibrations rise to above the TSI setpoint, direct manual scram and turbine trip per the vibration APP. (12 mils on bearings 1-8, 10 mils on bearings 9-10) (As conservative decision making may insert before setpoint).	

RO

Time	Action	Notes
	Plant Monitoring .	
	When directed by the SRO, insert a manual scram and trip the main turbine.	
	Recognize and report an ATWS.	

EVENT 5/6 (Cont'd) MTLO CONTROLLER FAILURE/TURBINE VIBRATIONS HIGH

BOP

Time	Action	Notes
	Recognize and report rising lube oil temperatures.	
	Dispatch TB AO to investigate TCV.	
	Perform actions of APPs <u>UA-23</u> 1-6 TURB OR RFP BRG TEMP HIGH 6-1 TURBINE VIBRATION HIGH 6-3 TSI HIGH VIBRATION TRIP	
	Monitor turbine bearing temperatures and vibrations (PC display 630).	
	May place the Main Turbine Lube Oil controller in manual and attempt to operate the valve.	

EVENT 7/8**ATWS ACTIONS**

Most control rods will fail to insert on the scram. The crew will respond to the ATWS per EOP-01-LPC. When SLC initiation is attempted, neither SLC pump will start due to switch failure. The crew will enter LEP-03 and align for alternate boron injection using CRD

Malfunctions Required:

Scram discharge volume vents and drain fail closed on the scram.
SLC switch is failed in the off position.

Objectives:

SCO – Direct actions for a reactor scram per EOP-01-RSP.

Direct actions to control reactor power per EOP-01-LPC.

RO/BOP – Perform immediate actions for a reactor scram.

Perform actions for an ATWS per EOP-01-LPC.

Success Path:

Controls reactor pressure using the SRV's. Performs actions of LPC, recognizes failure of SLC and performs alternate boron injection.

Simulator Operator Actions:

- ☐ If crew does not trip the main turbine by the time SLC initiation is directed, initiate **Trigger 6** to trip the main turbine.
- ☐ If requested to perform alternate boron injection using CRD, acknowledge the request. (will be performed after RPV injection is re-started)
- ☐ Acknowledge request as I&C to investigate failure of SLC.
- ☐ When directed by the lead examiner, proceed to the next event.

Required Operator Actions

SRO

Time	Action	Notes
	Enter RSP and transition to LPC.	
	Direct mode switch to shutdown when steam flow < 3 Mlbs/hr.	
	Direct ARI initiation.	
	Direct Recirc Pump speeds reduced to 10%.	
	Direct Recirc Pumps Tripped.	

EVENT 7/8

ATWS ACTIONS

SRO Continued

Time	Action	Notes
	Direct SLC initiation.	
	<i>Direct LEP-03, Alternate boron injection.</i>	
	Direct ADS inhibited.	
	Direct RWCU isolation.	
	<i>Direct LEP-02, Alternate Rod Insertion.</i>	

BOP

Time	Action	Notes
	Places ADS in inhibit.	
	Isolates RWCU. Closes RWCU Outboard Isol Valve G31-F004.	

RO

Time	Action	Notes
	Place mode switch to shutdown when steam flow < 3×10^6 lb/hr.	
	Initiates ARI.	
	Places Recirc Pump speeds reduced to 10%.	
	Trips Recirc Pumps.	
	Initiates SLC.	
	Recognizes failure of SLC and reports to SCO.	

RO (cont'd)

Time	Action	Notes
	<i>Performs LEP-03, Alternate Boron Injection.</i>	
	<i>Direct AO to perform LEP-03, Section 1, Alternate Boron Injection using CRD.</i>	
	<i>Performs LEP-02, Alternate Rod Insertion. (RMCS Section)</i>	
	<i>Insert IRMs.</i>	
	<i>When < range 3 on IRMs insert SRMs.</i>	
	<i>Start both CRD pumps.</i>	
	<i>Place CRD Flow Controller to Manual.</i>	
	<i>Throttle open flow controller to establish ≥ 260 drive water psid.</i>	
	<i>Bypass RWM.</i>	
	<i>Selects control rods and drives in using Emerg rod in notch override.</i>	
	Performs alternate rod insertion per LEP-02 Section 3.	
	Request jumpers for LEP-02 Section 3.	

The crew will terminate and prevent injection, re-injection will start when level is at 90 inches due to table 3 conditions not met. If RFPs are tripped they will be unavailable for level control as the Recirc Valves will fail in the closed position not allowing the RFPs to be restarted. HPCI will be available for level control.

Objectives:

SCO – Direct actions to lower reactor vessel level when the conditions of Table 3 are not met per EOP-01-LPC.

RO/BOP – Control reactor level during an ATWS per EOP-01 LPC.

Success Path:

Continues actions in the LPC procedure, terminate and prevent injection, drive rods using RMCS.

Simulator Operator Actions:

- ☐ If requested to defeat Group I LL3, wait 2 minutes, initiate **Trigger 8** and inform the SCO that the jumpers are installed.
- ☐ If requested to install LEP-02, Section 3 jumpers, wait until level has been terminated and prevented or 5 minutes whichever is longer, insert **Trigger 7** and inform the SCO that the jumpers are installed.
- ☐ If requested as I&C to investigate the failure of the scram discharge volume vents and drains, acknowledge the request.
- ☐ If requested to open the MVD-5005, wait 5 minutes, initiate **Trigger 9** and inform the control room that the valve is open.
- ☐ If requested to defeat Drywell Cooler LOCA Lockout, wait three minutes, initiate **Trigger 10** and inform the SCO that the jumpers are installed.
- ☐ When injection to the RPV has been re-established and if requested to line up boron to the CRD system initiate **Trigger 11**.
- ☐ When directed by the lead examiner, proceed to the next event.

Required Operator Actions

SRO

Time	Action	Notes
	Direct Group 10 switches to override reset.	
	<i>Direct terminate and prevent HPCI/Feedwater (CS/RHR when LOCA signal received).</i>	
	When level reaches +90 inches, evaluate Table 3: <ul style="list-style-type: none"> • If not met, establishes a level band of LL4 to +90 inches. 	
	Directs Drywell cooling restored per SEP-10.	
	Evaluate TAF and LL4 indicated levels using Caution 1 graphs.	
	Direct injection established to maintain RPV level LL4 to 90 inches (should try to keep level above the LL3 setpoint, most likely will establish a level band of 60-90 inches)	

RO

Time	Action	Notes
	Continues to select control rods and drive in using Emerg rod in notch override.	
	Monitor APRMs for downscale.	
	Performs LEP-02 Section 3 after jumpers are installed.	
	Inhibit ARI	
	Places ARI Initiation Switch to INOP	
	Places ARI Reset Switch to RESET and maintains for 5 seconds.	
	Verifies red TRIP light above ARI Initiation is OFF	
	Reset RPS when scram jumpers installed.	
	Ensures Disch Vol Vent & Drain Test switch is in Isolate.	
	Confirms Disch Vol Vent Valves V139 and CV-F010 are closed	
	Confirms Disch Vol Drain valves V140 and CV-F011 are closed.	
	Resets RPS.	
	Place Disch Vol Vent & Drain Test switch to Normal	
	Recognize/report failure of scram discharge volume vents and drains.	

BOP

Time	Action	Notes
	Places Group 10 switches to override / reset	
	<i>Terminate and prevent injection to RPV.</i>	
	<i>HPCI - Places HPCI Aux Oil Pump to Pull to Lock.</i>	
	<i>FW - Can be performed a couple of ways.</i>	
	<i>1. Trip RFP Turbines OR</i>	
	<i>2. Adjust discharge pressure of pump down to below RPV pressure to prevent injection.</i>	
	<i>Ensures MSTR RFPT SP/RX LVL CTL in manual and SULCV closed.</i>	
	<i>ECCS - Turns OFF low pressure ECCS pumps if they start.</i>	
	May place Feedwater in service for level control when directed by the SCO.	
	Raise RFP discharge pressure above RPV pressure	
	Open SULCV to obtain desired level	

BOP Continued

Time	Action	Notes
	May place HPCI in service for level control during ATWS when directed by the SCO.	
	Place HPCI in manual (M) and adjust output demand to approximately 40% using the manual lever.	
	Adjust HPCI setpoint to approximately 1000 GPM.	
	Start auxiliary oil pump.	
	When HPCI turbine speed stops increasing, then raise HPCI pump flow to approximately 1000 GPM using the manual lever on HPCI.	
	Ensure E41-F012 is closed when flow has increased above 800 GPM.	
	Transfer HPCI from Manual (M) TO Auto (A).	
	Adjust HPCI setpoint to maintain desired reactor water level	

EVENT 10**ALL RODS IN**

When level has been lowered and level band has been established, the scram discharge volume vents and drains will be repaired. Control rods can then be inserted by manual scram. When all control rods are inserted and level is being maintained 170 to 200 inches the scenario may be terminated

Malfunctions Required:

Success Path:

When actions are taken to control reactor water level during the ATWS after terminating and preventing, the SDV vents and drains will be repaired and rods can be inserted. When all rods are inserted and level is being controlled 170 - 200 inches the scenario may be terminated.

Simulator Operator Actions:

- ☐ When directed by the lead evaluator, delete the following commands:
 - ☐ Malfunction - RD036F, Scram Disc Vol Drn Fails Closed
 - ☐ Malfunction – RP010F, ATWS 3 (Make sure **RPS is reset** before deleting)
- Inform the SCO that a loose wire was found on the SDV vent and drain logic and have been fixed.
- ☐ If contacted as the RB AO to secure Alternate Boron Injection delete remote SL_IALP03.
- ☐ When directed by the lead examiner, proceed to the next event.

Required Operator Actions

SRO

Time	Action	Notes
	Exit LPC and enter RVCP when all rods are in.	
	Direct securing Alternate Boron Injection.	
	Direct level restored to 170 - 200 inches after rods are all in.	

EVENT 10**ALL RODS IN****RO**

Time	Action	Notes
	Continues to drive rods using RMCS	
	Confirms Disch Vol. Vent & Drains are open when reported fixed.	
	Inserts a scram after discharge volume has drained for ~2 minutes.	
	Reports all rods in.	
	Directs AO to secure Alternate Boron Injection.	

BOP

Time	Action	Notes
	Maintains reactor pressure as determined by the SCO.	
	Maintains level as directed by the SCO.	
	Restores level to 170 - 200 inches after all rod inserted.	
	Increases RCIC controller to 500 gpm.	
	Increases HPCI controller to raise reactor water level.	
	Raises feedwater flow to raise reactor water level, if RFPs were not tripped.	

Simulator Operator Activities:

WHEN directed by the lead examiner, place the simulator in **FREEZE**.

CAUTION

**DO NOT RESET THE SIMULATOR PRIOR TO RECEIPT
OF CONCURRENCE TO DO SO FROM THE LEAD
EXAMINER**

ATTACHMENT 1

Page 1 of 3

Verification of Reactor Power Level Using Alternate Indications

Unit 2

Date: Today

NOTE: This attachment is used to validate the heat balance at approximately 10% power increments.

1. **OBTAIN** valid Heat Balance (Display 820 or OPT-01.8D, Core Thermal Power Calculation) **AND RECORD** heat balance % power in Table 1.
2. **OBTAIN** LPRM % PWR - Display 861, Filtered LPRM Readings Edit, **AND RECORD** in Table 1.

TABLE 1

TIME	APPROX. RX POWER	STEAM FLOW % POWER	LPRM % POWER	HEAT BALANCE % POWER	APRM GAFs ≤ 1.00	INITIALS
N/A	TURBINE ON LINE	N/A	N/A	N/A	N/A	N/A
2 hrs ago	30%	29.2	29.9	30.1	RO	RO
1 hr ago	40%	38.6	39.6	39.9	RO	RO
15 min ago	50%	48.9	49.8	50.1	RO	RO
	60%					
	70%					
	80%					
	90%					
	100%					

Definitions for Table 1:

HEAT BALANCE % POWER - A calculation of core thermal power obtained by solving an energy balance on the reactor vessel. Valid heat balance calculations may be obtained from Display 820 edits or manually by performing OPT-01.8D. Caution must be taken to ensure that any failed sensors have valid substituted values.

LPRM % POWER - An alternate indication of reactor power calculated only on the process computer which is obtained by averaging calibrated LPRM readings.

STEAM FLOW % POWER - An alternate indication of reactor power obtained by correlating the total steam flow to a valid heat balance. Total steam flow can be obtained from Process Computer Point B041, ERFIS Points C32FA014, C32FA015, C32FA016, C32FA017, or RTGB indications C32-R603A, B, C, D on P603.

ATTACHMENT 1

Page 2 of 3

Verification of Reactor Power Level Using Alternate Indications

NOTE: The steam flow-power correlation is not accurate with the Turbine on-line and reduced feedwater heating in effect. STEAM FLOW % POWER should be marked N/A unless data exists from the Reactor Engineer using an approved calculation.

3. **PERFORM** the following to obtain the Total Steam Flow (Mlb/hr):

Steam Line	(A)	(B)	(C)	(D)
(ERFIS)	C32FA014	C32FA015	C32FA016	C32FA017
(P603)	C32-R603A	C32-R603B	C32-R603C	C32-R603D

Total Steam Flow = (A) + (B) + (C) + (D) =

OR

USE Computer Point B041

4. **PERFORM** the following to log on at the ERFIS terminal:

a. **TYPE:** SET HOST EC01B (EC02B)

OR

SET HOST EC01A (EC02A)

b. **TYPE:** GEPACUSER, at USERNAME prompt

c. **TYPE:** GEPAC, at PASSWORD prompt

ATTACHMENT 1

Page 3 of 3

Verification of Reactor Power Level Using Alternate Indications

NOTE: Typing MAN runs an interactive program called MAN_ALTDSP that performs alternate power calculations based upon user supplied plant inputs. Remember to enter decimal points for all values. Use the equivalent % power output from this program for the comparison in the next step.

NOTE: Typing NE runs an automatic program called NE_MAIN that reads ERFIS computer points and automatically calculates the alternate power correlations for display. There are 7 screens in the program. The user can type "A" to advance from one screen to the next or the user can enter the number of the screen (1-7) he wishes to display next. The Alternate Power Display is Screen 6. The user can enter "H" for on-line HELP. The user must enter "E" to EXIT the program.

d. **TYPE:** MAN (for manual input)

OR

e. **TYPE:** NE (for automatic input) and select Screen 6 (type: 6).

5. **RECORD** STEAM FLOW equivalent % power on Table 1 of this attachment using the values obtained from MAN or NE programs.
6. **COMPARE** the Heat Balance (%) with the other alternate indications (%).
7. **IF** the heat balance is greater than all alternate indications (conservative as is) **OR** one or more alternate indications are within $\pm 5\%$ of the heat balance (normal acceptance), **THEN** Power Ascension may continue.
8. **IF** power ascension is **NOT** permitted, **THEN CONTACT** Reactor Engineering to account for the differences in agreement.
9. **REPEAT** the above steps at 10% increments until the reactor is at 100% power.

**PROGRESS ENERGY CAROLINAS
BRUNSWICK TRAINING SECTION**

SIMULATOR SCENARIO

2010-1 NRC EXAM SCENARIO #4

Appendix D		Scenario Outline		Form ES-D-1
Facility: <u>BRUNSWICK</u>		Scenario No.: <u>2010-1 #4</u>		Op-Test No.: <u>DRAFT</u>
Examiners: _____		Operators: _____		(SRO)
_____		_____		(RO)
_____		_____		(BOP)
<p>Initial Conditions: Unit Two (2) is operating at 6% power. Reactor startup is in progress per GP-03. GP-10 sequence A2X is complete up to Step 166.</p> <p>Turnover: Continue with GP-03 actions to raise reactor power to 10% in preparation for placing the Mode switch to RUN.</p>				
Event No.	Malf. No.	Event Type*	Event Description	
1	NI018F	I-RO I-SRO	IRM C fails upscale (TS)	
2	N/A	N-BOP N-SRO	Shift SPEs	
3	N/A	R-RO R-SRO	Raise reactor power by pulling control rods	
4	RD012M, 26-23	C-RO C-SRO	Stuck control rod	
5	Q2BXPUAD		HCU 30-07 Accumulator low pressure (TS)	
6	MS005F	M-ALL	Inadvertent MSIV closure	
7	ES004F	C-RO C-SRO	SRV F failing open	
8	CA020F	M-ALL	Tailpipe rupture (LOCA)	
9	K1227A	I-BOP I-SRO	RHR A Spray logic failure	
10	RH_ZVRH28BM	C-BOP C-SRO	E11-F028B failure	
11			Drywell & Suppression Pool Spray and Reactor water level being maintained.	
*(N)ormal, (R)eactivity, (I)nstrument, (C)omponent, (M)ajor				

SCENARIO DESCRIPTION

Unit Two (2) is operating at 6% power. Reactor startup is in progress per GP-03. GP-10 sequence A2X is complete up to step 166.

- Event 1 The crew will continue raising power by pulling control rods in preparation for placing the Mode switch to RUN. Rods pulls will commence at Step 166 (10-23 @ 12) of the A2X sequence. While withdrawing control rod 10-23 from position 12, IRM C will fail upscale causing a rod block and half scram. SRO will address IRM A and C inoperability IAW TS 3.3.1.1. Once addressed, I&C will report IRM A is ready to be returned to service following proper channel check. The crew will take the actions of the APP and bypass IRM C and reset the half scram.
- Event 2 Maintenance will contact the control room and request SPEs be swapped due to low oil level. Shift SPE IAW 2OP-26.1, Section 8.
- Event 3 Following SPE shift, control rods will continue to be withdrawn raising power.
- Event 4 When control rod 26-23 is selected for withdrawal, it will be stuck at position 12. AOP-02 may be entered and 2OP-07, Section 8.2 actions are required to withdraw a difficult intermediate control rod.
- Event 5 When control rod 26-23 is fully withdrawn, HCU 30-07 accumulator light and annunciator will alarm. AO will be dispatched to investigate and determine accumulator alarm is due to low pressure and requires charging. TS 3.1.5 evaluation will be required.
- Event 6 HCU 30-07 accumulator is repressurized and TS addressed a spurious Group 1 isolation (MSIV closure) causes reactor pressure and power rise. Manual SRV opening or Scram may be performed. HPCI and/or RCIC may be manually started to control RPV water level due to loss of RFPTs.
- Event 7 2 minutes following MSIV closure, SRV F will fail open requiring entry into 0AOP-30.0 to attempt to close.
- Event 8 With SRV F failed open, PCCP will be entered and as reactor pressure falls below 700 psig, the tail pipe will rupture causing direct pressurization of the Suppression Pool air space (loss of PSP).
- Event 9 When containment spray is attempted with RHR Loop A, the Spray logic will fail to actuate, making sprays unavailable. Emergency depressurization will be required due to pressure suppression pressure limit. Logic will be available following ED.
- Event 10 When containment spray is attempted with the B RHR Loop, the E11-F028B will trip on thermal overload. RHR Loop B will be the only loop available to provide DW Spray IAW SEP-02. Emergency depressurization will be required due to pressure suppression pressure limit. Valve will be available following ED.
- Event 11 Once the reactor is depressurized with DW & SP Sprays in service and RPV water level being maintained in the normal band, the scenario may be terminated.

OBJECTIVES

SRO

1. 344231B402, Direct Actions For Safety/Relief Valve Failures Per AOP-30.0
2. 344243B402, Direct Shift Response To High Suppression Pool Temperature Per AOP-14.0
3. 344217B502, Direct Actions To Control RPV Level Per EOP-01-RVCP
4. 344218B502, Direct Actions To Control Reactor Pressure Per EOP-01-RVCP
5. 344220B502, Direct Actions To Emergency Depressurize The RPV Per EOP-01-RVCP
6. 344214B502, Direct Actions To Control Primary Containment Pressure Per EOP-02-PCCP
7. 344215B502, Direct Actions To Control Primary Containment Temperature Per EOP-02-PCCP
8. 344216B502, Direct Actions To Control Suppression Pool Temperature Per EOP-02-PCCP

RO

1. 200603B501, Perform immediate actions for a reactor scram
2. 223601B401, Respond to High Suppression Pool Temperature per AOP-14.0
3. 239008B401, Respond To An SRV Failure Per AOP-30.0
4. 200049B501, Spray The Drywell Per EOP-01-SEP-02
5. 200062B501, Spray The Suppression Pool Per EOP-01-SEP-03
6. 205014B101, Start Up RHR In Suppression Pool Cooling Mode Per OP-17

REFERENCES

- A. OP-07
- B. OP-08
- C. OP-26.1
- D. GP-03
- E. GP-10
- F. AOP-02.0
- G. AOP-30.0
- H. AOP-39
- I. OI-50
- J. EOP-01-RSP
- K. EOP-01-RVCP
- L. EOP-02-PCCP
- M. EOP-LEP-01
- N. EOP-01-SEP-02
- O. EOP-01-SEP-03
- P. EOP-01-SEP-09
- Q. Conduct Of Operations Manual
- R. Technical Specifications
- S. Plant Emergency Procedures
- T. Annunciator Panel Procedures

SIMULATOR SETUP

Initial Conditions

IC-6

Rx Pwr 6%

Event Triggers

Event	Trigger Description
0	Normal Ops (Shift SPEs)
1	Auto Initiated (IRM C Fails Upscale)
2	Auto Initiated (Control Rod 26-23 Stuck)
3	Manually Initiated (HCU 30-07 Low Pressure)
4	Manually Initiated (MSIV closure)
5	Auto Initiated (SRV F Fail Open)
6	Auto Initiated (SRV F Tailpipe rupture)
7	Auto Initiated (RHR Loop A Spray Logic Failure)
8	Auto Initiated (E11-F028B Overload)

Event Number	Trigger	Trigger Description	
1	1	NI018F	Withdraw override SRM C failure (K2324JGD)
2			SPE shift
3			Raise reactor power by pulling control rods
4		RD012M	Control Rod 26-23 stuck at position "12"
	2	K2324JVD	EMERG IN deletes RD012M 26-23
5	3	Q2BXPUD	HCU 30-07 low pressure
6	5	MS005F	Inadvertent MSIV closure
7	6	ES004F	SRV F fails open
8	7	CA020F	SRV F tail pipe rupture
9		K1227A	A RHR Containment Spray Logic failure
10	8	Q1717RGN	E11-F028B Overload
11			Delete K1227A
11			Delete E11-F028B Overload
	11		Pull SRV F Backpanel fuses

Malfunctions Summary

Mal ID	Mult ID	Description	Current Value	Target Value	Rmptime	Actime	Dactime	Trig
NI018F		IRM C FAILURE	FALSE	TRUE		40 sec		1
RD012M		30-07 STUCK CONTROL ROD	TRUE	TRUE				
MS005F		MSIV closure	FALSE	TRUE				5
ES004F		ADS VALVE fail open	FALSE	TRUE				6
CA020F		SRV F tail pipe rupture	FALSE	TRUE				7

Remotes Summary

Remf ID	Mult ID	Description	Current Value	Target Value	Rmptime	Actime	Trig
K2324JGD		OVERRIDE					1
Q2BXPUD	30-07	ACCUM-ROD DISPLAY	OFF	ON			3
K2324JVD		EMER IN					2
G1HZ1G1H		REACTOR PRESSURE < 700 psig					7
Q1303LGH		SCRAM PUSH BUTTON			2 min		6

SIMULATOR SETUP

Override Summary

Tag ID	Description	Position/ Target	Actual Value	Override Value	Rmptime	Actime	Dactime	Trig
K1227A	CONT SPRAY VLV CONT	NORM	ON	ON				
K1227A	CONT SPRAY VLV CONT	MANUAL	OFF	OFF				
K1227A	CONT SPRAY VLV CONT	RESET	OFF	OFF				
Q1717LGN	TORUS ISOL E11-F0028B GREEN	ON/OFF	ON	ON				9
Q1717RRN	TORUS ISOL E11-F0028B RED	ON/OFF	OFF	ON				9
Q1508RRJ	SRV VLV B21-FO13F RED	ON/OFF	OFF	OFF				11
Q1508LGJ	SRV VLV B21-FO13F GREEN	ON/OFF	ON	OFF				11

Annunciator Summary

Window	Description	Tagname	Override Type	Oval	AVal	Actime	Dactime	Trig
6-1	CRD ACCUM LO PRESS/HI LEVEL	ZA761	ON/OFF	ON	OFF			3
5-8	RHR B VALVES OVERLOAD	ZA358	ON/OFF	ON	OFF			9
2-2	AUTO DEPRESS CONTROL PWR FAILUE	ZA322	ON/OFF	ON	OFF			11

Special Instructions

1. Ensure "Exam In Progress" Stop Signs posted at all simulator entrances.
2. Advance all chart recorders to indicate steady state conditions.
3. Place all SPDS displays to the Critical Plant Variable display (#100).
4. Ensure appropriate keys have blanks in switches.
5. Exit shutdown screen on RWM and place the RWM key in the key locker.
6. Reset alarms on SJAE, MSL, and RWM NUMACs.
7. Ensure reference materials are in appropriate location.
8. Verify all log books have blank sheets only.
9. Reset to IC-6 and place in run.
10. Insert control rods to get back to Step 166 (10-23 @ 12)
11. Bypass IRM A and place off normal tag.
12. Verify SPE A is in service
13. Ensure GP-10 is completed up to Step 166 of A2X sequence.
14. Ensure 0GP-03 is completed up to Step 5.1.5.
15. Ensure Reactor pressure is 925 psig and #1 BPV open at least 20%.
16. Transfer RFP & Master level controllers to Auto and fully open SULCV in Manual.
17. Verify APRM GAFs are ≤ 1.00 .
18. Load scenario file, 2010 Scenario 4.scn, if required.
19. Provide turnover sheet along with IRM A Troubleshooting Form (Attachment 5).

SHIFT BRIEFING

Plant Status

Unit startup is in progress per GP-03 following a refueling outage.

Reactor power is approximately 5%. Control rod withdraw is in progress per Step 5.1.5 of GP-03.

Reactor pressure is 925 psig with one bypass valve open to approx. 20%.

GP-10, sequence A2X, is being used and is complete up to Step 166.

Equipment Out of Service

IRM A was declared inoperable early last shift due to spiking and is bypassed.

I&C Troubleshooting has determined that the instrument loop is functioning satisfactorily and that the spiking was due to welding near the pre-amp at that time. Stable operation has been observed for the last 5 hours. The Ops Center SRO is evaluating IRM Operability.

Plan of the Day

Continue with GP-03 actions to raise reactor power to 10% in preparation for placing the Mode switch to RUN.

Continuous control rod withdrawal is allowed per RE recommendation.

SCENARIO TRAINING INFORMATION

Instructor Notes

1. This guide is designed to meet the requirements of an examination scenario for Initial License as outlined in NUREG-1021, Revision 9, ES-301 and Appendix D.
2. During the execution of this scenario, the students should be rated on the performance of the objectives, compliance with general simulator performance standards, and for overall team skills in accordance with TAP-409 and NUREG-1021, ES-303.

B.Common Student Problems/Errors

None

C.Simulator Deficiencies

There are no known simulator deficiencies applicable to this scenario.

D.CREW CRITICAL TASKS

(Critical Tasks are identified to ensure scenario validity and do not constitute pass/fail criteria for Initial License.)

1. Emergency Depressurize the RPV when PSP has been exceeded.
2. Maintain RPV level above LL4

EVENT 1 SHIFT TURNOVER, RAISE REACTOR POWER, IRM C FAILURE

The crew will continue raising power by pulling control rods in preparation for placing the Mode switch to RUN. Rods pulls will commence at Step 166 (10-23 @ 12) of the A2X sequence. While withdrawing control rod 10-23 from position 12, IRM C will fail upscale causing a rod block and half scram. Unit SRO will address IRM A and C inoperability IAW TS 3.3.1.1. Once addressed, Ops Center SRO will report IRM A is ready to be returned to service following proper channel check. The crew will take the actions of the APP and bypass IRM C and reset the half scram.

Objectives:

SRO

Directs and monitor reactor power ascension with control rods

Direct actions for IRM C failure.

Address IRM C TS 3.3.1.1

RO

Withdraw control rods to raise reactor power

Monitor plant parameters during power ascension

Perform actions for IRM C failure

Success Path:

Technical Specification / TRM

- 3.3.1.1 Reactor Protection System (RPS) Instrumentation
Determines with IRMs A & C inoperable, Condition A. One or more required channels inoperable for Function 1a (IRM Neutron Flux—High. Required Action A.1 (Place channel in trip) OR A.2 (Place associated trip system in trip) within 12 hours.

Declare IRM A operable by channel check and bypass IRM C with tracking LCO for IRM C.

Simulator Operator Actions:

- ☐ While continuously withdrawing control rods, verify Trigger #1 initiates to fail IRM C upscale.
- ☐ If contacted as the RE for IRM C inoperability, acknowledge request.
- ☐ When IRM C inoperability has been addressed and by lead examiners direction, contact the control room as Ops Center SRO and report IRM A can be declared Operable following a satisfactory channel check.
- ☐ When directed by the lead examiner, proceed to the next event.

Required Operator Actions

Instrument Failure – IRM C upscale rod block and half scram.

Technical Specification – IRM C inoperability and restore IRM A operability.

SRO

Time	Action	Notes
	Ensures no other distracting evolutions are in progress while reactivity controls are being manipulated.	

EVENT 1 SHIFT TURNOVER, RAISE REACTOR POWER, IRM C FAILURE

SRO

Time	Action	Notes
	Directs RO to raise reactor power by withdrawing control rods IAW GP-10. (Continuous withdrawal allowed).	
	Directs BOP to continue monitoring plant.	
	Directs APP reference.	
	Contacts I&C for IRM C failure. May contact Shift Manager also.	
	References TS 3.3.1.1 and determines with IRMs A & C inoperable: Condition A is applicable for Function 1a Required Action A.1 <u>OR</u> A.2 is required within 12 hours.	
	TRM 3.3 (Control Rod Block Instrumentation) Function 3 Condition A, Required Action A.1 Restore channel to OPERABLE status within 24 hours.	
	Evaluates IRM A operability following satisfactory channel check . 2OP-09, Attachment 4, 2.3.4 (Operability Guidance) - Channel Checks are a sufficient WO PMT for SRMs and IRMs at power unless a component failure is suspected in which case an I/V curve and TDR trace is desirable.	
	Directs IRM A channel check be performed.	
	Determines IRM A is operable	
	Directs removing IRM A from Bypass	
	Directs bypassing IRM C	
	Directs resetting half scram	

EVENT 1 SHIFT TURNOVER, RAISE REACTOR POWER, IRM C FAILURE

RO

Time	Action	Notes
	Commence rod withdrawal at step 166 of GP-10 per guidance of OI-01.02	
	<p>2OP-07 Continuous Rod Withdraw</p> <ol style="list-style-type: none"> 1. ENSURE ROD SELECT POWER control switch is in ON. 2. SELECT desired control rod by depressing its CONTROL ROD SELECT push button. 3. ENSURE the backlighted CONTROL ROD SELECT push button is brightly illuminated AND the white indicating light on the full core display is also illuminated. 4. ENSURE ROD WITHDRAWAL PERMISSIVE indication has illuminated. 5. CONTINUOUSLY WITHDRAW control rod to position designated on GP pull sheets by holding EMERGENCY ROD IN NOTCH OVERRIDE switch to OVERRIDE, while simultaneously holding ROD MOVEMENT switch to NOTCH OUT. 6. MONITOR control rod position AND nuclear instrumentation while withdrawing the control rod. 7. PERFORM the following for control rods to be fully withdrawn: <ol style="list-style-type: none"> a. WHEN control rod reaches position 48, THEN PERFORM either of the following: <ul style="list-style-type: none"> - MAINTAIN the continuous withdraw signal for the desired time - APPLY a separate notch withdraw signal. b. ENSURE control rod does NOT retract beyond position 48. (ref. SR 3.1.3.4) c. RELEASE ROD MOVEMENT and EMERGENCY ROD IN NOTCH OVERRIDE switches, if used. d. ENSURE control rod settles at position 48 AND rod settle light extinguishes. e. ENSURE control rod reed switch position indicators agree with FULL OUT indication on full core display. 	
	Stops withdrawing control rods when IRM C fails upscale. <i>ROD OUT BLOCK</i>	
	Determines IRM C failed upscale.	

EVENT 1 SHIFT TURNOVER, RAISE REACTOR POWER, IRM C FAILURE

RO

Time	Action	Notes
	Responds and reports applicable alarms for IRM C failing upscale. A-5 1-7 REACTOR AUTO SCRAM SYS A 4-7 NEUT MON SYS TRIP 2-4 IRM UPSCALE 2-2 ROD OUT BLOCK 3-4 IRM A UPSCALE/INOP	
	A-5 IRM A UPSCALE/INOP actions: May Reposition range switch for IRM C to bring indicated power to between 15 and 50 on the 0-125 scale. May verify IRM C Drawer Selector switch (Control Panel H12-P606) is in OPERATE. May notify SRO of Tech Spec applicability	
	May inform SRO IRM C cannot be bypassed and half scram cannot be reset due to IRM A being bypassed.	
	Performs channel check of IRM A for operability. RO DSR Item # 9 (IRM channel check) 2OI-03.2, Definition 5.1.	
	Removes IRM A from Bypass	
	Bypasses IRM C per APP guidance.	
	Resets half scram per APP guidance.	

BOP

Time	Action	Notes
	Monitors reactor plant parameters during evolution.	

EVENT 2 SHIFT STEAM PACKING EXHAUSTERS

Maintenance will contact the control room and request SPEs be swapped due to low oil level in SPE A. Shift SPE IAW 2OP-26.1, Section 8.

Objectives:

SRO

Directs SPE shift A to B.

BOP

Shift SPEs IAW 2OP-26.1, Section 8

Success Path:

SPE B placed in service and SPE A shutdown IAW 2OP-26.1, Section 8.

Simulator Operator Actions:

- ☐ Following half scram reset and by direction of the Lead examiner, Contact the control room as Maintenance and request SPE A be shutdown due to low oil level to prevent equipment failure.
- ☐ As AO, when requested, report MVD-V52 is open,
- ☐ As AO, when requested, report MVD-V51 is closed.
- ☐ When directed by the lead examiner, proceed to the next event.

Required Operator Actions

Normal Operation – Shift SPEs IAW 2OP-26.1.

SRO

Time	Action	Notes
	Direct RO to stop power maneuver and monitor plant while shifting SPEs.	
	Directs BOP to shift SPEs to remove A from service.	
	May direct continuing control rod withdrawal following SPE shift.	

RO

Time	Action	Notes
	Monitors plant while shifting SPEs.	

BOP

Time	Action	Notes
	Communicates maintenance request for shutting down SPE A to SRO.	
	Identifies 2OP-26.1, Section 8.1 (Shifting Steam Packing Exhausters) is required.	

EVENT 2 SHIFT STEAM PACKING EXHAUSTERS

BOP

Time	Action	Notes
	Shifts SPEs	
	Directs AO to OPEN <i>FLOAT TRAP OUTLET VALVE, MVD-V52.</i>	
	Makes plant PA announcement and Starts SPE B	
	Ensures <i>STEAM SEAL SPE 2B MO INLET VLV, OG-MOV-E2</i> , is open.	
	Throttles closed <i>STEAM SEAL SPE 2A MO DISCH VLV, OG-MOV-D1</i> , AND Throttles open <i>STEAM SEAL SPE 2B MO DISCH VLV, OG-MOV-D2</i> , while maintaining <i>GLAND EXHAUST HEADER, OG-PI-EPT-9</i> , located on Panel XU-2, between 10 and 20 inches water vacuum.	
	May get annunciator UA-02 4-5 <i>GLAND SEAL VACUUM LOSS</i> If Gland seal vacuum on OG-PI-EPT9-SPE drops below 5 inches of water.	
	Ensures <i>STEAM SEAL SPE 2A MO DISCH VLV, OG-MOV-D1</i> , is closed.	
	Makes plant PA announcement and Stops SPE A	
	Directs AO to close <i>FLOAT TRAP OUTLET VALVE, MVD-V51</i>	
	Ensures <i>STEAM SEAL SPE 2A MO INLET VALVE, OG-MOV-E1</i> , is closed.	
	Informs SRO SPE shift is complete.	
	Notifies maintenance SPE A is shutdown.	

EVENT 3/4 RAISE REACTOR POWER /STUCK CONTROL ROD

Following SPE shift, control rods will continue to be withdrawn until control rod 26-23 which is stuck at position 12, requires OP-07 actions to move.

Objectives:

SRO

Directs and monitor reactor power ascension with control rods

Direct actions for a stuck control rod.

RO

Withdraw control rods to raise reactor power

Perform 2OP-07 actions for stuck control rod

Monitor plant parameters during power ascension

BOP

Monitor plant parameters during power ascension

Success Path:

Control rod 26-23 withdrawn to position 48 by use of increase drive water DP and double clutch.

Simulator Operator Actions:

- ☐ If contacted as the RE for Control Rod 26-23 stuck, concur with 2OP-07 guidance and double clutch withdrawal if requested.
- ☐ When drive water DP has been raised to 300 psid and RE concurrence, ensure Trigger #2 deletes RD012M when EMERGENCY ROD IN NOTCH OVERRIDE is placed in the EMERGENCY ROD IN position.
- ☐ When directed by the lead examiner, proceed to the next event.

Required Operator Actions

Reactivity Manipulation – Raise reactor power by control rod withdrawal.

Component Failure – Control Rod 26-23 stuck at position 12.

SRO

Time	Action	Notes
	Directs RO to continue to raise reactor power by withdrawing control rods. (Continuous withdrawal allowed).	
	Directs RO to perform 2OP-07.	
	May direct AOP-02 (Control Rod malfunction) – Provides notifying RE and Using 2OP-07 to move rod.	

EVENT 3/4 RAISE REACTOR POWER /STUCK CONTROL ROD

SRO

Time	Action	Notes
	<p>May evaluate Tech Spec 3.1.3 Control Rod Operability</p> <p>Condition A. One withdrawn control rod stuck</p> <p>Required Action A.1 Verify stuck control rod separation criteria are met (Immediately)</p> <p>AND</p> <p>Required Action A.2 Disarm the associated control rod drive (CRD). (2 hours)</p> <p>AND</p> <p>Required Action A.4 Perform SR 3.1.1.1.(72 hours)</p>	
	<p>May evaluate TS 3.1.3, Control Rod Operability, AND 3.3.2.1, Control Rod Block Instrumentation before performing procedure.</p> <p>Should not declare control rod stuck until actions of 2OP-07 have been attempted.</p> <p>Separation criteria is met (no identified slow rods)</p>	
	Obtains RE concurrence for double clutching control rod with elevated drive water DP.	

RO

Time	Action	Notes
	Continues rod withdrawal per GP-10 IAW guidance of OI-01.02 and 2OP-07.	
	Report A-6 2-7 <i>APRM DOWNSCALE</i> annunciator clears.	
	Recognizes control rod 26-23 is stuck.	
	Notifies SRO control rod 26-23 is stuck.	
	Identifies 2OP-07, Reactor Manual Control System Operating Procedure, Section 8.2 (Control Rod Difficult to Withdraw, Control Rod NOT at Position 00) is required.	

EVENT 3/4 RAISE REACTOR POWER /STUCK CONTROL ROD

RO

Time	Action	Notes
	Notifies SRO to consult TS 3.1.3 & 3.3.2.1.	
	Verifies no Rod Blocks.	
	Raises drive water DP to 300 psid. May use 2OP-08, Section 8.29 (Adjusting CRDHS Parameters) Maintains CRD flow rate 30 to 60 gpm <ul style="list-style-type: none">• May raise CRD flow and/or throttle closed DRIVE PRESSURE VLV, C12-PCV-F003	
	Attempts to withdraw control rod 26-23 Normal withdraw attempts may be repeated at elevated drive water DP.	
	Notifies SRO double clutching is required.	
	Verifies RE concurrence.	
	Momentarily places EMERGENCY ROD IN NOTCH OVERRIDE in EMERGENCY ROD IN.	Deletes malfunction Trigger #2
	Simultaneously places EMERGENCY ROD IN NOTCH OVERRIDE in OVERRIDE AND ROD MOVEMENT in NOTCH OUT.	
	Recognizes control rod withdraw and stops to return drive water DP back to normal (260 – 275 psid)	
	Once fully withdrawn, control rod is inserted to 46 and withdrawn to 48 under normal drive water DP.	
	Performs coupling check following fully withdrawing control rod to position 48.	

BOP

Time	Action	Notes
	Monitors plant while control rods are being withdrawn.	

EVENT 5 HCU 30-07 ACCUMULATOR LOW PRESSURE

When directed by Lead examiner, HCU 30-07 accumulator light and annunciator will alarm. AO will be dispatched to investigate and determine accumulator alarm is due to low pressure and requires charging. TS 3.1.5 evaluation will be required.

Objectives:

SRO

Direct actions for inoperable CRD accumulator.
Address TS 3.1.5

RO/BOP

Perform actions for HCU accumulator alarm

Success Path:

Technical Specification / TRM

- 3.1.5 Control Rod Scram Accumulators
Determines Condition C. One or more control rod scram accumulators inoperable with reactor steam dome pressure < 950 psig.
Required Action C.1 Verify all control rods associated with inoperable accumulators are fully inserted Immediately.
AND
C.2 Declare the associated control rod inoperable within 1 hour.

Simulator Operator Actions:

- ☐ When directed by the Lead examiner, activate Trigger #3 to cause accumulator alarm and annunciator for HCU 30-07.
- ☐ If contacted as AO to investigate, acknowledge request, wait 2 minutes and report the red indication light is ON for the affected HCU 30-07 at the local panel.
- ☐ When directed by to depress the red light, report light stays lit and accumulator pressure is at 930 psig.
- ☐ After Tech Spec declaration is made, delete CRD ACCUM LO PRESS/HI LEVEL (ZA761) and ACCUM-ROD DISPLAY (Q2BXPUD) and report HCU 30-07 has been re-charged with final accumulator pressure equal to 1140 psig.
- ☐ When directed by the lead examiner, proceed to the next event.

Required Operator Actions

Component Failure – HCU accumulator low pressure
Technical Specification – 3.1.5

SRO

Time	Action	Notes
	Directs APP actions	
	Direct contingency plans to monitor the other accumulator alarms due to masking.	
	Directs charging the accumulator per 2OP-08.	

EVENT 5 HCU 30-07 ACCUMULATOR LOW PRESSURE**SRO**

Time	Action	Notes
	Determines TS 3.1.5 applicability	
	Determines Condition C. One or more control rod scram accumulators inoperable with reactor steam dome pressure < 950 psig. Required Action C.1 Verify all control rods associated with inoperable accumulators are fully inserted Immediately. AND C.2 Declare the associated control rod inoperable within 1 hour.	

RO

Time	Action	Notes
	Acknowledges and reports to SRO annunciator A-7 6-1 CRD ACCUM LO PRESS/HI LEVEL	
	Directs AO to investigate.	
	Directs AO to determine if alarm is due to low pressure or high water level in the HCU by depressing the lighted indication on the local HCU panel and observing the status of the light (light out indicates water).	
	Directs charging the accumulator per 2OP-08	
	Reports to SRO annunciator A-7 6-1 CRD ACCUM LO PRESS/HI LEVEL is clear.	

BOP

Time	Action	Notes
	Monitors plant	

EVENT 6/7 MSIV CLOSURE, REACTOR SCRAM, SRV F FAILS OPEN

When HCU 30-07 accumulator is re-pressurized and TS addressed, a spurious Group 1 isolation (MSIV closure) causes reactor pressure and power rise. Manual SRV opening or Scram may be performed. HPCI and/or RCIC may be manually started to control RPV water level due to loss of RFPTs.

Objectives:

SRO

Direct manual scram and pressure control
Directs entry to AOP-14
Enters RSP, RVCP, PCCP

RO/BOP

Diagnose loss of pressure control
Diagnose SRV F failing open
Perform SCRAM actions
Control reactor parameters post SCRAM

Success Path:

Manual reactor scram inserted with pressure being controlled

Simulator Operator Actions:

- ☐ When HCU 30-07 accumulator is re-pressurized and TS addressed and by direction of the Lead examiner, activate Trigger 5.
- ☐ If contacted as I&C to investigate MSIV closure, Acknowledge request.
- ☐ Ensure Trigger 6 automatically actuates 2 minutes after MSIV closure.
- ☐ If contacted as Ops Center SRO to pull fuses for SRV F, acknowledge request and activate Trigger 11 one minute later and report fuses pulled.
- ☐ If contacted as I&C to investigate SRV F opening, Acknowledge request.

Required Operator Actions

Major – Reactor scram
Component Failure – SRV F fails open

SRO

Time	Action	Notes
	Direct manual scram insertion.	
	Direct manual pressure control.	
	Enters and directs EOP-01-RSP	
	Determines entry into EOP-01-RVCP is required	
	Directs AOP-30 entry	
	Directs LEP-02 to reset scram.	

EVENT 6/7 MSIV CLOSURE, REACTOR SCRAM, SRV F FAILS OPEN**SRO**

Time	Action	Notes
	Directs verification : <ul style="list-style-type: none">• Group Isolations• ECCS Initiations• Diesel Generator Auto Starts	
	Directs restoring and maintaining reactor water level between +170 and +200 inches with one or more of the systems listed in Table 1 <ul style="list-style-type: none">• CRD (SEP-09)• RCIC	
	Directs AOP-14 on rising Suppression Pool temperature.	
	Direct RHR be placed in suppression pool cooling	
	Directs starting RCIC to maintain level	
	May direct starting HPCI to maintain level	
	May direct utilizing SLC aligned to Demin Water (LEP-01).	

RO

Time	Action	Notes
	Inserts a manual scram as directed by SRO	
	Performs scram immediate actions: <ol style="list-style-type: none">1. Unit 2 Only: After steam flow is less than 3×10^6 lb/hr, PLACE the reactor mode switch to SHUTDOWN.2. IF reactor power is below 2% (APRM downscale trip), THEN TRIP the main turbine.3. ENSURE the master reactor level controller setpoint is +170".4. IF two reactor feed pumps are running, and reactor vessel level is above +160" and rising, then trip one.	
	Reports Scram immediate actions complete All rods in, Mode Switch in shutdown	

EVENT 6/7 MSIV CLOSURE, REACTOR SCRAM, SRV F FAILS OPEN**RO**

Time	Action	Notes
	Maintains RPV level 170-200" Reports when out of band and actions to address recovery.	
	Diagnoses loss of Feedwater flow to RPV	
	Recognize SRV F failed opened.	
	Enter and announce AOP-30.0	
	Performs AOP-30 immediate actions: 1. Cycles the control switch of the affected safety/relief valve to OPEN and CLOSE OR OPEN and AUTO several times. 2. Ensures the affected safety/relief valve control switch is left in CLOSE OR AUTO. 3. Contacts Ops Center SRO to pull fuses for SRV F IAW 0AOP-30, Attachment 1	
	Recognizes SRV control power fuses pulled (no position indication and <i>AUTO DEPRESS CONTROL PWR FAILURE</i>)	
	Manually starts RCIC to maintain RPV level	
	May perform SEP-09, CRD Flow Maximization with procedure or Hardcard.	
	May start HPCI to maintain level or pressure.	

BOP

Time	Action	Notes
	Diagnoses loss of Feedwater flow to RPV	
	Announces Unit Two reactor scram	

EVENT 6/7 MSIV CLOSURE, REACTOR SCRAM, SRV F FAILS OPEN

BOP

Time	Action	Notes
	May perform SCRAM Hardcard actions. 1. Ensure Scram Valves Are Open By Manual Scram or ARI Initiation 2. Control Reactor Pressure Between 800 and 1000 psig 3. Control Reactor Water Level Between +170 and +200 Inches 4. Place SULCV in Service 5. Insert Nuclear Instrumentation 6. Ensure Turbine Oil System Operating	
	Enter and announce AOP-14.0	
	Place RHR in suppression pool cooling	

EVENT 8/9/10 SRV TAIL PIPE RUPTURE, SPRAY FAILURES

With SRV F failed open and reactor pressure approaching 700psig, the tail pipe will rupture causing direct pressurization of the Suppression Pool air space (loss of PSP). Suppression chamber and drywell pressure rapidly rise. Suppression chamber pressure leads drywell pressure and torus-drywell vacuum breakers lifting indicate broken SRV tailpipe

When containment spray is attempted with the A RHR Loop, the Spray logic will fail to actuate, making sprays unavailable. Emergency depressurization will be required due to pressure suppression pressure limit. Logic will be available following ED.

When containment spray is attempted with the B RHR Loop, the E11-F028B will trip on thermal overload. RHR Loop B will be the only loop available to provide DW Spray IAW SEP-02. Emergency depressurization will be required due to pressure suppression pressure limit. Valve will be available following ED.

Objectives:

SRO

Direct entry into PCCP

Direct Emergency Depressurization when loss of PSP is recognized.

RO/BOP

Diagnose and report rapidly rising containment pressures

Determine leak is in suppression chamber based on higher suppression chamber pressure

Attempt to initiate spray per SEP-02 and/or SEP-03

Diagnose and report failure of Loop B spray logic

Success Path:

Emergency depressurize the RPV and restore RPV water level followed by aligning RHR for SP Spray.

Simulator Operator Actions:

- ☐ Monitor RPV pressure and ensure Trigger 7 activates when RPV pressure drops below 700 psig.
- ☐ If contacted as I&C for RHR A Spray logic failure, acknowledge request.
- ☐ If contacted as I&C for RHR B E11-F028B overload, acknowledge request.
- ☐ If contacted as AO for RHR B E11-F028B overload, acknowledge and request breaker location MCC (2XB-2)

Required Operator Actions

Component Failure – SRV F tailpipe failure

Major – Emergency Depressurize the RPV

SRO

Time	Action	Notes
	Enters and Directs PCCP	
	Directs SP Spray IAW SEP-03 before Suppression Chamber pressure reaches 11.5 psig	

EVENT 8/9/10 SRV TAIL PIPE RUPTURE, SPRAY FAILURES

SRO

Time	Action	Notes
	Directs DW Spray IAW SEP-02 when Suppression Chamber exceeds 11.5 psig	
	Determine leak is in suppression chamber based on higher suppression chamber pressure	
	Directs I&C for RHR A Spray logic failure.	
	Directs I&C for RHR E11-F028B failure	
	When PSPL exceeded, determine emergency depressurization is required	
	Directs Emergency Depressurization	

RO/BOP

Time	Action	Notes
	Diagnose and report rising containment pressures.	
	Diagnose SRV F tailpipe rupture <ul style="list-style-type: none"> • SP to DW vacuum breakers open • SP pressure > DW pressure 	
	Place RHR Loop A into suppression pool cooling. <ul style="list-style-type: none"> • Open SW-V101 • Close SW-V143 • If LOCA signal is present place RHR SW Booster Pumps A & C LOCA override switch to manual override • Start RHRSW Pump • Adjust E11-PDV-F068A (1 pump 2000 - 4000 gpm) (2 pumps 5000 - 8000 gpm) • Supply Clg Wtr to Vital Hdr • Verify spray logic is made up • Start Loop A RHR Pmp • Open E11-F028A • Throttle E11-F024A (1 pump 6000 - 10000 gpm) (2 pumps 6000 - 11500 gpm) • Throttle E11-F048A 	RHR Loop A remains available for SPC only until a LOCA signal is recieved.

EVENT 8/9/10 SRV TAIL PIPE RUPTURE, SPRAY FAILURES

RO/BOP

Time	Action	Notes
	Diagnose and report RHR Loop A Spray Logic failure	
	<p>Initiate suppression chamber spray per SEP-03.</p> <ul style="list-style-type: none">• If necessary, then place Loop B 2/3 CORE HEIGHT LPCI INITIATION OVERRIDE SWITCH, E11-CS-S18B, in Manual Overrd.• If the CTMT SPR OVRD light for the Loop B CONTAINMENT SPRAY VALVE CONTROL SWITCH, E11-CS-S17B is not on, then momentarily place Loop B CONTAINMENT SPRAY VALVE CONTROL SWITCH, E11-CS-S17B, to Manual• Ensure at least one RHR Loop B Pump is operating• Ensure TORUS DISCHARGE ISOL VLV, E11-F028B, is open• Open TORUS SPRAY ISOL VLV, E11-F027B.	
	Diagnose and report RHR Loop B E11-F028B overload.	
	Dispatch AO to RB MCC 2XB-2 to attempt thermal reset for E11-F028B overload.	
	Report RHR Loop B is only available for DW Spray operation.	

EVENT 8/9/10 SRV TAIL PIPE RUPTURE, SPRAY FAILURES

RO/BOP

	<p>Initiate Drywell Spray per SEP-02</p> <ul style="list-style-type: none">• Ensure WELL WATER TO VITAL HEADER VLV, SW-V141, is closed• Ensure both reactor recirculation pumps are tripped• Place all drywell cooler control switches to OFF (L/O)• Request Drywell Cooler override switches to STOP.• Confirms the following:<ul style="list-style-type: none">▪ Drywell pressure and drywell temperature are in the "SAFE" region of the DSIL graph.▪ Suppression pool water level is below +21 inches.• Open Loop B DRYWELL SPRAY INBD ISOL VLV, E11-F021B• Throttle open Loop B DRYWELL SPRAY OTBD ISOL VLV, E11-F016B, to obtain between 8,000-10,000 gpm flow	
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EVENT 11 EMERGENCY DEPRESSURIZATION, CONTAINMENT SPRAY

Once the reactor is depressurized and DW & SP Sprays are in service, with RPV water level being maintained in the normal band, the scenario may be terminated.

Objectives:

SCO

Directs actions Emergency Depressurization and restoration of reactor water level.
Direct drywell and torus spray per SEP-02 and SEP-03 following level restoration.

RO/BOP

Performs actions for emergency Depressurization and restoration of reactor water level.
Places RHR Loop A in Suppression Chamber and DW spray

Success Path:

Restore reactor water level to 170-200 inches.
RHR Loop has been placed in SP & DW Sprays

Simulator Operator Actions:

Instructor Activities

- ☐ Following emergency depressurization actions and by direction of the Lead examiner, DELETE K1227A overrides and contact the control room as I&C to report RHR A Spray logic has been repaired.
- ☐ Following emergency depressurization actions and by direction of the Lead examiner, DELETE Q1717LGN, RRN, & ZA358 overrides and report as AO the thermal overload has been reset for the E11-F028B.
- ☐ When RPV level is being controlled above 170" with DW & SP spray in service, the scenario may be terminated
- ☐ When directed by the lead evaluator, place the simulator in FREEZE.

Required Operator Actions

Emergency Depressurize the RPV

Restore and maintain RPV level above LL4

SRO

Time	Action	Notes
	Determine Emergency Depressurization is required.	
	Direct placing 7 ADS valve switches to open.	
	Direct RPV level be restored and maintained +170-200 inches	
	Evaluate level instruments IAW Caution 1.	

EVENT 11 EMERGENCY DEPRESSURIZATION, CONTAINMENT SPRAY

SRO

Time	Action	Notes
	Directs controlling condensate injection when RPV pressure is less than 440 psig.	
	Directs controlling Low Pressure ECCS injection when RPV pressure is less than 400 psig	
	Directs DW and SP spray when level is being controlled.	

RO / BOP

Time	Action	Notes
	Places 7 ADS valve control switches	
	<i>Operates LP ECCS to restore and maintain RPV level 170-200 inches.</i>	
	Re-align RHR for LPCI injection. Ensures Drywell Sprays / SP Sprays / Torus Cooling removed from service Low Pressure ECCS systems may be overridden to prevent uncontrolled injection.	

Termination Cue

When RPV water level is being maintained above 170 inches with a Loop of RHR spraying the DW and Suppression Pool, by direction of the Lead examiner, the scenario may be terminated.

Simulator Operator Activities:

WHEN directed by the lead examiner, place the simulator in **FREEZE**.

CAUTION

**DO NOT RESET THE SIMULATOR PRIOR TO RECEIPT
OF CONCURRENCE TO DO SO FROM THE LEAD
EXAMINER**

ATTACHMENT 5
Page 1 of 1
Neutron Monitoring Spiking Troubleshooting Form

R
Reference
Use

1. Initiator's name Unit Two SRO

2. Check all instruments that are spiking and the associated Unit:

- | | | | |
|--|--------------------------------|---|--------------------------------|
| <input type="checkbox"/> Unit 1 | <input type="checkbox"/> SRM A | <input checked="" type="checkbox"/> IRM A | <input type="checkbox"/> IRM E |
| <input checked="" type="checkbox"/> Unit 2 | <input type="checkbox"/> SRM B | <input type="checkbox"/> IRM B | <input type="checkbox"/> IRM F |
| | <input type="checkbox"/> SRM C | <input type="checkbox"/> IRM C | <input type="checkbox"/> IRM G |
| | <input type="checkbox"/> SRM D | <input type="checkbox"/> IRM D | <input type="checkbox"/> IRM H |

3. Time and date of event Today - Previous Shift

4. What is the duration of the spiking (duration of individual spike)? Add additional information below to characterize spiking event.

- ☐ Seconds ☒ Minutes ☐ Hours

5. Ensure all required observations to support operability are appropriately documented.

- | | | |
|--|---|--|
| 6. Has a WO or AR been initiated?
If yes, list number(s): <u>00345765</u> | <input checked="" type="checkbox"/> Yes | <input type="checkbox"/> No |
| 7. Has a log entry been made? | <input checked="" type="checkbox"/> Yes | <input type="checkbox"/> No |
| 8. Is there any welding occurring in the plant? | <input checked="" type="checkbox"/> Yes | <input type="checkbox"/> No |
| 9. Are there any personnel under-vessel? | <input type="checkbox"/> Yes | <input checked="" type="checkbox"/> No |
| 10. Are there any plant evolutions in progress? | <input checked="" type="checkbox"/> Yes | <input type="checkbox"/> No |
| 11. Is there any electrical switching occurring? | <input type="checkbox"/> Yes | <input checked="" type="checkbox"/> No |
| 12. Are any control rods being moved or selected? | <input checked="" type="checkbox"/> Yes | <input type="checkbox"/> No |
| 13. Has there been a recent change in the mode switch? | <input type="checkbox"/> Yes | <input checked="" type="checkbox"/> No |
| 14. Is there any major equipment being started? | <input checked="" type="checkbox"/> Yes | <input type="checkbox"/> No |
| 15. Has there been any observed relay chatter? | <input type="checkbox"/> Yes | <input checked="" type="checkbox"/> No |
| 16. Is there any refuel bridge movement? | <input type="checkbox"/> Yes | <input checked="" type="checkbox"/> No |
| 17. Are the rod interlocks being affected? | <input checked="" type="checkbox"/> Yes | <input type="checkbox"/> No |
| 18. Completed copy of this attachment sent to engineer | <input checked="" type="checkbox"/> Yes | <input type="checkbox"/> No |

Please note below any additional information that may aid troubleshooting (such as 2 instruments spiking but not in the same manner):

Multiple upscale and downscale alarms during startup over a 15 minute period. All other IRMs responded normally.

**PROGRESS ENERGY CAROLINAS
BRUNSWICK TRAINING SECTION**

SIMULATOR EXAM SCENARIO

2010-1 NRC Exam Scenario #5

Facility: BrunswickScenario No.: 2010-1 #5Op-Test No.: DraftExaminers: _____

_____Operators: _____

Initial Conditions: The unit is operating at approximately 92%, end of cycle. Coast-down is in progress. FFTR has not been implemented. RCC Pump 2B is under clearance. APRM 2 is failed low and bypassed.

Turnover: Maintain maximum power for current plant conditions.

Event No.	Malf. No.	Event Type*	Event Description
1	1	C-BOP C-SRO	NSW pump trip w/failure of standby (AOP)(TS)
2	2	C-RO C-SRO	SLC Continuity Failure (TS)
3	NA	N-BOP N-SRO	Oil leak develops on RFP A. Oil tank low level alarms. RFP A removed from service.
3 (Con't)	NA	R-RO R-SRO	Power reduction to shutdown RFP.
4	3	C-RO C-SRO	Recirc MG Set cooling loss. Fails to trip on high oil temp requiring manual trip. Operation in SAR requires exit (AOP)(TS)
5	4	C-BOP C-SRO	Sub E7 trips on fault resulting in total loss of RCC. Actions for total RCC loss including manual scram. (AOP)
5 (Con't)	5	N/A	Several control rods fail to fully insert on the scram and must be manually inserted
6	NA	M-All	Small steam leak in the drywell, rising drywell temp & press (already elevated due to loss of RCC)
7	6	C-RO C-SRO	Drywell spray on RHR Loop B fails to function (Loop A spray not available due to E7 loss). Drywell temp exceeds 300°F

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

SCENARIO DESCRIPTION

The plant is operating at $\approx 92\%$ power end of cycle (coast-down in progress). RCC Pump 2B is under clearance and APRM 2 is bypassed. NSW Pump 2B shaft will seize and 2A NSW pump will fail to auto start.

After the pumps have been shifted, the continuity light bulb will blow on the A squib Valve. With the monitoring system inoperative the system is inoperative, so declaration of TS 3.1.7 would be declared. The light bulb is replaced and the TS can be exited.

After the SLC failure, an oil leak will develop on RFP 2A oil system. A low level alarm will be received. The crew should reduce power and shutdown RFP 2A. The pump will trip in ≈ 20 minutes if still running.

After RFP 2A has been shutdown, the temperature controller for Recirc MG Set 2A will fail closed. Oil temperature will rise causing an alarm, then a trip condition. The Recirc MG Set will fail to auto trip and must be manually tripped. The flow reduction will place the plant in the Scram Avoidance Region of the Power/Flow map, requiring immediate exit by control rod insertion or raising flow (not to exceed SLO limits).

Substation E7 trips on fault resulting in loss of all associated loads. RCC Pumps 2A and 2C are lost resulting in complete loss of RBCCW and drywell cooling. This condition requires a manual reactor scram and securing RCC system loads (RWCU, Recirc Pumps, CRD Pumps).

Several control rods fail to insert fully on the scram and must be inserted per LEP-02. CRD Pumps should be left running until rods are inserted. 120 VAC power panel 2AB must be transferred to alternate E8 power for rod insertion.

The loss of drywell cooling will result in rising drywell temperature and pressure. Drywell pressure will exceed 1.7 psig requiring entry into PCCP and RVCP (or LPC until rods are inserted).

A small steam leak will develop in the drywell. Drywell temperature and pressure rises at a faster rate requiring initiation of drywell sprays. RHR Loop 2A is unavailable for spray due to loss of E7 (valve power). When RHR 2B is placed in drywell spray, the outboard spray valve (F016B) will fail. With no spray available, drywell temperature will exceed 300°F (cannot be restored and maintained below) requiring emergency depressurization.

During the depressurization, low pressure injection systems (RHR, Core Spray and Condensate) must be operated to prevent uncontrolled injection.

When emergency depressurization actions have been performed, the scenario may be terminated.

OBJECTIVES

SRO

341219B102, Direct Actions To Lower Reactor Power From Rated to 55% Including Removal Of One Feed Pump From Service Per GP-05 & GP-12

344209B402, Direct Shift Response To Recirculation Pump Trip Per AOP-04.0

344219B402, Direct Shift Response To RBCCW Failure Per AOP-16.0

344237B402, Direct Actions For A Loss of Any 4KV Buses or 480V E Buses Per AOP-36.1

344214B502, Direct Actions To Control Primary Containment Pressure Per EOP-02-PCCP

344215B502, Direct Actions To Control Primary Containment Temperature Per EOP-02-PCCP

344220B502, Direct Actions To Emergency Depressurize The RPV Per EOP-01-RVCP

RO

202202B101, Decrease Reactor Recirculation Pump Speed/Reactor Power Using The Manual Control Station Per OP-02

259204B101, Secure The First Reactor Feed Pump Per OP-32

202017B401, Respond To Recirc Pump Trip(s) Per AOP-04.0

208011B401, Respond To A RBCCW System Failure Per AOP-16

262005B401, Respond To A Loss Of 4160 VAC or 480 VAC Emergency Bus(es) Per AOP-36.1

201041B501, Insert Control Rods With Reactor Manual Control System Per EOP-01-LEP-02

200049B501, Spray The Drywell Per EOP-01-SEP-02

SIMULATOR SETUP

Initial Conditions

IC-25

Event Triggers

Event	Trigger Description
1	Manually Initiated (NSW Pump Trip)
2	Manually Initiated (SLC Continuity Alarm)
3	Manually Initiated (RFP A Oil Leak)
4	Manually Initiated (Recirc MG Set Loss Cooling)
5	Manually Initiated (Sub E7 Trips)
6	Auto Initiated (ZA624 = TRUE, Fluid Drive A Scoop Tube Lock alarm)
7	Manually initiated (Steam Leak in Drywell)
8	Auto Initiated (K1J36EEN[OPEN] = TRUE, E11-F016B Control Switch Open)

Malfunctions

Event	System	Tag	Title	Value (Ramp)	Activate Time	Deactivate Time
A	RC	RC028F	Recirc A Auto Trip Fail	NA	0 SEC	NA
A	NI	NI032F	APRM 2 Fails Low	NA	0 SEC	NA
1	CW	CW023F	NSW Pmp Shaft Seizure (B)	NA	0 Sec	NA
8	CF	CF027F	RFP 2A Lube Oil Leak	NA	30 MIN	NA
4	RC	RC017F	Recirc MG A Cool Wtr Loss	NA	0 SEC	NA
5	DG	DG015F	Loss Of Sub E7	NA	0 SEC	NA
6	NB	NB006F	MSL Break	2% 10 MIN	0 SEC	NA
A	RP	RP008F	ATWS #1	NA	0 SEC	NA

Switches

Event	Panel	Tag	Title	Value (Ramp)	Activate Time	Deactivate Time
A	XU-2	K4520A	NSW Pump A	Man	0 SEC	NA
A	XU-2		RCC Pump B	Off	0 SEC	NA

Lamps

Event	Panel	Tag	Title	Value (Ramp)	Activate Time	Deactivate Time
A	P601	Q1J36LGN	E11-F016B Green	ON	0 SEC	NA
2	P603	Q2201LOA	A Squib Valve Ready	Off	0 SEC	NA
A	XU-2	Q4521RR4	2B RCC Pump Green	Off	0 SEC	NA

Alarms

Event	Panel	Tag	Title	Value (Ramp)	Activate Time	Deactivate Time
3	XU-2	ZUA442	RFP A Oil Level Hi/Low	ON	0 SEC	NA
7	P603	ZA623	Recirc MG A Drive Trip	ON	0 SEC	NA
9	P601	ZA358	RHR B Vlv Mtr Overload	ON	0 SEC	NA
2	P603	ZA445	Squib Valve Cont Loss			

Remote Functions

Event	System	Tag	Title	Status	Activate
A	RH	ZVRH16BT	E11-F016B	OFF	0 SEC
11	ED	ZEIDH08, HX0, H11	Transfers AB Panels to Alternate (2AB-RX, 2AB, 32AB)	Alt	0 Sec
12	RP	IBZNORM IAEPAALT	RPS to Alternate EPA Breakers Set	Alt Set	0 Sec 10 Sec

Special Instructions

Ensure Exam In Progress Stop Signs posted at all simulator entrances.

Advance all chart recorders to indicate steady state conditions.

Place all SPDS displays to the Critical Plant Variable display (#100).

Ensure appropriate keys have blanks in switches.

Exit shutdown screen on RWM and place the RWM key in the key locker.

Reset alarms on SJAE, MSL, and RWM NUMACs.

Ensure reference material is in appropriate location.

Verify any log books have blank sheets only and procedures are not marked.

Bypass APRM 2 and place EC tag on bypass switch.

Place a red cap on 2B RCC pump.

Load malfunctions/overrides or scenario file if available.

Ensure ENP-24 for IC-25 @ P603.

SHIFT BRIEFING

Plant Status

The plant is operating at $\approx 92\%$ power. End of cycle coast-down is in progress. Final Feedwater temperature reduction per GP-13 has not been implemented.

Equipment Out Of Service

APRM Channel 2 is failed downscale and bypassed. I&C is investigating the cause of the failure.

2B RCC Pump is under clearance due to high vibrations. Return to service expected in 8 hours.

No other equipment is out of service.

Plan of the Day

Maintain maximum achievable power.

No other activities are scheduled for this shift.

SCENARIO TRAINING INFORMATION

Instructor Notes

This guide is designed to meet the requirements of an examination scenario for Initial License as outlined in NUREG-1021 (Draft Rev 9), ES-301 and Appendix D.

During the execution of this scenario, the students should be rated on the performance of the objectives, compliance with general simulator performance standards, and for overall team skills in accordance with TAP-409 and NUREG-1021, ES-303.

Common Student Problems/Errors

None noted to date.

Simulator Deficiencies

There are no known simulator deficiencies applicable to this scenario.

Critical Tasks

Insert control rods per LEP-02.

Depressurize the reactor when drywell average air temperature cannot be restored and maintained below 300°F by performing or anticipating emergency depressurization.

Reason For Revision

New scenario.

EVENT 1 SHIFT TURNOVER, NSW PUMP TRIP

The crew will complete shift turnover and a NSW pump will trip and the standby will fail to start. The standby can be manually started.

Malfunctions required: Shaft Seizure for B NSW pump and auto start failure of A NSW pump.

Objectives:

SCO - Directs standby NSW pump to be started.

BOP – Start standby NSW Pump.

Success Path:

Standby NSW Pump is started and pressure is returned to normal.

Simulator Operator Actions:

- ☐ When directed by the lead examiner, initiate **Trigger 1**, to fail B NSW pump.
- ☐ If contacted as AO to perform pre-start checks for the A NSW Pump, report pre-start checks are completed.
- ☐ If contacted as Unit One, report one of the NSW pumps are inoperable.
- ☐ Acknowledge the request for IC to investigate the trip of B NSW Pump.
- ☐ When directed by the lead examiner, proceed to the next event.

Required Operator Actions

Component – Start standby NSW pump.

TS 3.7.2 – Condition B, With One required NSW pump inoperable for reasons other than Condition A, Restore required NSW pump to OPERABLE status in 7 days.

SRO

Time	Action	Notes
	Direct entry into 0AOP-18.0, NSW System Failures.	
	Direct start of standby NSW Pump	
	Makes TS determination. TS 3.7.2 – <u>Condition B</u> , With One required NSW pump inoperable for reasons other than Condition A, Restore required NSW pump to OPERABLE status in 7 days	From the Bases: The SW System is considered operable when it has two operable CSW pumps (specifically the CSW 2A and CSW 2C pumps), three site NSW pumps (any combination of Unit 1 and Unit 2 NSW pumps), and an operable flow path capable of taking suction from the intake structure and transferring the water to the ECCS equipment and the DGs.

EVENT 1 (Cont'd) SHIFT TURNOVER, NSW PUMP TRIP

RO

Time	Action	Notes
	Plant Monitoring	

BOP

Time	Action	Notes
	<p>Announce and enter 0AOP-18.0</p> <p>Announce UA-01 annunciators, 1-10, <i>NUCLEAR HDR SERV WTR PRESS-LOW.</i> 4-10, <i>NUCLEAR HDR SW PUMP B TRIP</i></p> <p>Announce UA-18 annunciator 6-1, <i>BUS E4 4KV MOTOR OVLD</i></p> <p>Start Standby NSW Pump as directed by either the APP or the AOP when system pressure is <40#.</p>	

EVENT 2 SLC SQUIB VALVE LIGHT BULB FAILURE

The crew will respond to the loss of the 2B SLC pump and make the TS declaration.

Malfunctions required: 2A SLC Squib Valve Continuity Light to off and Annunciator A-04 4-5, *SQUIB VALVE CONTINUITY LOSS*.

Objectives:

SCO – Determines applicable TS.

Success Path:

TS 3.1.7 determination.

Simulator Operator Actions:

- ☐ When directed by the lead examiner, initiate **Trigger 2**, to extinguish the A Squib Valve Continuity light and activate Annunciator A-04 4-5.
- ☐ If contacted as AO to check the SLC Circuit Supply Breaker, Circuit 12 on Emergency 120V AC Distribution Panel 2AB, report that it looks normal.
- ☐ If asked for indications on the back panels report that on P624 SLC Explosive Squib Valve Continuity Meter, C41-M600A, is reading 0 milliamps and SLC Explosive Squib Valve C41-F004A continuity light is off.
- ☐ If requested for IC to investigate circuit, wait until TS call has been made then report SLC Explosive Squib Valve C41-F004A continuity light bulb on the P624 panel is burnt out.
- ☐ **When** requested to replace the SLC Explosive Squib Valve C41-F004A continuity light bulb on the P624 panel **then delete** override for the light (Q2201LOA) and the Annunciator (ZA445).
- ☐ When directed by the lead examiner, proceed to the next event.

Required Operator Actions

TS determination – 3.1.7, Condition A, Restore SLC to operable status in 7 days.

SRO

Time	Action	Notes
	Determines TS declaration for the time that the light bulb is blown: <u>TS 3.1.7 Condition A</u> Restore SLC to operable status in 7 days	

EVENT 2 (cont'd) SLC SQUIB VALVE LIGHT BULB FAILURE

RO

Time	Action	Notes
	<p>Respond to Annunciator A-04 4-5, <i>SQUIB VALVE CONTINUITY LOSS</i></p> <p>May dispatch AO to investigate SLC Circuit Supply Breaker, Circuit 12 on Emergency 120V AC Distribution Panel 2AB.</p> <p>Request that the light bulb for A Squib Valve Continuity Light is changed.</p>	

BOP

Time	Action	Notes
	Plant Monitor	

EVENT 3 REACTOR FEED PUMP OIL LEAK

An oil leak will develop on RFP 2A oil system. A low level alarm will be received. The crew should reduce power and shutdown RFP 2A. The pump will trip in ≈20 minutes if still running.

Malfunctions required: *RFP A OIL LEVEL HI/LOW* Annunciator and RFP 2A Lube Oil Leak

Objectives:

SCO – Determines that 2A RFP needs to be shutdown and directs power to support securing 2A RFP.

RO - Lower power to be able to remove 2A RFP.

BOP - Removes the 2A RFP from Service

Success Path:

2A RFP removed from service.

Simulator Operator Actions:

- ☐ When directed by the lead examiner, initiate **Trigger 3**, to activate *RFP A OIL LEVEL HI/LOW* Annunciator.
- ☐ After power has been reduced and level has been raised to 190 inches, initiate **Trigger 8** to activate the RFP oil leak.
- ☐ If contacted as AO report oil tank level is low. Report an oil leak on RFP A. Report the leak appears to be unisolable.
- ☐ When contacted as maintenance, report that the RFP must be shutdown in an expeditiously (per the procedure) and due to the leak location the AC oil pumps must be shutdown. The DC pump only can be operated.
- ☐ If contacted as the Load Dispatcher acknowledge the power reduction.
- ☐ If contacted as the NE recommend to lower power per 0ENP-24.5 and thermal limits will be monitored via the computer.
- ☐ If requested to de-energize seal water solenoids for RFP 2A, report circuits are off (2C-TB1, circuits 8 & 24).
- ☐ If asked and the DC oil pump is the only running pump (AC Pumps are shutdown), report as AO the oil leak has stopped
- ☐ When directed by the lead examiner, proceed to the next event.

Required Operator Actions

Reactivity Manipulation - to 60-65% power

Normal Operation - Shutdown 2A RFP.

SRO

Time	Action	Notes
	Direct power reduction per 0ENP-24.5 and GP-12 to shutdown RFP A (60-65%).	
	Direct RFP A to be removed from service per 2OP-32.	
	May direct RFP A oil pumps (AC) secured.	

RO

Time	Action	Notes
	Reduce power per 0ENP-24.5 as directed by the SCO.	
	Lower flow on one RR Pump (~2%) at a time to stay within mismatch criteria (7.5×10^6 Mlbs jet pump flow if < than 58 Mlbs or 3.5×10^6 Mlbs if > than 58 Mlbs).	
	Continues alternating Recirc pump decreases until core flow is ~43 Mlbs.	
	Inserts control rods using ENP-24.5 to get to 60-65% power.	
	Turns control rod power on.	
	Selects control rods in the sequence prescribed on the 0ENP-24.5 sheets. 14-27, 38-27, 26-39, 26-15, and maybe 26-27.	
	Continuously drives selected rod in using RMCS.	

EVENT 3 (Cont'd) REACTOR FEED PUMP OIL LEAK

BOP

Time	Action	Notes
	Shutdown RFP A per 2OP-32. (the RFP may trip during the execution of this procedure)	
	Adjust level setpoint on <i>MSTR RFPT SP/RX LVL CTL, C32-SIC-R600</i> , to 190 inches.	
	Notify Radwaste Operator to monitor CDD flows and place demineralizers in service as necessary.	
	Ensure <i>SJAE Condensate Recirculation Valve, CO-FV-49</i> , is closed.	
	Place <i>RFPT A Recirc Vlv, FW-FV-V46</i> , in <i>OPEN</i>	
	Ensure <i>RFPT A Sp Ctl, C32-SIC-R601A</i> , is selected to <i>BIAS</i> and Adjust, using raise and lower push buttons, until <i>BIAS</i> setting is 0.	
	Ensure <i>RFPT B Sp Ctl, C32-SIC-R601B</i> , is selected to <i>BIAS AND</i> Adjust, using raise and lower push buttons, until <i>BIAS</i> setting is 0.	
	Depress <i>SEL</i> pushbutton on both <i>RFPT A and B SP Ctl, C32-SIC-R601A and B</i> , until <i>PMP DEM</i> is displayed on each	
	Depress <i>A/M</i> pushbutton on <i>C32-SIC-R601A</i>	
	Slowly Lower <i>RFPT A</i> speed, using lower pushbutton on <i>C32-SIC-R601A</i> , And Observe <i>RFPT B</i> increases speed to maintain reactor level between 182 and 192 inches.	

EVENT 3 (Cont'd) REACTOR FEED PUMP OIL LEAK

BOP cont'd

Time	Action	Notes
	Slowly Lower RFPT A speed using lower pushbutton on <i>C32-SIC-R601A</i> , until RFP discharge pressure is slightly less than reactor pressure.	
	De-energize seal water solenoid valves.	
	Close <i>RFP A Disch Vlv, FW-V3</i> .	
	Return level setpoint on <i>MSTR RFPT SP/RX LVL CTL, C32-SIC-R600</i> , to 187 inches	
	Slowly Reduce RFPT A speed, using <i>RFPT A SP CTL, C32-SIC-R601A</i> , until RFPT speed is ~2550 rpm	
	Place RFPT A(B) <i>MAN/DFCS</i> control switch to <i>MAN</i>	
	Slowly Reduce RFPT A speed to ~1000 rpm by placing RFPT A <i>LOWER/RAISE</i> speed control switch in <i>LOWER</i> .	
	Trip RFPT A(B) at ~1000 rpm	
	Place <i>RFP A TURNING GEAR MTR</i> mode selector switch in <i>NORM</i>	
	Place <i>RFP A Recirc Vlv, FW-FV-V46</i> , in <i>AUTO</i> .	
	IF RFPT does NOT automatically engage, Then Depress turning gear engage pushbutton when turbine speed reaches zero	
	Ensure <i>EMERG OIL PUMP</i> starts	

EVENT 3 (Cont'd) REACTOR FEED PUMP OIL LEAK

BOP cont'd

Time	Action	Notes
	<p>OPEN the following drain valves</p> <ul style="list-style-type: none">• <i>RFP A HP Stop Vlv & Ln Drain, MS-V41 and MS-V42</i>• <i>RFP A HP Stop Below Seat Drn, MS-V40</i>• <i>RFP A LP Stop Vlv & Ln Drain, RHS-V32 and RHS-V39</i>• <i>RFP A LP Stop Below Seat Drn, RHS-V31</i>• <i>RFP A LP Ctl Vlv Chest Drn, RHS-V30 and MS-V51</i>• <i>RFP A LP Stm Supply Ln Drn, RHS-V40</i>	

EVENT 4 RECIRC MG SET A COOLING LOSS

The temperature controller for Recirc MG Set 2A will fail closed. Oil temperature will rise causing an alarm, then a trip condition. The Recirc MG Set will fail to auto trip and must be manually tripped. The flow reduction will place the plant in the Scram Avoidance Region of the Power/Flow map, requiring immediate exit by control rod insertion or raising flow (not to exceed SLO limits).

Malfunctions required: Recirc MG A Cool Wtr Loss

Objectives:

SCO – Directs securing 2A recirc Pump and raising RR flow or inserting control rods to exit the Scram Avoidance Region.

RO - Trips A Recirc pump. Raises RR flow or insert rods to exit Scram Avoidance Region.

Success Path:

2A Recirc Pump removed from service and Scram Avoidance Region exited.

Simulator Operator Actions:

- ☐ When directed by the lead examiner, initiate **Trigger 4**, to activate Recirc MG A cooling loss.
- ☐ If asked as TBAO to investigate, wait until crew has determined if the problem is with Recirc Pump A or B and report that the cooling water temperature control valve for MG Set A is closed (TV-607).
- ☐ If asked as I&C to investigate, acknowledge the request.
- ☐ If contacted as NE, report you will monitor thermal limits. If requested, recommend control rod insertion per 0ENP-24.5 to exit scram avoidance region.
- ☐ If contacted as chemistry for samples, acknowledge request.
- ☐ If contacted as NIT, acknowledge the request to backup OPRM data.
- ☐ When directed by the lead examiner, proceed to the next event.

Required Operator Actions

EVENT 4 (Cont'd) RECIRC MG SET A COOLING LOSS

SRO

Time	Action	Notes
	Direct 2A Recirc Pump to be secured.	
	Direct entry into 0AOP-4.0 Direct Scram Avoidance Region to be exited by raising core flow or by control rod insertion using 0ENP-24.5.	
	Evaluate TS 3.4.1 Condition A applies, implement modified APLHGR Limit and APRM setpoints within 6 hours.	
	Contact I&C to investigate/repair temperature control on Recirc MG A.	

BOP

Time	Action	Notes
	Plant Monitor	

EVENT 4 (Cont'd) RECIRC MG SET A COOLING LOSS

RO

Time	Action	Notes
	Dispatch TBAO to investigate.	
	Check temperature recorder R625 for rising temperatures. Determine rising temperatures on MG Set A.	
	Determine Recirc MG Set A has failed to trip and manually trip after receiving A-06 2-4, <i>FLUID DRIVE A SCOOP TUBE LOCK</i> .	
	Enter and announce 0AOP-04.0.	
	Determine region of operation on power/flow map (computer display 806 may be used)	
	May raise core flow or insert control rods to exit scram avoidance region per 0ENP-24.5 predetermined rod sequence.	
	Limitations on the Recirc Pump flow: < 50% power < 45 Mlbs > 30.8 Mlbs	
	Reduce CRD flow to 30 gpm.	
	Maintain core flow >30.8 E6 lb/hr to prevent excessive cool down of idle loop.	
	Monitor for THI.	
	Notify chemistry for sampling requirements.	

EVENT 5 LOSS OF E7

Substation E7 trips on fault resulting in loss of all associated loads. A half scram will occur due to the loss of RPS A. RCC Pumps 2A and 2C are lost resulting in complete loss of RBCCW and drywell cooling. This condition requires a manual reactor scram and securing RCC system loads (RWCU, Recirc Pumps, CRD Pumps). The loss of drywell cooling will result in rising drywell temperature and pressure. Drywell pressure will exceed 1.7 psig requiring entry into PCCP and RVCP (or LPC until rods are inserted). HPCI auto initiates and injects (if not tripped on high level).

Malfunctions required: Trip of substation E7

Objectives:

SCO – Directs insertion of control rods using LEP-02.

RO - Insertion of control rods using LEP-02

BOP – Recognize failure of RBCCW.

Success Path:

Perform actions of AOP-16.0 and AOP-36.1 to scram the reactor.

Simulator Operator Actions:

- ☐ When directed by the lead examiner, initiate **Trigger 5**, to activate trip substation E7.
- ☐ If asked to investigate, report E7 480 Main Breaker (AZ1) @ E7 is tripped on overcurrent (white overcurrent trip indicator protruding).
- ☐ If requested to transfer 2AB, 32AB and 2AB-RX to alternate, initiate **Trigger 11**.
- ☐ If requested to transfer RPS alternate to alternate supply, initiate **Trigger 12**.
- ☐ When directed by the lead examiner, proceed to the next event.

Required Operator Actions

Critical Task - ***Insert control Rods per LEP-02.***

EVENT 5 (Cont'd) LOSS OF E7

SRO

Time	Action	Notes
	Direct entry into AOP-36.1	
	Direct entry into OAP-16.0 Direct actions for a complete loss of RBCCW.	
	Direct insertion of a manual scram.	
	Enter and direct EOP-01-RSP actions.	
	<i>Direct control rod insertion per LEP-02.</i>	
	Direct the continued operation of the CRD Pump until rods are inserted.	
	Enter and direct EOP-01-RVCP actions (when control rods inserted). (May transition to LPC if DW pressure reaches 1.7# and rods are not inserted)	
	Enter and direct EOP-02-PCCP actions.	
	Direct RPV level be maintained 170-200 inches.	

EVENT 5 (Cont'd) LOSS OF E7

RO

Time	Action	Notes
	Insert a manual scram	
	<p>Perform immediate actions for Reactor scram</p> <p>After steam flow is less than 3×10^6 lb/hr, place the reactor mode switch to shutdown</p> <p>When APRM downscale trip, then Trip the main turbine</p> <p>Ensure the master reactor level controller setpoint is +170 inches</p>	
	<p><i>Performs LEP-02, Alternate Rod Insertion. (RMCS Section)</i></p> <p><i>Insert IRMs.</i></p> <p><i>When < range 3 on IRMs insert SRMs.</i></p> <p><i>Start both CRD pumps.</i></p> <p><i>Place CRD Flow Controller to Manual.</i></p> <p><i>Throttle open flow controller to establish ≥ 260 drive water psid.</i></p> <p><i>Bypass RWM.</i></p> <p><i>Selects control rods and drives in using Emerg rod in notch override.</i></p>	
	Shutdown CRD Pumps when all rods in (AOP-16).	

**EVENT 5 (Cont'd) LOSS OF E7
BOP**

Time	Action	Notes
	Diagnose loss of E7 and loss all RBCCW Pumps.	
	Enter and announce 0AOP-36.1.	
	Ensure one of the <i>CB EMERG RECIRC FANS, 2A(B)-ERF-CB</i> , is operating.	
	Direct AO to transfer 2AB, 32AB, and 2AB-RX panels to their alternate power supply.	
	Enter and announce 0AOP-16.0. Perform actions for a total loss of RBCCW (leave CRD running).	
	Place all RBCCW Pump Switches to Off.	
	Close the following valves: <i>RBCCW TO DW ISOL VLVS, RCC-V28</i> <i>RBCCW TO DW ISOL VLVS, RCC-V52</i> <i>(These have no power)</i>	
	Trip RWCU pumps and isolate the system <i>(Pumps already tripped and isolated)</i>	
	Trip both reactor recirculation pumps.	
	Shutdown CRD Pumps when all rods are inserted.	
	Recognize and report high drywell pressure.	
	May attempt to control HPCI to prevent high level trip (It will trip on high reactor water level).	
	Control RPV level as directed by SCO. (170-200 inches)	

EVENT 6 STEAM LEAK IN DRYWELL

A small steam leak will develop in the drywell. Drywell temperature and pressure rises at a faster rate requiring initiation of drywell sprays. RHR Loop 2A is unavailable for spray due to loss of E7 (valve power). When RHR 2B is placed in drywell spray, the outboard spray valve (F016B) will fail. With no spray available, drywell temperature will exceed 300°F (cannot be restored and maintained below) requiring emergency depressurization. During the depressurization, low pressure injection systems (RHR, Core Spray and Condensate) must be operated to prevent uncontrolled injection. When emergency depressurization actions have been performed, the scenario may be terminated.

Malfunctions required: Small steam line break in the DW.

Objectives:

SCO – Directs Emergency Depressurization actions when exceeding 300°F in the DW.

BOP – Perform Emergency Depressurization actions when instructed by the SCO.

Success Path:

Perform Emergency Depressurization of the reactor due to 300°F in the DW.

Simulator Operator Actions:

- ☐ When drywell pressure exceeds 1.7 psig (A-05 5-6 annunciator) verify activation of **Trigger 6**, steam leak.
- ☐ If asked to check breaker for E11-F016B (MCC 2XB) report thermal overload tripped, if directed to reset thermal overload, report it trips again, if directed to manually open E11-F016B, report valve is bound.
- ☐ Monitor drywell average temperature on ERFIS, if required to achieve 300 degrees DW temp, modify steam leak severity.
- ☐ When directed by the lead examiner, proceed to the next event.

Required Operator Actions

Critical Task - ***Depressurize the reactor when drywell average air temperature cannot be restored and maintained below 300°F by performing or anticipating emergency depressurization.***

EVENT 6 (Cont'd) STEAM LEAK IN DRYWELL

SRO

Time	Action	Notes
	Recognize drywell temperature and pressure rising at faster rate and diagnose as line break.	
	Direct suppression chamber spray per SEP-03.	
	Direct drywell spray per SEP-02.	
	Direct maintenance to investigate E11-F016B.	
	Before drywell temperature reaches 300°F, may direct anticipating emergency depressurization if MSIVs are open.	
	If drywell temperature exceeds 300°F, determines it cannot be restored below 300°F (unless actions in progress for anticipating emergency depressurization) and directs emergency depressurization.	
	Direct low pressure ECCS be operated to prevent uncontrolled injection.	
	Direct condensate be operated to prevent uncontrolled injection.	

EVENT 6 (Cont'd) STEAM LEAK IN DRYWELL

RO

Time	Action	Notes
	May recognize drywell temperature and pressure rising at faster rate and diagnose as line break.	
	<p>Initiate suppression chamber spray per SEP-03.</p> <p>If necessary, then place Loop B 2/3 CORE HEIGHT LPCI INITIATION OVERRIDE SWITCH, E11-CS-S18B, in Manual Overrd.</p> <p>If the CTMT SPR OVRD light for the Loop B CONTAINMENT SPRAY VALVE CONTROL SWITCH, E11-CS-S17B is not on, then momentarily place Loop B CONTAINMENT SPRAY VALVE CONTROL SWITCH, E11-CS-S17B, to Manual</p> <p>Ensure at least one RHR Loop B Pump is operating</p> <p>Ensure TORUS DISCHARGE ISOL VLV, E11-F028B, is open</p> <p>Open TORUS SPRAY ISOL VLV, E11-F027B.</p>	

EVENT 6 (Cont'd) STEAM LEAK IN DRYWELL

RO (Cont'd)

Time	Action	Notes
	<p>Initiate drywell spray per SEP-02</p> <p>Ensure WELL WATER TO VITAL HEADER VLV, SW-V141, is closed</p> <p>Ensure both reactor recirculation pumps are tripped</p> <p>Place all drywell cooler control switches to OFF (L/O)</p> <p>Confirm the following:</p> <ul style="list-style-type: none">• Drywell pressure and drywell temperature are in the "SAFE" region of the DSIL graph.• Suppression pool water level is below +21 inches. <p>Open Loop B DRYWELL SPRAY INBD ISOL VLV, E11-F021B</p>	
	Recognize and report failure of E11-F016B to open as thermal overload.	
	May dispatch AO to check breaker and attempt to reset thermal overload per the APP.	

EVENT 6 (Cont'd) STEAM LEAK IN DRYWELL

BOP

Time	Action	Notes
	May recognize drywell temperature and pressure rising at faster rate and diagnose as line break.	
	Performs actions to rapidly depressurize the RPV to the main condenser as directed by the SCO	
	<i>Opens seven ADS valves when directed by the SCO.</i>	
	Verifies low pressure ECCS actuations at 410#.	
	Overrides ECCS off to prevent uncontrolled injection.	
	Operate Condensate as necessary to prevent uncontrolled injection.	

Simulator Operator Activities:

WHEN directed by the lead examiner, place the simulator in **FREEZE**.

CAUTION

**DO NOT RESET THE SIMULATOR PRIOR TO RECEIPT
OF CONCURRENCE TO DO SO FROM THE LEAD
EXAMINER**