

**Draft Submittal**  
(Pink Paper)

## **SIMULATOR SCENARIOS**

Facility:	BRUNSWICK	Scenario No.:	1	Op Test No.:	Nov. 2008
Examiners:	_____	Operators:	_____		(SRO)
	_____		_____		(RO)
	_____		_____		(BOP)
Initial Conditions:	The plant is operating at 100% power, End of Cycle. No equipment is out of service				
Turnover:	Following shift turnover, Reduce power and place the 2C Condensate Pump in service and remove the 2A Condensate Pump. The 2A Condensate pump is experiencing high vibrations and will be placed under clearance by the WCC for maintenance.				
Critical Task:	See Scenario Summary				
Event No.	Malfunction No.	Event Type*	Event Description		
1	N/A	R-SRO R-RO	Reduce power to <92% power in order to swap Condensate Pumps.		
2	N/A	N-SRO N-BOP	Swap Condensate Pumps per 2OP-32 section 8.5.		
3	EE030M	C-RO C-SRO	2XB power failure. (TS)		
4	NB007F	I-SRO I-RO	A Reactor Water Level Instrument failure. (TS)		
5	K4517A Off	C-BOP C-SRO	TBCCW Pump Trip		
6	MS031F	C-BOP C-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	K5416A Off	C-ALL	EHC pump trip and failure of standby pump causing bypass valve failure.		
9	K2119A Off	C-RO C-SRO	SLC pumps will not start due to switch failure.		
10	RD036F	C-RO C-SRO	Scram discharge volume drains fail closed.		
11	K1208A Off	C-BOP C-SRO	E11-F024A will initially trip on thermal overload when opened.		
12	N/A	M- ALL	Torus temperature rises requiring reactor pressure reduction or emergency depressurization due to HCTL.		

## SCENARIO DESCRIPTION

Unit 2 is operating at maximum power, End Of Cycle.

Event 1 - Direction in the turnover has the crew remove the A condensate pump from service which requires a power reduction to less than 92% power in accordance with ENP-24.

Event 2 – Swap condensate pumps in accordance with 2OP-32.

Event 3 - 2XB will fail. The crew will respond per APPs and refer to TS to declare RHR B Loop inoperable (3.5.1 Action A) and PCIV's 3.6.1.3 Action A (8 hours to isolate the affect flowpath) and B (2 hours to isolate the affected flowpath).

Event 4 - Level transmitter C32-LT-N004A will fail downscale. Refer to Tech Spec and determine must be tripped in 7 days (3.3.2.2 and TRM Table 3.3.2.2-1). Crew should select level instrument B per 2OP-32.

Event 5 - The B TBCCW pump will trip. AOP-17 should be entered and the standby pump started to recover system pressure.

Event 6/7/8 - 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 and the reactor to be scrammed. Most control rods will fail to insert on the scram. The crew will respond to the ATWS per EOP-01-LPC. When the scram occurs, the running EHC pump will trip and the standby EHC pump will also trip.

Event 9 - 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 10 - 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 11 - Suppression pool temperature will rise requiring entry into EOP-02-PCCP and lowering water level per LPC Table 3. When RPV level is lowered to TAF, reactor power will still be above the APRM downscale set point. Suppression pool cooling is required due to elevated suppression pool temperature. Suppression pool cooling is limited to RHR A. The E11-F024A will initially trip on thermal overload when opened. If the crew requests, the thermal overload can be reset and the valve can then be opened, after actions are taken to reduce reactor pressure.

Event 12 - Suppression pool temperature will continue to rise, and eventually approach the Heat Capacity Temperature Limit. Reactor pressure can be reduced per the guidance of LPC pressure leg to maintain (and actually gain) margin to the HCTL. Otherwise Emergency Depressurization will be required. When pressure has been lowered to avoid HCTL, the scram discharge volume vents and drains will be repaired. Control rods can then be inserted by manual scram. When level is restored above TAF, RHR Loop A placed in suppression pool cooling. When all control rods are inserted and suppression pool cooling initiated, the scenario may be terminated.

**PROGRESS ENERGY CAROLINAS  
BRUNSWICK TRAINING SECTION**

**2008 NRC EXAM SCENARIO #1**

**Simulator Setup**

Initial Conditions:

IC  
 ENP-24 for IC 14  
 Rx Power 100%  
 Core Age EOC

Events:

Event #	Trigger		Description
1	NA		Reduce power from 100% to 92% using recirc
2	1	Manual	Swap Condensate pumps (Start 2C, Secure 2A).
3	2	Manual	2XB power failure
4	3	Manual	Reactor Water Level Instrument Failure (C32-LT-N004A)
5	4	Manual	TBCCW pump trip
6	5	Manual	MTLO controller failure
7	6	Auto	Turbine high vibration causing the crew to scram the plant with an ATWS condition
8	7	Auto	EHC pump trip with failure of standby to auto start
9	NA		SLC switch failure
10	7	Auto	Scram Discharge Vents and Drains fail closed
11	8	Auto	Thermal overload on RHR 24 valve
12	NA		ED / Depressurize the Reactor

**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				
MS051F		EHC pump B Fails to Auto Start	True	True				
RD036F		Scram Disc Vol Drn Fails Closed	False	True				7 - on Scram
EE030M	2XB	Individual Bus Failure	False	True				2
NB007F	A	Rx Lvl Transmitter C32-LT-N004A Fails	60.32	0.0				3
MS031F		MTLO Temp Cntrlr Fails	False	True				5
MS017F	4	Turbine Bearing Vibration	0	5	5 min			6 on UA23 1-6
MS017F	5	Turbine Bearing Vibration	0	5	5 min			6 on UA23 1-6
MS017F	6	Turbine Bearing Vibration	0	5	5 min			6 on UA23 1-6
MS008F		Main Turbine Trip	False	True				9
RP005F		Auto Scram Defeat	False	True				13

Remotes Summary

Remote ID	Mult. ID	Description	Current Value	Target Value	Trig
EE_LSHED3		LOCA Load Shed Sel Sw, 2C Condensate Pump	Enabled	Disabled	1
EE_UTSHED3		Unit Trip Load Shed Sel Sw, 2C Condensate Pump	Enabled	Disabled	1
RH_ZVRH24AT		E11-F024A Full Flow Test	ON	OFF	8
EE_LSHED1		LOCA Load Shed Sel Sw, 2A Condensate Pump	Disabled	Enabled	10
EE_UTSHED1		Unit Trip Load Shed Sel Sw, 2A Condensate Pump	Disabled	Enabled	10
EP_IAEOPJP1		Bypass LL3 Group I Isol	Off	On	12
MS_VMS5005D		MVD-5005 Mn Stm Drn Hdr Isolation	0	1	14
EP_IACS993U		DW CLR A&D Override – Normal/Run	Normal	Run	15
EP_IACS994U		DW CLR B&C Override – Normal/Run	Normal	Run	15
EP_IASW5997		SW-V106 LOCA Override	Normal	Bypass	15
EP_IASW5998		SW-V103 LOCA Override	Normal	Bypass	15

Switches Summary

Switch ID	Description	Target Position	Override Value	Trig
K4517A	TBCCW Pmp B On	Off	On	4
K4517A	TBCCW Pmp B On	On	Off	4
Q4517LG4	TBCCW Pmp B Off G	On/Off	Off	4
Q4517RR4	TBCCW Pmp B On R	On/Off	Off	4
K5416A	Hyd Fluid Pmp A HFPM-A	Off	On	7 on Scram button A (K2501A=True)
K5416A	Hyd Fluid Pmp A HFPM-A	Auto	Off	7 on Scram button A (K2501A=True)
K5416A	Hyd Fluid Pmp A HFPM-A	On	Off	7 on Scram button A (K2501A=True)
K5417A	Hyd Fluid Pmp A HFPM-B	Off	On	7 on Scram button A (K2501A=True)
K5417A	Hyd Fluid Pmp A HFPM-B	Auto	Off	7 on Scram button A (K2501A=True)
K5417A	Hyd Fluid Pmp A HFPM-B	On	Off	7 on Scram button A (K2501A=True)
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	
Q1207LGN	Full flow E11-F024 Green	On/Off	On	8
Q1207RRN	Full flow E11-F024 Red	On/Off	On	8

Annunciators:

Remote ID	Description	Current Value	Target Value	Trig
A-01 5-9	RHR A Valves Overload	Off	On	8 on 24 valve to open (Q1207RRN=True)

Special Instructions:

Load Scenario file, 2008 Scenario 1.scn, if required.  
 Ensure ENP-24 for IC-14 at P603 panel.

Shift Briefing

Plant Status

The plant is operating at ~100% power, End of Cycle.

Equipment Out of Service

No equipment is out of service

Plan of the Day

Following shift turnover, Reduce power to 92% and place the 2C Condensate Pump in service and remove the 2A Condensate Pump. The 2A Condensate pump is experiencing high vibrations and will be placed under clearance by the WCC for maintenance.

## Scenario Information

### Examiner Notes

#### Procedures used in Scenario

##### Event 1

- ENP-24
- 2OP-02 Sect. 7.1

##### Event 2

- 2OP-32, Section 8.5

##### Event 3

- 2APP-UA-18 2-2, Sub E8 Fdr to MCC-2XB Bkr Trip
- 2APP-UA-25 1-8, Ctmt Atmos Rad Mon Dnsc/Inop
- 2OI-50.4, 4160V Emergency Bus E-4 Electrical Load List
- TS 3.5.1 / 3.7.1 / 3.6.2.3 / 3.6.1.3/3.4.2

##### Event 4

- 2APP-A-07 4-2, FW Ctl Sys Trbl
- 2OP-32
- TS 3.3.2.2

##### Event 5

- 0AOP-17, TBCCW System Failure
- 2APP-UA-03 2-4, TBCCW Pump Disch Header Press Low
- 2OP-44 Sect. 8.1

##### Event 6

- 2APP-UA-23 1-6, Turb or RFP Brg Temp High

##### Event 7

- 2APP-UA-23 6-1, Turb or RFP Vibration High
- ENP-24
- 0EOP-01-RSP
- 0EOP-01-LPC

##### Event 8

- Power leg of level power control

##### Event 9

- 0EOP-01-LEP-03, Alternate Boron Injection

##### Event 10

- 0EOP-01-LEP-02, Alternate Rod Insertion

##### Event 11

- 0EOP-01-PCCP
- Suppression Pool Cooling Hard Card
- 2APP-A-01 5-9, RHR A Valves Overload

##### Event 12

- HCTL graph

### Critical Tasks

- Emergency Depressurization when exceeding the HCTL, or reduce reactor pressure to maintain a safe margin to the HCTL.
- Implement Alternate Boron Injection using CRD.
- Perform alternate rod insertion using RMCS.

## EVENT 1 SHIFT TURNOVER, REDUCE POWER

The crew will have to reduce power to less than or equal to 92% power.

Malfunctions required: None.

### **Objectives:**

SCO - Directs power to be reduced in order to swap Condensate Pumps.

RO - Performs power reduction in accordance with ENP-24.

### **Success Path:**

Power reduced to less than or equal to 92% power.

### **Simulator Operator Actions:**

- If contacted as the NE for power reduction guidance, inform crew to use ENP-24 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 U2 will be lowering power.
- If contacted as the NE for guidance on operation above the MELL line, inform crew to insert rods per ENP-24 to get below the MELL.

### **Required Operator Actions**

Reactivity Manipulation – Reduce Power to 92% to be able to swap Condensate pumps.

#### SRO

- Directs power to be reduced in accordance with ENP-24 using recirculation flow in order to swap Condensate Pumps.
- Directs RO to insert control rods to get below the MELL line.

#### RO

- Reduces power using ENP-24 using recirculation flow to 92% power.
  - May reference 2OP-02 section 7.1.
  - Request peer checker.
  - Reduce flow on one RR Pump (~2%) at a time to stay within mismatch criteria ( $3.5 \times 10^6$  Mlbs jet pump flow).
  - Continues alternating Recirc pump reductions until 92% power.
  - Verifies operation on the Power to Flow map.
  - Recognizes operation above the MELL line and informs SCO.
- Inserts control rods using ENP-24 to get below the MELL line. (Should only need to insert one control rod)
  - Turns control rod power on.
  - Selects control rod in accordance with ENP-24 sheet.
  - Continuously drives rod in using RMCS.

#### BOP

- Plant monitor

**NOTES:**

- 1) S = Satisfactory; U - Unsatisfactory; N/O = Not Observed  
All Unsatisfactory ratings require comments; a comment sheet is attached.
- 2) \* = Critical Task/Step



## EVENT 2 SWAP CONDENSATE PUMPS

After power has been reduced to less than 92% the crew will swap condensate pumps.

Malfunctions required: None

### **Objectives:**

SCO - Directs starting of the 2A Condensate Pump and securing the 2C Condensate Pump.

BOP - Starts the 2A Condensate Pump and secures the 2C Condensate Pump.

### **Success Path:**

2A condensate pump running and the 2C condensate pump shutdown.

### **Simulator Operator Actions:**

- When contacted as RW to place an additional CFD and/or CDD in service report that this had already been completed.
- If contacted as the TB AO report that the prestart checks for the 2A Condensate pump are complete.
- When contacted as the TB AO to disable the LOCA and Unit Trip Load Shed switches acknowledge request, initiate **trigger 1** and inform control room that the LOCA Load Shed and Unit Trip Load Shed switches are disabled for the 2C Condensate pump.
- When contacted as the TB AO to enable the LOCA and Unit Trip Load Shed switches acknowledge request, initiate **trigger 10** and inform control room that the LOCA Load Shed and Unit Trip Load Shed switches are enabled for the 2A Condensate pump.
- When contacted as the RW operator to secure CFD and/or CDD from service, acknowledge the request.

### **Required Operator Actions**

Normal Ops –Swap Condensate pumps in accordance with 2OP-32 Section 8.5.

#### SRO

- Directs BOP to swap Condensate Pumps in accordance with 2OP-32.

#### RO

- Performs plant monitoring.

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### EVENT 3 2XB POWER FAILURE

The main feeder breaker to 2XB will trip. The crew will respond per APPs and refer to 00I-50.4 to determine TS. Should declare RHR B Loop inoperable (3.5.1 Condition A), RHRSW B Loop Inop (3.7.1 Condition B), RHR B Loop SPC Inop (3.6.2.3 Condition A), PAM Instrumentation for PCIV Position Indication (Condition A – 30 days), PCIV's 3.6.1.3 Condition A (8 hours to isolate the affected flowpath that has one of two isolation valves Inop), Condition B (2 hours to isolate the affected flowpath that has two out of two valves Inop), and Condition C (8 hours to isolate the affected flowpath that has one out of one valves Inop). Primary containment atmosphere particulate monitor (CAC-1260) will be lost per TRM 3.4 Condition A requires it to be restored in 31 days.

Malfunctions required:

2XB feeder breaker over current trip causing a loss of all loads on MCC 2XB.

#### **Objectives:**

SCO - Determine actions required for LCO per Technical Specifications.

#### **Success Path:**

Technical Specification / TRM

- 3.7.1, Declare One RHR SW subsystem Inop (Condition B, 7 days)
- 3.5.1, Declare RHR B Loop inoperable (Condition A, 7 days)
- 3.6.2.3, Declare One RHR SPC subsystem Inop (Condition A, 7 days)
- TRM 3.4 One drywell radiation monitor inoperable (Condition A, 31 days)
- 3.3.3.1, PAM Instrumentation – PCIV Position Indication (Condition A – 30 days)
- 3.6.1.3, PCIV's
  - Condition A – 8 hours to isolate the affect flowpath (E11-F024B, E11-F027B, E41-F079, E51-F066, and B32-V30). Valves F024 and 27 are closed.
  - Condition B - 2 hours to isolate the affected flowpath (E11-F016B and F021B). Valves are closed.
  - Condition C - 8 hours to isolate the affect flowpath (E11-F007B, F011B, F020B, and F103B). Valves F007, 11, and 103 are closed.

#### **Simulator Operator Actions:**

- Insert **trigger 2** at the discretion of the lead evaluator.
- If contact as the RB AO, wait one minute and report that MCC 2XB looks normal except that there is no power at the MCC.
- If contacted as the Outside AO, report that the 480V MCC 2XB Feeder Breaker A02 at E8 is tripped on over current. (white trip flag protruding from the breaker)
- If contacted as Chemistry, wait two minutes and report that the CAC-1260 Analyzer has lost power.
- Acknowledge request as I&C to do troubleshooting/repair for the electrical failure.

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#### EVENT 4 REACTOR WATER LEVEL INSTRUMENT FAILURE (C32-LT-N004A)

Malfunctions Required:

Failure of level transmitter N004 downscale.

#### **Objectives:**

SCO – Direct required channel be placed in trip condition per Technical Specifications in accordance with OI-18.

RO – Recognize level instrument failure.

#### **Success Path:**

The crew will respond per APP and TS and determine the channel must be placed in a trip condition within 7 days. The crew should select level B to match conditions with the switch alignment.

#### **Simulator Operator Actions:**

- At the discretion of the lead evaluator insert **trigger 3** to fail N004 level instrument.
- If contacted as the AO to verify Circuit 3 on panel V10A and Circuit 10 on panel 4B, report that the breakers are on.
- If contacted as I&C to investigate, acknowledge the request.
- If contacted as I&C to disarm Annunciator input, acknowledge the request.

#### **Required Operator Actions**

SRO

- Refer to TS 3.3.2.2 and TRM Table 3.3.2.2-1.
  - Determine C32-LT-N004A must be placed in a trip condition within 7 days.
  - May direct WCC to pull the required fuses per OI-18.
  - OOI-18 gives guidance on how to place in a trip state.
- Direct transfer of level select to B.
  - If procedure is used to transfer, then a step in the procedure will have to be noted because the N004A is failed and can not read within two inches of the N004B.

RO

- Report C32-LT-N004A is downscale.
- Perform actions of APP.
  - May dispatch AO to confirm Circuit 3 on UPS panel V10A is ON.
  - May dispatch AO to confirm Circuit 10 on 125V DC panel 4B is ON.
- Transfer level select to B to match conditions with the switch alignment.

BOP

- Perform plant monitoring.

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## EVENT 5 TBCCW PUMP TRIP

### Malfunctions Required:

Trip of the 2B TCC pump and override of lights.

### Objectives:

SCO – Direct shift response to TBCCW failures per AOP-17.

BOP – Respond to a partial loss of TBCCW per AOP-17.

### Success Path:

The B TCC pump will trip and pressure will lower. A TCC low pressure alarm will be received. Starting the 2C TCC pump on U2 will restore pressure to normal. Both the APP and the AOP direct starting a standby TCC pump.

### Simulator Operator Actions:

- At the discretion of the lead evaluator, initiate **trigger 4** to fail the 2B TCC pump.
- If directed as the TB AO to investigate the 2B TCC pump trip, wait 2 minutes and report motor feels much hotter than normal, the breaker is tripped on magnetics. Breaker will not reset if asked.
- If contacted as Unit 1, the 2C TCC pump is not being used on Unit 1.
- If contacted as the RB AO, inform the control room prestart checks of the 2C TCC pump are complete.
- If directed to investigate as I&C acknowledge the request.

### Required Operator Actions

#### SRO

- Enter and direct activities of AOP-17 for the trip of 2B TCC pump.
- Direct 2C TCC pump start.
- Direct maintenance to investigate 2B TCC pump.

#### RO

- Perform plant monitoring.

#### BOP

- Perform actions of APP and/or AOP.
  - Verifies U1 not using the 2C TCC pump.
  - Places 2C TCC pump mode select switch in operate.
  - May request AO to perform prestart checks of 2C TCC pump.
  - Makes PA announcement of starting 2C TCC pump.
  - Starts 2C TCC pump.
- Dispatch AO to check breaker for 2B TCC pump.

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## EVENT 6/7 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 5** 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).
- If asked as I&C to investigate acknowledge the request.

### Required Operator Actions

#### SRO

- Direct actions of APP's.
- When vibrations rise to above the TSI setpoint, direct manual scram and turbine trip per the vibration APP. (As conservative decision making may insert before setpoint)

#### RO

- Plant monitoring.
- When directed by the SRO, insert a manual scram and trip the main turbine.
- Recognize and report an ATWS.

#### BOP

- Recognize and report rising lube oil temperatures.
- Dispatch TB AO to investigate TCV.
- Perform actions of APP.
- Monitor turbine bearing temperatures and vibrations (PC display 630)

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**EVENT 10/11 ATWS ACTIONS - CONTINUED**

**Objectives:**

SCO – Direct actions to lower reactor vessel level when the conditions of Table 3 are met per EOP-01-LPC.

RO/BOP – Control reactor level during an ATWS per EOP-01 LPC.  
Start up RHR in Suppression Pool Cooling mode per OP-17.

**Success Path:**

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

**Simulator Operator Actions:**

- If requested to defeat Group I LL3, wait 2 minutes, initiate **trigger 12** and inform the SCO that the jumpers are installed.
- If requested to install LEP-02, Section 3 jumpers, wait 5 minutes, insert **trigger 13** 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 14** and inform the control room that the valve is open.
- If requested to defeat Drywell Cooler LOCA Lockout, wait three minutes, initiate **trigger 15** and inform the SCO that the jumpers are installed.
- If directed as the AO to investigate the E11-F048A breaker, wait until reactor pressure is being lowered because of HCTL and then report nothing appears wrong at the breaker except that the position indicating lights are off.
- If requested as maintenance to inspect the E11-F024A valve, wait until reactor pressure is being lowered because of HCTL and report it is tripped on thermals.
- If directed as the AO/Maintenance to attempt to reset the thermals for the E11-F024A, then delete the following commands:
  - o Malfunction - E11-F048A Full Flow Test
  - o Lights – Red and Green lights for E11-F024A
  - o Annunciator – RHR Valves Overload

**Required Operator Actions**

**SRO**

- Direct Group 10 switches to override reset
- Direct terminate and prevent HPCI/Feedwater (CS/RHR when LOCA signal received).
- When level reaches +90 inches, evaluate Table 3:
  - o If not met, establishes a level band of LL4 to +90 inches.
  - o When met, direct injection be or remain terminated.
- When Suppression Pool is greater than 95° F, enters PCCP and directs Suppression Pool Cooling.
- 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 TAF (or the level at which APRMs indicate downscale)
- Direct attempt to reset breaker for E11-F024A valve.

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2) \* = Critical Task/Step

RO

- Continue to Drive rods using RMCS.
- Monitor APRMs for downscale.
- Inhibit ARI after scram jumpers installed.
  - 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 Dish 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

- Places Group 10 switches to override / reset
- Terminate and prevent injection to RPV.
  - Places HPCI Aux Oil Pump to Pull to Lock.
  - Places startup level control valve in service.
  - Close FW-V6 and V8.
  - Ensure FW-V177 closed.
  - Open FW-V10.
  - Selects FW control mode to 1 Element.
  - Ensures MSTR RFPT SP/RX LVL CTL in manual and SULCV closed.
- Continue to control RPV pressure using SRV's, steam line drains.
- Places suppression pool cooling in service on A Loop.
  - Opens SW-V101.
  - Closes SW-V143.
  - May verify adequate suction source and start a CSW Pump.
  - Starts RHR SW Pump(s)
  - Adjusts E11-PDV-F068A to achieve ~4000 gpm per RHR SW pump running.
  - Supplies cooling water to vital header ensures open either SW-V111 or SW-V117.
  - Operates THINK switch to make up spray logic.
  - Starts RHR pump
  - Attempts to open E11-F028A.
  - Recognizes/reports failure of E11-F024A.
  - May direct AO to reset the thermals for the E11-F024A breaker.
  - When reset, throttles open E11-F024A (establishes flow in green band for 1 pump or  $\leq$ 11500 gpm for 2 pump operation)
  - Closes E11-F048A.

- NOTES:**
- 1) S = Satisfactory; U - Unsatisfactory; N/O = Not Observed  
All Unsatisfactory ratings require comments; a comment sheet is attached.
  - 2) \* = Critical Task/Step







Facility:	BRUNSWICK	Scenario No.:	2	Op Test No.:	<b>Draft</b>
Examiners:	_____	Operators:	_____		(SRO)
	_____		_____		(RO)
	_____		_____		(BOP)
Initial Conditions:	The plant is operating at 100% power, Middle of Cycle. No equipment is out of service				
Turnover:	Transfer 2A SJAE Train to FULL LOAD and secure 2B SJAE Train IAW 2OP-30.				
Event No.	Malf. No.	Event Type*	Event Description		
1	N/A	N-SRO N-BOP	Transfer 2A SJAE Train to FULL LOAD, secure 2B SJAE Train		
2	NI032F	I-SRO I-RO	APRM 3 fails downscale; (TS)		
3	CN001F	R-RO	Small condenser leak causes lowering vacuum. (AOP) RO reduces reactor power with recirc flow to stabilize vacuum >25".		
4	ZUA125	C-SRO C-BOP	Large debris causes "B" Circ. Water Screen to stop; "CIRC SCREEN Hi DP or STOPPED" alarm; Swap Circ. Pumps per OP		
5	CW023F	C-SRO C-BOP	NSW Pump Trip, failure of STBY pump to auto start, manual start req'd; (AOP-18) (TS)		
6	ES002F	C-SRO C-RO	SRV "E" fails open. (AOP-30) Pull fuses to close SRV; Possible PCCP entry; Place torus cooling in service.		
7	RW013F/15F/ 16F	M-ALL	Un-isolable RWCU leak, SCRAM, Loss of Vacuum; (AOPs, EOPs)		
8	ES028F	C-SRO C-RO	HPCI injection valve fails to auto open		
9	N/A	M-ALL	Emergency Depressurization (EOPs)		
10	K1507A K1512A	C-BOP	Failure of two ADS valves to open, manually open two additional SRV's; Scenario ends when reactor pressure reaches 50#		
* (N)ormal, (R)eactivity, (I)nstrument, (C)omponent, (M)ajor					

## Scenario Description

Event 1 – BOP operator will transfer SJAE 2A to FULL load using ZOP-30 Section 8.1.

Task requires some component manipulations and parameter monitoring.

Event 2 – APRM 3 will fail downscale requiring the APRM to be bypassed and T.S. evaluation.

Event 3 – A small condenser leak which will cause condenser vacuum to slowly lower. Crew should enter AOP-37. SRO should direct RO to lower reactor power to stabilize vacuum. Once power has been reduced at least 5%, vacuum will stabilize.

Event 4 – Large piece of debris will lodge in 2B CW traveling screen. "CIRC SCREEN A HIGH DP or STOPPED" will alarm on panel UA-1. Crew will reference APP and dispatch AO to investigate. AO will report that screen is jammed and will not move. Per the direction of the APP, crew will start an available CW pump and secure 2B CW pump.

Event 5 – The running NSW pump will TRIP on motor overload. The STBY NSW pump will fail to AUTO start. The BOP operator should recognize the failure and manually start the STBY NSW pump. System parameters will return to normal. SRO should address T.S. implications. AOP-18 entry.

Event 6 – SRV "E" will fail full open. Crew will enter AOP-30. Immediate operator actions are unsuccessful in closing the SRV; pulling fuses per supplementary actions will close SRV.

Event 7 – A large un-isolable RWCU leak will occur. Crew will enter AOP-5.0 and SCCP. SRO should direct a SCRAM. Original vacuum leak will worsen causing a complete loss of vacuum. Group 1 isolation will occur due to loss of vacuum.

Event 8 – HPCI injection valve will fail to open if HPCI AUTO initiation is received. Manual operation will open injection valve.

Event 9 – Secondary containment conditions will worsen, forcing the SRO to direct an Emergency Depressurization due to high water levels.

Event 10 – Two ADS SRV's will fail to manually open. SRO should direct opening two additional SRV's. Scenario will end when reactor pressure reaches 100#.

**PROGRESS ENERGY CAROLINAS  
BRUNSWICK TRAINING SECTION**

**2008 NRC EXAM SCENARIO #2**

## SCENARIO DESCRIPTION

Unit Two (2) is operating at maximum power, Middle Of Cycle.

BOP operator will transfer SJAЕ 2A to FULL load using 2OP-30 Section 8.1. After the recombiner strip heaters have been taken to OFF, the scenario will continue.

APRM 3 will fail downscale. Bypassing the APRM will be required. Evaluate Tech Spec 3.3.1.1 and TRMS 3.3 for operability requirements.

A small condenser leak will cause condenser vacuum to slowly lower. Crew will enter AOP-37, Low Condenser Vacuum. The SRO should direct RO to lower reactor power to stabilize vacuum. When power has been reduced 5% - 10%, vacuum will stabilize above 25" hg.

A large piece of debris will lodge in 2A CW traveling screen. "CIRC SCREEN A HIGH DP or STOPPED" will alarm on panel UA-1. Crew will reference APP and dispatch AO to investigate. AO will report that screen is jammed and will not move. Per the direction of the APP, crew will start an available CW pump and secure 2A CW pump.

The running NSW pump will TRIP following shaft seizure. AOP-18 entry. STBY NSW pump will fail to AUTO start. The BOP operator should recognize the failure and manually start the STBY NSW pump. System parameters will return to normal. SRO should address T.S. 3.7.2.

SRV "E" will fail full open. Crew will enter AOP-30. Immediate operator actions will be unsuccessful in closing the SRV. Pulling fuses in supplementary actions will close SRV.

A RWCU leak will develop in the Reactor Building. Crew will enter AOP-5.0 and SCCP. Crew will unsuccessfully attempt to isolate RWCU. SRO should direct reactor scram. Original vacuum leak will worsen causing a complete loss of vacuum. Group 1 isolation will occur.

HPCI injection valve will fail to open if HPCI AUTO initiation is received. Manual operation will open injection valve.

South Core Spray room will fill to the flood hi-hi alarm (max safe). South RHR room flood level hi will alarm. Crew will consider anticipate emergency depressurization. South RHR room flood level hi-hi (max safe) will then alarm requiring emergency depressurization.

Two ADS SRV's will fail to manually open. SRO should direct opening two additional SRV's. Scenario will end when reactor pressure reaches 100# and reactor water level is above 170 inches.

## SIMULATOR SETUP

### Initial Conditions

IC

ENP-24 for IC 13

Rx Pwr      100%

Core Age    MOC

### EVENTS

Event Number	Trigger	Trigger Description	
1	N/A		Transfer 2A SJAE to Full Load, Secure 2B SJAE
2	1	Manual	APRM 3 fails downscale, APRM bypass required
3	2	Manual	Small condenser leak, lowering vacuum, power reduction
4	3	Manual	Circ. Screen Stopped, Swap Circ. water pumps
5	4	Manual	NSW pump trip, failure of STBY NSW pump to start
6	5	Manual	'E' SRV stuck open
7	6	Manual	Unisolable RWCU leak, SCRAM, Loss of vacuum, Gp.I isolation
8	N/A		HPCI Injection valve fails to open
9	N/A		Emergency Depress
10	N/A		Failure of 2 ADS valves to open

## SIMULATOR SETUP

### Interventions Summary (Shaded entries = Active)

### Malfunctions Summary

Malf ID	Mult ID	Description	Current Value	Target Value	Rmptime	Actime	Dactime	Trig
CN001F		LOSS OF CONDENSER VACUUM	0.00	825.00	00:03:00			2
ES002F		ADS VALVE E FAILS OPEN	FALSE	TRUE				4
CW023F	B	NSW PUMP SHAFT SEIZURE	FALSE	TRUE				5
RW013F		RWCU BRK IN TRIANGLE ROOM 70'	0.00	100.0000	00:10:00			6
RW015F		G31-F001 FAILURE TO AUTO CLOSE	TRUE					
RW016F		G31-F004 FAILURE TO AUTO CLOSE	TRUE					
ES028F		HPCI INJECT VLV FAILS TO OPEN	TRUE					
NI032F		APRM FAILS LO	FALSE					1

### Remotes Summary

Remf ID	Mult ID	Description	Current Value	Target Value	Rmptime	Actime	Trig
RW_ZVRW004M		G31-F004 OUTBOARD ISOL VALVE	ON	OFF			8
RW_ZVRW001M		G31-F004 OUTBOARD ISOL VALVE	ON	OFF		00:00:02	9

## SIMULATOR SETUP

### Override Summary

Tag ID	Description	Position/ Target	Actual Value	Override Value	Rmptime	Actime	Dactime	Trig
K1504A	MAN DEPRESS VLV B21-F013E	CLOSE	ON	ON				7
K1504A	MAN DEPRESS VLV B21-F013E	OPEN	OFF	OFF				7
Q1504LGJ	SRV VLV B21-F013E GREEN	ON/OFF	ON	OFF				7
Q1504RRJ	SRV VLV B21-F013E RED	ON/OFF	OFF	OFF				7
K4B20A	NUC HDR SW PMP A DISCH VLV	AUTO	ON	OFF				5
K4B20A	NUC HDR SW PMP A DISCH VLV	MAN	OFF	ON				5
K1507A	AUTO DEPRESS VLV B21-F013C	AUTO	ON	ON				
K1507A	AUTO DEPRESS VLV B21-F013C	OPEN	OFF	OFF				
K1512A	AUTO DEPRESS VLV B21-F013K	AUTO	ON	ON				
K1512A	AUTO DEPRESS VLV B21-F013K	OPEN	OFF	OFF				
Q1314RRK	RWCU VLV G31-F001 RED	ON/OFF	ON	ON				9
Q1314LGK	RWCU VLV G31-F001 GREEN	ON/OFF	OFF	ON				9

### Annunciator Summary

Window	Description	Tagname	Override Type	Oval	AVal	Actime	Dactime	Trig
2-5	CW SCREEN B DIFF HIGH	ZUA125	ON	ON	OFF			3
5-5	OTBD NSS VALVES MTR OVLD	ZA255	ON	ON	OFF			8

### Special Instructions

Load scenario file, 2008 Scenario 2.scn, if required.

Ensure ENP-24 for IC-13 at P603 panel.

## **SHIFT BRIEFING**

### Plant Status

The plant is operating at 100% power, Middle of Cycle.

### Equipment Out of Service

No equipment is out of service

### Plan of the Day

Maintain current power.

Following shift turnover, place 2A SJAE in full load and remove 2B SJAE from service per the direction of 2OP-30 Section 8.1.

The 2B SJAE is being removed from service for periodic maintenance and will be unavailable for 48 hours.

## SCENARIO INFORMATION

### Examiner Notes

#### Procedures Used in Scenarios:

##### EVENT 1

- 2OP-30 Section 8.1 Off-gas Recombiner
- 2APP-UA-45 (6-3) ICNDSR COND OUTLET VLV CO-V17 OPEN
- 2APP-UA-45 (4-3) AFTER CNDSR COND LVL HIGH/LO
- 2APP-UA-45 (3-2) RECOMBINER INLET TEMP LOW

##### EVENT 2

- 2APP-A-06 (2-7) APRM DOWNSCALE
- 2APP-A-06 (3-7) APRM TROUBLE
- 2APP-A-06 (3-8) APRM UPSCALE TRIP/INOP
- 2APP-A-05 (2-2) ROD OUT BLOCK

##### EVENT 3

- AOP-37 LOW CONDENSER VACUUM
- 2APP-UA-48 (5-3) AOG SYSTEM OUTLET FLOW/TEMP HIGH
- 2APP-UA-48 (5-4) AOG SYSTEM BYPASS
- 2APP-UA-23 (2-1) EXH HOOD A VACCUM LOW
- 2APP-UA-23 (3-1) EXH HOOD B VACUUM LOW
- 2APP-A-5 (4-8) OPRM TRIP ENABLED

##### EVENT 4

- 2APP-UA-01 (2-5) CW SCREEN B DIFF-HIGH OR STOPPED
- 2OP-29 Circulating Water System
- AOP-37.1 Intake Structure Blockages

##### EVENT 5

- 2APP-UA-01 (4-10) NUCLEAR HDR SW PUMP B TRIP
- 2APP-UA-01 (1-10) NUCLEAR HEADER SERV WTR PRESS-LOW
- 2APP-UA-03 (1-5) RBCCW HEAD TANK LEVEL HI/LO
- AOP-18 NSW System Failure

##### EVENT 6

- 2APP-A-03 (1-10) SAFETY/RELIEF VALVE OPEN
- 2APP-A-03 (1-1) SAFETY OR DEPRESS VALVE LEAKING
- 2APP-UA-12 (5-4) SPTMOS DIV I
- 2APP-UA-12 (5-5) SPTMOS DIV II
- 2APP-A-2 (3-2) RHR PUMP 2A SEAL CLR FLOW LOW

- 2APP-A-2 (4-2) RHR PUMP 2C SEAL CLR FLOW LOW
- 2APP-A-3 (2-1) CS OR RHR PUMPS RUNNING
- AOP-30 Safety/Relief Valve Failures
- Primary Containment Control Procedure

#### EVENT 7/8

- 2APP-UA-3 (2-7) AREA RAD RX BLDG HIGH
- 2APP-A-4 (5-3) RX BLDG FLR DRN SUMP HIGH
- 2APP-UA-3 (4-5) PROCESS RX BLDG VENT RAD HIGH
- 2APP-A-4 (1-5) RWCU FLTR DEMIN FAILURE
- 2APP-UA-23 (2-1, 3-1) EXH HOOD A/B LOW VACCUUM
- 2APP-UA-23 (1-1) TURB VACCUUM TRIP
- 2APP-A-5 (5-4, 5-3) GP.I ISOL LOGIC TRIPPED
- 2APP-A-7 (3-2) RX PRESSURE HIGH
- 2APP-A-2 (6-8) RB 20/50 FT TEMP HIGH
- 2APP-UA-12 (2-3) SOUTH CS RM FLOOD LEVEL HIGH
- AOP-5.0 High Radiation
- Secondary Containment Control Procedure
- Reactor Vessel Control Procedure

#### EVENT 9/10

- 2APP-UA-12 (1-3) SOUTH CS RM FLOOD LEVEL HI-HI
- 2APP-UA-12 (2-4) SOUTH RHR RM FLOOD LEVEL HI
- 2APP-UA-12 (1-4) SOUTH RHR RM FLOOD LEVEL HI-HI
- AOP-5.0 High Radiation
- Secondary Containment Control Procedure
- Reactor Vessel Control Procedure

#### Critical Tasks

- Recognize failure of HPCI injection valve to auto open and take manual action to open valve.
- Perform Emergency Depressurization when two plant areas exceed max safe water level.
- Recognize failure of two ADS valves to open and manually open two additional SRV's.

## **EVENT 1    SHIFT TURNOVER / SJAE TRAIN MANIPULATIONS**

The crew places 2A SJAE in full load per SCO direction

Malfunctions required:     None

### ***Objectives:***

#### **SRO**

- Directs BOP to place 2A SJAE in full load and remove 2B SJAE from service per 2OP-30 section 8.1.

#### **BOP**

- Places 2A SJAE in full load and removes 2B SJAE from service per 2OP-30 section 8.1.

#### **RO**

- Monitors reactor plant during evolution

### ***Success Path:***

2A SJAE in full load, 2B SJAE secured, vacuum steady

### ***Simulator Operator Actions:***

- If contacted as the Auxiliary Operator, respond that you are standing by and ready to assist during the evolution.

## EVENT 1 SHIFT TURNOVER / SJAE TRAIN MANIPULATIONS

### **Required Operator Actions**

Normal Operations – Transfer 2A SJAE to full load and secure 2B SJAE

#### SRO

- Direct BOP operator to place 2A SJAE in full load and secure 2B SJAE

#### BOP

- Place 2A SJAE in full load and removes 2B SJAE from service per 2OP-30, section 8.1 as follows:
  - Verify Auxiliary Operator available to respond to valve or breaker problems that could be encountered during the transfer.
  - DEPRESS** OFFGAS TRAIN A(B) MASTER SWITCH, FULL LOAD pushbutton.
  - CHECK** SJAE Off Gas Rad Monitors A&B
  - DEPRESS** OFFGAS TRAIN B(A) MASTER SWITCH, OFF/RESET pushbutton.
  - CLOSE** the following condensate system valves:
    - SPE COND INL VALVE
    - AFTERCOND SR COND OUTLET VALVE
    - SJAE INTERCOND SR COND OUTLET VALVE
  - PLACE** recombiner electric strip heaters to OFF
  - ENSURE** condenser vacuum is stable

#### RO

- Monitor reactor plant parameters during evolution.



## **EVENT 2    APRM 3 FAILS DOWNSCALE / TECH SPEC**

The crew responds to annunciator “APRM DOWNSCALE”.

Malfunctions required:

- APRM 3 fails downscale

### ***Objectives:***

#### SRO

- Direct actions in response to an APRM failure
- Evaluates Tech Spec 3.3.1.1 Reactor Protection System Instrumentation

#### BOP/RO

- Respond to APRM failure
- Execute applicable APP's

### ***Success Path:***

Bypass APRM 3 per the Annunciator Panel Procedure

### ***Simulator Operator Actions:***

- WHEN** directed by the lead examiner, activate **TRIGGER 1**  
(APRM 3 fails downscale)
- If contacted as I&C to assist with APRM troubleshooting, acknowledge request.

## EVENT 2    APRM 3 FAILS DOWNSCALE / TECH SPEC

### *Required Operator Actions*

#### SRO

- Direct RO/BOP to enter and execute applicable APPs
- Direct RO to bypass APRM 3
- Refer to T.S. 3.3.1.1
- Refer to TRMS 3.3
- Contacts I&C for support
- Evaluate Tech Spec 3.3.1.1 Reactor Protection System Instrumentation
  - Determine APRM #3 is inoperable
  - Determine 3 of 4 required channels still operable for Function 2
  - Establish tracking LCO for 3.3.1.1. Function 2 APRMs

#### BOP

- Monitor plant parameters

#### RO

- Execute APP A-5(2-7) "APRM DOWNSCALE"
  - Monitor APRM indications
  - Recognize APRM #3 downscale
  - Verify APRM DNSC light ON
  - Verify ROD OUT BLOCK annunciator illuminated
  - Compare APRM #3 indication to other APRMs
  - Notify Unit SRO
  - Bypass the affected APRM



### EVENT 3    **SMALL CONDENSER LEAK / LOWERING VACUUM / POWER REDUCTION**

The crew responds to lowering condenser vacuum.

Malfunctions required:

- Condenser leak

#### ***Objectives:***

##### SRO

- Direct actions in response to lowering condenser vacuum

##### BOP

- Respond to lowering condenser vacuum

##### RO

- Respond to lowering condenser vacuum
- Reduce reactor power, as directed by SRO, to stabilize vacuum above 25"

##### Success Path:

Reduce reactor power approx. 10% to stabilize condenser vacuum above 25" Hg

#### ***Simulator Operator Actions:***

- WHEN** directed by lead examiner, activate **TRIGGER 2**  
(Condenser Leak)
- IF** asked as the Rad Waste Operator to maintain hotwell level using manual hotwell level control, respond in the affirmative.
- IF** contacted as Ops Center to assist with vacuum leak search, acknowledge request.
- IF** contacted as chemistry to perform actions for 15% power reduction, acknowledge.
- IF** contacted as HP to assist in SJAE room entry, acknowledge request.
- IF** contacted as AO to check closed MVD-5023, acknowledge request.

**EVENT 3    SMALL CONDENSER LEAK / LOWERING VACUUM /  
POWER REDUCTION**

***Required Operator Actions***

Reactivity Manipulation – lower reactor power with recirc. to maintain condenser vacuum.

**SRO**

- Direct crew to enter and execute AOP-37 Low Condenser Vacuum
- Direct RO to reduce reactor power until vacuum stabilizes above 25" Hg

**BOP**

- Enter and execute AOP-37 Low Condenser Vacuum
  - Direct Radwaste to maintain hotwell level between -7 and +7 inches in manual hotwell level control
  - Verify proper SJAE operation

**RO**

- Enter and execute AOP-37 Low Condenser Vacuum
  - Reduce reactor power as required to maintain condenser vacuum greater than 25" Hg.



## **EVENT 4    LARGE DEBRIS IN CIRC SCREEN 2A / SWAP CIRC WATER PUMPS**

The crew responds to a jammed circ water traveling screen and swaps CW pumps

Malfunctions required:

- Annunciator UA-01 (2-5) CW Screen B Diff-High or Stopped

### ***Objectives:***

#### SCO

- Supervises the swapping of circ water pumps

#### BOP

- Recognizes the requirement to swap circ water pumps and takes action to do so.

#### RO

- Monitors reactor plant parameters

### ***Success Path:***

Circ water pump 2B removed from service and another available circ pump placed in service.

### ***Simulator Operator Actions:***

- WHEN** directed by the lead examiner, activate **TRIGGER 3**  
(Annunciator – CW Screen A Diff-Hi or Stopped UA-01 / 2-5)
- IF** contacted as the Outside Operator to check the status of the 2A CW Screen, report the screen is stopped and jammed with a large immovable piece of debris. Report all other screens are operating and free of debris.
- IF** contacted as maintenance to assist with screens, acknowledge request.

## **EVENT 4    LARGE DEBRIS IN CIRC SCREEN 2A / SWAP CIRC WATER PUMPS**

### ***Required Operator Actions***

#### **SRO**

- Direct RO/BOP to enter and execute Annunciator Panel Procedure
- Direct RO/BOP to enter and execute AOP-37.1 Intake Structure Blockages

#### **BOP**

- Execute APP UA-01(2-5) CW Screen B Diff-Hi or Stopped
  - Direct aux operator to check status of 2B CW screen
  - When informed of CW screen status:
    - Shutdown 2B Circ. Pump
    - Start an available Circ. Pump

#### **RO**

- Monitor plant parameters



## EVENT 5 NSW PUMP TRIP / FAILURE OF STBY PUMP TO START

The crew responds to the trip of a NSW pump and the failure of the auto pump to start.

Malfunctions required:

- 'B' NSW Pump shaft seizure
- Failure of STBY NSW pump to start

### ***Objectives:***

#### SCO

- Direct actions for loss of NSW
- Evaluates Tech Specs 3.7.2 Service Water System and Ultimate Heat Sink

#### BOP

- Respond to the trip of a NSW pump
- Respond to the failure of an automatic action

#### RO

- Monitor reactor plant parameters

### ***Success Path:***

STBY NSW pump started and NSW system pressure returned to normal band

### **Simulator Operator Activities:**

- WHEN** directed by lead examiner, activate **TRIGGER 4**.  
(NSW pump trip)
- IF** contacted as Outside AO to investigate NSW pump and breaker, acknowledge request.
- IF** contacted as maintenance or I&C to investigate trip, acknowledge request.

## EVENT 5 NSW PUMP TRIP / FAILURE OF STBY PUMP TO START

### *Required Operator Actions*

#### SRO

- Direct entry into AOP-18 NSW System Failure
- Evaluate Tech Spec 3.7.2 Service Water System and Ultimate Heat Sink
  - Determine 2B NSW pump inoperable
  - 3.7.2 Condition B. One required NSW pump inoperable for reasons other than condition A
  - Required Action B.1 Restore required NSW pump to Operable status in 7 days

#### BOP

- Monitor NSW system parameters
- Recognize lowering NSW system pressure
- Enter and execute AOP-18 NSW System Failure
  - Recognize trip of B NSW pump
  - Recognize the failure of the STBY NSW pump to start
  - Start the STBY NSW pump
  - Verify NSW system pressure returns to normal band
- Refer to APP UA-01 (4-10) NUCLEAR HEADER SW PUMP B TRIP

#### RO

- Monitor reactor plant parameters



## EVENT 6 SRV 'E' FAILS OPEN

The crew responds to an inadvertent stuck open SRV

Malfunctions required:

- ADS valve 'E' fails open

### ***Objectives:***

#### SCO

- Direct actions in response to a stuck open SRV

#### BOP/RO

- Respond to a stuck open SRV

### ***Success Path:***

'E' SRV is closed by pulling fuses per the supplementary actions of AOP-30.

### ***Simulator Operator Actions:***

- WHEN** directed by the lead examiner, activate **TRIGGER 5**.  
(ADS valve E fails open)
- If contacted as operator to pull fuses, wait until torus temperature reaches 95F and then activate **TRIGGER 7** and immediately **DELETE** the malfunction from **TRIGGER 5**

## EVENT 6 SRV 'E' FAILS OPEN

### *Required Operator Actions*

#### SRO

- Direct entry into AOP-30 Safety/Relief Valve Failure
- Enter PCCP if torus temp reaches 95F
- Direct BOP to place torus cooling in service per PCCP/Hard Card or OP-17.

#### RO

- Enter and execute AOP-30 Safety/Relief Valve Failure
  - Verify SRV is open using available indications
  - Cycle 'E' SRV control switch several times leaving control switch in CLOSE or AUTO
  - Direct support personnel to pull applicable fuses per Attachment 1 of AOP-30.0
  - Monitor tailpipe temperatures on XU-73
  - When informed that fuses have been pulled, verify SRV is closed

#### BOP

- Enter and execute AOP-30.0
- If directed by SRO, place torus cooling in service per PCCP using the hard card directions or OP-17.
- Monitor plant parameters



## **EVENT 7 & 8      UNISOLABLE RWCU LEAK / SCRAM / LOSS OF VACUUM**

The crew will respond to an un-isolable RWCU leak in secondary containment.

Malfunctions required:

- RWCU leak Triangle Room 77ft
- RWCU isolation valve failures
- Vacuum Loss
- HPCI Injection valve failure to open

### ***Objectives:***

#### SCO

- Direct response to un-isolable primary system breach in secondary containment
- Direct execution of applicable AOPs & EOPs

#### BOP/RO

- Respond to un-isolable primary system breach in secondary containment
- Recognize and respond to component malfunctions
- Execute AOP and EOP actions as directed by SRO
- Perform SCRAM actions
- Control reactor parameters post SCRAM

### ***Success Path:***

Crew enters and executes AOP-5.0 and SCCP, attempts to isolate RWCU, inserts reactor scram, recognizes Gp.I isolation, recognizes failure of HPCI injection valve, maintains reactor water level above LL3, controls reactor pressure with SRVs.

### ***Simulator Operator Actions:***

- WHEN** directed by lead examiner, activate **TRIGGER 6**
- WHEN** crew inserts a **SCRAM**,  
increase **TRIGGER 2** malfunction setting (vacuum leak) to maximum.

## EVENTS 7 & 8 UNISOLABLE RWCU LEAK / SCRAM / LOSS OF VACUUM

### *Required Operator Actions*

#### SRO

- Direct entry into AOP-5.0 High Radiation
- Diagnose source of radiation as RWCU leak
- Direct RO to trip and isolate RWCU
- Enter and execute SCCP
  - Direct a reactor scram
  - Direct cooldown at normal cooldown rates
- Enter and execute RVCP
  - Direct RO/BOP to stabilize reactor pressure below 1050 psig
  - Verify Instrument operability per Caution 1
  - Verify group isolations, ECCS initiations and DG starts as appropriate
  - Direct RO/BOP to restore and maintain reactor water level 170"-200" using systems available in Table 1
- Recognize Group 1 isolation due to loss of vacuum
- Recognize failure of HPCI injection valve to open and direct RO/BOP to manually open valve.
- Contact support personnel for assistance with RWCU isolation valve failures

#### RO

- Monitors reactor plant parameters
- Enter and execute AOP-5.0 High Radiation
  - Diagnose source of radiation as RWCU leak
  - Trip and isolate RWCU as directed by SRO
  - Recognize RWCU isolation valve failures and report to SRO
- Insert Reactor scram as directed by SRO
- Complete scram actions
- Recognize Gp.I isolation (vacuum loss) and report to crew
- Maintain reactor pressure with SRVs as directed by SRO
- Maintain reactor water level as directed by SRO
- Perform reactor cooldown as directed by SRO
- Recognize failure of HPCI injection valve to open and open manually
- Recognize and report to SRO alarm A-2 RB 50/20 ft Temp Hi

## BOP

- Enter and execute AOP-5.0 High Radiation
  - Evacuate Unit 2 Reactor Bldg per AOP-5.0
  - Direct AO to close PIV-33 RB Sprinkler Shutoff Valve per AOP-5.0
  - Direct E&RC to take applicable AOP-5.0 actions
  - Check area radiation readings at back panels
  - Diagnose source of radiation as RWCU leak
  - Trip and isolate RWCU as directed by SRO
  - Recognize RWCU isolation valve failures and report to SRO
- Complete scram actions
- Recognize Gp.I isolation (vacuum loss) and report to crew
- Maintain reactor pressure with SRVs as directed by SRO
- Maintain reactor water level as directed by SRO
- Perform reactor cooldown as directed by SRO
- Recognize failure of HPCI injection valve to open and open manually
- Recognize and report to SRO alarm A-2 RB 50/20 ft Temp Hi
- Recognize and report to SRO alarm UA-12 South Core Spray Flood Level Hi



## EVENT 9 & 10      EMERGENCY DEPRESSURIZATION / ADS VALVE FAILURES

### Required Operator Actions:

#### **SRO**

- Continue reactor cooldown per SCCP direction
- Consider anticipation of Emergency Depressurization per SCCP
- Direct Emergency Depressurization when RHR RM FLOOD LEVEL HI-HI alarm (Two plant areas with radiation levels above Max Safe – South CS and RHR)
- Direct RO/BOP to open 7 ADS valves
- If informed by RP/BOP that 2 SRVs failed to open, direct opening additional SRVs until 7 SRVs are open.
- Direct opening of 2 additional SRVs when informed of ADS valve failures

#### **BOP**

- Continue reactor cooldown as directed by SRO
- Recognize and report South CS and South RHR Room Flood Hi-Hi alarms
- Open seven ADS valves as directed by SRO
- Recognize failure of 2 ADS valves to OPEN and report to SRO
- Open 2 additional SRVs as directed by SRO
- Maintain reactor water level as directed by SRO

#### **RO**

- Continue reactor cooldown as directed by SRO
- Recognize and report South CS and South RHR Room Flood Hi-Hi alarms
- Open seven ADS valves as directed by SRO
- Recognize failure of 2 ADS valves to OPEN and report to SRO
- Open 2 additional SRVs as directed by SRO
- Maintain reactor water level as directed by SRO



**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**

Facility:	BRUNSWICK	Scenario No.:	3	Op Test No.:	<b>Draft</b>
Examiners:	_____	Operators:	_____		(SRO)
	_____		_____		(RO)
	_____		_____		(BOP)
Initial Conditions: Reactor power is 60% with power ascension in progress per GP-04					
Turnover: GP-04 is complete thru step 5.2.21. Continue with step 5.2.22 to place the second reactor feed pump in service in accordance with 2OP-32.					
Event No.	Malf. No.	Event Type*	Event Description		
1	N/A	N – BOP SRO	Place second reactor feed pump in service		
2	N/A	R – RO SRO	Raise reactor power to 70% with recirc.		
3	RD001M	C – RO TS - SRO	Control rod drift (TS)		
4	ES022F	I – BOP TS - SRO	Inadvertent RCIC Initiation (TS)		
5	RD187F	C – RO SRO	CRD pump trip; start STBY CRD pump		
6	IAUPB2A6	C – BOP SRO	Power loss to Main Stack Rad Monitor; SBGT system failure to start		
7	NB006F RP008F	M - All	Main steam line leak in primary containment / SCRAM / 5 rod ATWS		
8	K1227A K1J36A	C – BOP SRO	Drywell Spray required; spray valve failures prevent sprays		
9	N/A	M - All	Emergency Depressurization with low power ATWS		
* (N)ormal, (R)eactivity, (I)nstrument, (C)omponent, (M)ajor					

## Scenario Description

Event 1 – Following shift turnover the BOP operator will place the second reactor feed pump in service.

Event 2 – When the second reactor feed pump is in service, the RO will be directed to raise reactor power to 70% using recirc. per the nuclear engineers direction.

Event 3 – A fully withdrawn control rod will drift full in. The crew will enter AOP-2.0 Control Rod Malfunction/Misposition. AOP-2.0 will direct response per 2APP-A-05 (3-2) ROD DRIFT. The RO should attempt to arrest the drifting control rod.

Event 4 – An inadvertent RCIC initiation will occur. The crew will respond by verifying no initiation signal is present and securing RCIC. If injection occurs, crew will enter AOP-3.0 Positive Reactivity Addition.

Event 5 – The running CRD pump will trip. The crew should respond by placing the STBY CRD pump in service in accordance with the OP.

Event 6 – Power to the Main Stack Radiation Monitor will be lost resulting in a Gp. 6 Isolation. SBGT system will fail to start as required. The crew must diagnose the failure of SBGT and start manually to maintain secondary containment integrity.

Event 7 – A main steam line leak inside primary containment will cause drywell pressure and temperature to rise. The crew should scram the reactor before 1.7 psig or an auto scram will occur. Five control rods will fail to insert following the scram requiring entry into LPC and PCCP.

Event 8 – Containment parameters will worsen requiring drywell and torus sprays. A combination of failures will prevent drywell sprays from occurring.

Event 9 – Drywell temperature will approach or exceed 300F with no drywell sprays available. SRO will direct an Emergency depressurization.

**PROGRESS ENERGY CAROLINAS  
BRUNSWICK TRAINING SECTION**

**2008 NRC EXAM SCENARIO #3**

## SCENARIO DESCRIPTION

Following shift turnover the BOP operator will place the second reactor feed pump in service.

When the second reactor feed pump is in service, the RO will be directed to raise reactor power to 70% using recirc. per the nuclear engineers direction.

A fully withdrawn control rod will drift full in. The crew will enter AOP-2.0 Control Rod Malfunction/Misposition. AOP-2.0 will direct response per 2APP-A-05 (3-2) ROD DRIFT.

An inadvertent RCIC initiation will occur. The crew will respond by verifying no initiation signal is present and tripping RCIC. If injection occurs, crew will enter AOP-3.0 Positive Reactivity Addition.

The running CRD pump will trip. The crew should respond by placing the STBY CRD pump in service in accordance with OP-8.0.

Power to the Main Stack Radiation Monitor will be lost resulting in a Gp. 6 Isolation. SGBT system will fail to start as required. The crew must diagnose the failure of SGBT and start manually to maintain secondary containment integrity.

A main steam line leak inside primary containment will cause drywell pressure and temperature to rise. The crew may scram the reactor before 1.7 psig or an auto scram will occur. The crew will enter RVCP and PCCP.

Five control rods will fail to insert during the scram requiring entry into L/PC.

Containment parameters will worsen requiring drywell and torus sprays. A combination of failures will prevent drywell sprays from occurring.

Drywell temperature will approach or exceed 300F with no drywell sprays available. SRO will direct an Emergency depressurization from LPC. This will require termination and prevention of injection to the reactor prior to opening ADS valves.

With 7 ADS valves open, the crew will inject to the reactor once reactor pressure is less than 120 psig. When injection has been restored to the vessel and level is being maintained above 170 inches the scenario will end.

## SIMULATOR SETUP

### Initial Conditions

IC

ENP-24 for IC 9

Rx Pwr      60%

Core Age    BOC

### EVENTS

Event Number	Trigger	Trigger Description	
1	N/A		Place second reactor feed pump in service
2	N/A		Raise reactor power to 70% with recirc.
3	1	Manual	Control Rod drift
4	2	Manual	Inadvertent RCIC initiation
5	3	Manual	CRD pump trip; start STBY CRD pump
6	4	Manual	Loss of power to Mn Stack Rad Mon / SGBT system failure
7	5	Manual	Main steam leak in primary containment / Scram / 5 rod ATWS
8	N/A		Drywell sprays required; spray valve failures
9	N/A		Emergency depressurization required; ATWS conditions

## SIMULATOR SETUP

### Interventions Summary (Shaded entries = Active)

### Malfunctions Summary

Malf ID	Mult ID	Description	Current Value	Target Value	Rmptime	Actime	Dactime	Trig
RD001M	30-119	CONTROL ROD DRIFT	FALSE	TRUE				1
ES022F		RCIC INADVERTANT START	FALSE	TRUE				2
RD187F	A	CRD PUMP SHAFT SEIZURE	FALSE	TRUE				3
NB006F	B	MSL BREAK	0.00	10.0000	00:20:00			5
RP008F		ATWS 1	TRUE	TRUE				

### Remotes Summary

Remf ID	Mult ID	Description	Current Value	Target Value	Rmptime	Actime	Trig
RH_ZVRH16BT		DW SPRAY VLV E11-F016B	ON	OFF			8
RD_RDELDIS	30-19	ELECTRIC DISARM ROD	ARM	DISARM			5
RD_RDELDIS	30-19	HYDRAULIC DISARM ROD	ARM	DISARM			5
EP_IAEOPJP1		BYPASS LL3 GP.1 ISOL (SEP-10)	OFF	ON			7
RH_IVTRH16B		E11-F016B POS	-1	0			
ED-IAUPB2A6		UPS LOAD BKR PNL 2A SMPL SKD	CLOSE	OPEN			4

## SIMULATOR SETUP

### Override Summary

Tag ID	Description	Position/ Target	Actual Value	Override Value	Rmptime	Actime	Dactime	Trig
K1227A	CONT SPRAY VLV CONTROL	NORMAL	ON	ON				
K1227A	CONT SPRAY VLV CONTROL	NORMAL	OFF	OFF				
K1227A	CONT SPRAY VLV CONTROL	RESET	OFF	OFF				
K2322A	ROD SEL POWER	OFF	ON	ON				5
K2322A	ROD SEL POWER	ON	OFF	OFF				5
K1J36A	CONT SPRAY VLV E11-F016B	AUTO	OFF	OFF				8
K1J36A	CONT SPRAY VLV E11-F016B	CLOSE	ON	ON				8
K1J36A	CONT SPRAY VLV E11-F016B	OPEN	OFF	OFF				8

### Annunciator Summary

Window	Description	Tagname	Override Type	Oval	AVal	Actime	Dactime	Trig
5-8	RHR B VALVES OVERLOAD	ZA358	ON	ON	OFF			8
1-2	CRD HYD TEMP HIGH	ZA512	OFF	OFF	OFF			1

### Special Instructions

Load scenario file 2008 Scenario 3.scn, if required.

Ensure ENP-24 for IC-9 at P603 panel.

Ensure GP-04 open and signed off through step 5.2.21

Ensure GP-04 alternate power verifications signed off through 60% power

## **SHIFT BRIEFING**

### Plant Status

Reactor power is 60% with power ascension in progress per GP-04.

GP-04 is complete thru step 5.2.21.

Alternate power verification for 60% power is complete.

### Equipment Out of Service

None

### Plan of the Day

Following shift turnover, place the second reactor feed pump in service.

After second feed pump is in service, raise reactor power to 70% with recirc.

## SCENARIO INFORMATION

### Examiner Notes

#### Procedures Used in Scenarios:

##### EVENT 1

- 0GP-04 Increasing Turbine Load to Rated Power
- 2OP-32 Section 5.7 Condensate and Feedwater System

##### EVENT 2

- 2OP-02 Section 5.3 Reactor Recirculation System

##### EVENT 3

- AOP-2.0 Control Rod Malfunction / Misposition
- 2APP-A-05 (3-2) CONTROL ROD DRIFT
- 2APP-A-05 (5-2) ROD OUT BLOCK

##### EVENT 4

- AOP-3.0 Positive Reactivity Addition
- 2OP-16 Section 8.7 RCIC System
- 2APP-A-3 (4-5) RCIC BAROM CNDSR VAC TANK LVL HI
- 2APP-A-3 (3-5) RCIC TURBINE STM LINE DRN POT LEVEL HI
- 2APP-A-3 (3-4) RCIC PP DISCH FLOW LOW
- 2APP-A-3 (5-4) RCIC TURBINE TRIP

##### EVENT 5

- AOP-2.0 Control Rod Malfunction / Misposition
- OP-8.0 Section 8.17 CRD Hydraulic System
- OP-2.0 Section 8.7 Recirculation System
- 2APP-UA-17 (6-1) BUS E3 4KV MOTOR OVLD

##### EVENT 6

- 2APP-UA-3 (5-4) PROCESS OG VENT PIPE RAD HIHI
- 2APP-UA-3 (6-4) PROCESS OG VENT PIPE RAD HI
- 2APP-UA-3 (6-3) PROCESS OG VENT PIPE DNSC/INOP
- 2APP-UA-3 (6-10) RX BLDG ISOLATED
- 2APP-UA-5 (3-5) SBTGT A FAILURE
- 2APP-UA-5 (4-6) SBTGT B FAILURE
- 2APP-UA-5 (6-7) RX BLDG STATIC PRESS DIFF LOW

#### EVENT 7

- AOP-14 Abnormal Primary Containment Conditions
- Reactor Scram Procedure
- Reactor Vessel Control Procedure
- Level/Power Procedure
- Primary Containment Control Procedure
- LEP-02

#### EVENT 8

- Level/Power Procedure
- Primary Containment Control Procedure
- SEP-02
- SEP-03

#### EVENT 9

- Level/Power Procedure
- Primary Containment Control Procedure

#### **Critical Tasks**

- Attempt to spray the drywell; recognize spray system failures
- Perform Emergency Depressurization when it is recognized that drywell temperature cannot be restored and maintained below 300F.

## EVENT 1            PLACE SECOND REACTOR FEED PUMP IN SERVICE

The BOP operator places the second feed pump in service per OP-32.

Malfunctions required:

- None

### ***Objectives:***

#### SCO

- Direct BOP operator to place the second RFP in service per OP-32.

#### BOP

- Place a second RFP in service per the direction of OP-32

#### RO

- Monitor reactor plant parameters during RFP startup.

### ***Success Path:***

Two RFPs in service with balanced injection flows.

### ***Simulator Operator Actions:***

- If asked as the RW operator to monitor CDD flows and place additional demins in service as needed, acknowledge request.
- If asked as the RW operator to monitor CDD effluent conductivity, acknowledge request.

## EVENT 1                    PLACE SECOND REACTOR FEED PUMP IN SERVICE

### ***Required Operator Actions***

Normal Operations – Placing a second RFP in service.

#### SRO

- Direct BOP operator to place the second RFP in service per OP-32.

#### BOP

- Place the second RFP in service per OP-32 Section 5.7.
- Notify Radwaste operator to monitor CDD flows
- Ensure RFP B LP SUPPLY VLV 'V1' is open
- Slowly raise RFPT B speed until speed is > 2550 rpm
- When RFPT B speed is > 2550 rpm, match DFCS and SPEED outputs to within 100 rpm
- Notify Radwaste operator to monitor CDD effluent conductivity
- Verify speed signals within 100 rpm and place MAN/DFCS control switch to DFCS
- Slowly raise RFPT speed until RFP discharge pressure is approx. equal to reactor pressure
- Open RFP B DISCH VLV 'V4'
- Slowly raise speed on RFP B to match demand signal of RFP A
- Depress RFP B A/M pushbutton to place RFP B in AUTO
- When RFP B flow is greater than 3.3E6, place RFP B RECIRC VLV 'V47' to close
- When RFP B RECIRC VLV closes, adjust level setpoint to 187 inches
- If desired, balance RFP flows by adjusting flow BIAS settings

#### RO

- Monitor reactor plant parameters during evolution



## **EVENT 2 RAISE REACTOR POWER TO 70% WITH RECIRC SYSTEM**

The crew will increase recirc flow to raise reactor power to 70%.

Malfunctions required:

- None

### ***Objectives:***

#### SCO

- Direct RO to raise reactor power to 70% per guidance of the Reactor Engineer.

#### BOP

- Monitor plant parameters during evolution

#### RO

- Raise reactor power by increasing recirc flow IAW OP-02 Reactor Recirc System

### ***Success Path:***

Reactor power raised to 70% using recirc flow.

### ***Simulator Operator Actions:***

- None

## EVENT 2 RAISE REACTOR POWER TO 70% WITH RECIRC SYSTEM

### ***Required Operator Actions***

Reactivity Manipulation – Raise reactor power by adjusting recirculation flow

#### SRO

- Direct the RO to raise reactor power to 70%

#### BOP

- Monitor plant parameters during the evolution

#### RO

- Raise reactor power by increasing reactor recirculation flow IAW OP-02.
- Request peer checker
- Increase flow on one RR pump at a time to stay within mismatch criteria.
- Continue alternating RR pump speed increases until reactor power is 70%
- Monitor power/flow map
- Monitor plant parameters



## EVENT 3            CONTROL ROD DRIFT

The crew responds to a drifting control rod.

Malfunctions required:

- Drifting control rod

### ***Objectives:***

#### SCO

- Direct actions in response to a drifting control rod
- Evaluate Tech Specs

#### BOP

- Respond to a drifting control

#### RO

- Respond to a drifting control rod

### ***Success Path:***

The drifting control rod is fully inserted, valved out of service and electrically disarmed.

### ***Simulator Operator Actions:***

- WHEN** directed by the lead examiner, activate **TRIGGER 1** (Control Rod Drift)
- WHEN** drifting rod has been fully inserted, **REMOVE** drift malfunction.
- If asked as the RBAO to investigate HCU for control 30-19, acknowledge request.
- If asked as the aux operator to valve out accumulator and disarm control rod, WAIT 2 minutes and activate **TRIGGER 6**.

## EVENT 3

## CONTROL ROD DRIFT

### *Required Operator Actions*

#### SRO

- Direct entry into AOP-2.0 Control Rod Malfunction/Misposition
- Evaluate Tech Spec 3.1.3 Control Rod Operability
  - Condition C. One or more control rods inoperable for reasons other than Condition A or B
  - Required Action C.1 Fully insert inoperable control rod (3 hours)
  - Required Action C.2 Disarm the associated CRD (4 hours)

#### BOP

- Monitor plant parameters

#### RO

- Enter and execute AOP-2.0
  - Perform the actions of APP-A-05 (3-2) ROD DRIFT
    - Determine which control rod is drifting
    - Select the drifting control rod and determine direction of drift
    - Attempt to arrest the drift by giving a withdraw signal
    - If rod continues to drift in, apply an RMCS insert signal and fully insert to position 00.
    - Monitor core parameters



## EVENT 4            INADVERTENT RCIC INITIATION

The crew responds to an inadvertent RCIC initiation and possible injection.

Malfunctions required:

- Inadvertent RCIC initiation

### ***Objectives:***

#### SRO

- Direct actions in response to an inadvertent RCIC initiation and potential positive reactivity addition

#### BOP

- Respond to an inadvertent RCIC initiation and potential positive reactivity addition

#### RO

- Respond to an inadvertent RCIC initiation and potential positive reactivity addition

### ***Success Path:***

Verify RCIC initiation signal not present and trip RCIC.

### ***Simulator Operator Actions:***

- WHEN** directed by the lead examiner, activate **TRIGGER 2.**  
(RCIC Initiation)
- If crew has not recognized RCIC initiation within 5 minutes, call control room as RBAO and ask why RCIC is running.
- If contacted as I&C to assist with troubleshooting, acknowledge request.

## EVENT 4            INADVERTENT RCIC INITIATION

### *Required Operator Actions*

#### SRO

- Direct crew to verify no RCIC initiation signal is present
- Direct crew to trip RCIC following verification of false initiation
- Direct crew to enter and execute AOP-3.0 Positive Reactivity Addition, if required
- Evaluate Tech Spec 3.5.3 RCIC System
  - Condition A. RCIC System Inoperable
  - Required Action A.1 Verify by administrative means HPCI System is OPERABLE (Immediately)
  - Required Action A.2 Restore RCIC to OPERABLE status (14 days)

#### BOP

- Verify false RCIC initiation signal (No LL2 signal present)
- Trip RCIC by pushing the RCIC trip pushbutton
- Enter and execute AOP-3.0 Positive Reactivity Addition, if required
- Reference 2APP-A-3 (3-5) RCIC Turbine Stm Line Drn Pot Level Hi
- Reference 2APP-A-3 (4-5) RCIC Barom Cndsr Vac Tank Lvl Hi

#### RO

- Monitor for RCIC injection
- Enter and execute AOP-3.0 Positive Reactivity Addition, if required
  - If necessary to prevent a scram, reduce reactor power
  - Notify Reactor Engineering



## EVENT 5            CRD PUMP TRIP

The crew responds to a CRD pump trip.

Malfunctions required:

- 2A CRD pump shaft seizure

### ***Objectives:***

#### SRO

- Direct response to a loss of CRD pump

#### BOP

- Respond to a loss of CRD pump

#### RO

- Respond to loss of CRD pump

### ***Success Path:***

Crew places STBY CRD pump in service IAW OP-8.0, section 8.17

### **Simulator Operator Activities:**

- WHEN** directed by the lead examiner, activate **TRIGGER 3** (CRD pump shaft seizure)
- If asked as the aux operator to close SEAL INJECTION FLOW CONTROLLER UPSTREAM ISOLATION VALVE and BYPASS VALVE, wait 2 minutes and report closed.
- If asked as the aux operator to open SEAL INJECTION FLOW CONTROLLER UPSTREAM ISOLATION VALVE or BYPASS VALVE, wait 2 minutes and report open.
- If contacted as RBAO to perform prestart checks on the STBY CRD Pp, wait 2 minutes and report complete and SAT.

## EVENT 5

## CRD PUMP TRIP

### *Required Operator Actions:*

#### SCO

- Direct crew to enter and execute AOP-2.0 Control Rod Malfunction/Misposition
- Request assistance from support personnel for assistance with troubleshooting the trip of 2A CRD pump

#### BOP

- Enter and execute AOP-2.0
- Monitor plant parameters

#### RO

- Enter and execute AOP-2.0
  - Place STBY CRD pump in service IAW OP-8.0 Section 8.17
    - Close SEAL INJ VLV 'V22' for RR pump 2A
    - Close SEAL INJ VLV 'V30' for RR pump 2B
    - Place CRD FLOW CNTRL in MAN and reduce setting to minimum
    - Ensure DRIVE PRESS VLV 'F003' is fully open
    - Ensure RBCCW system in operation
    - Start non-operating CRD pump
    - Raise CRD flow rate to 30-60 gpm by adjusting CRD FLOW CNTRL
    - Restore Seal Purge Flow to Recirc pumps IAW 2OP-2.0 Section 8.7
    - Null CRD FLOW CNTRL by adjusting setpoint tape
    - Shift CRD FLOW CNTRL to AUTO
    - Adjust setpoint tape to maintain cooling water DP 10-26 psid
    - Ensure CRD flow rate 30-60 gpm
    - Establish drive water header DP 260-275 psid by throttling DRIVE PRESS VLV 'F003'



## EVENT 6

## LOSS OF POWER TO MAIN STACK RAD MONITOR

The crew responds to a loss of power to the main stack radiation monitor with a failure of the SBGT system to auto start.

Malfunctions required:

- Power loss to Main Stack Radiation Monitor

### ***Objectives:***

#### SRO

- Direct response to a loss of Main Stack Radiation Monitor

#### BOP

- Respond to a loss of Main Stack Radiation Monitor
- Respond to a failure of SBGT to auto start

#### RO

- Respond to loss of Main Stack Radiation Monitor

### ***Success Path:***

Crew recognizes SBGT failure and manually starts SBGT

### **Simulator Operator Activities:**

- WHEN** directed by the lead examiner, activate **TRIGGER 4** (Power loss to Main Stack Rad Monitor)
- If asked as I&C to investigate, acknowledge request

## EVENT 6

## LOSS OF POWER TO MAIN STACK RAD MONITOR

### *Required Operator Actions:*

#### SCO

- Direct Alarm Panel Procedure actions for loss of Main Stack Rad Monitor
- Recognize failure of SBGT to start and direct manual start
- Contact support personnel for troubleshooting assistance
- Reference Tech Spec 3.3.6.1 and 3.3.6.2
- Reference TRM 3.4
- Reference ODCM 7.3.2

#### BOP

- Recognize and report loss of Main Stack Radiation Monitor
- Verify auto actions occur as described in Alarm Panel Procedure
  - Secondary Containment Isolation
  - SBGT system start
- Recognize a failure of SBGT to start
- Manually start SBGT

#### RO

- Monitor plant parameters



## **EVENT 7    MAIN STEAM SYSTEM LEAK IN THE DRYWELL / SCRAM / ATWS**

The crew responds to a steam leak in the drywell.

Malfunctions required:

- Main Steam leak upstream of flow restrictors
- ATWS 1
- Rod select switch failure

### ***Objectives:***

#### SRO

- Direct response to rising drywell pressure per AOP-14 and PCCP
- Direct SCRAM / ATWS response per Reactor Scram Procedure, Reactor Vessel Control Procedure and Level/Power Control Procedure

#### BOP

- Respond to steam leak in primary containment
- Respond to low power ATWS condition

#### RO

- Respond to steam leak in primary containment
- Respond to low power ATWS condition

### ***Success Path:***

Recognize 4 rod ATWS; Execute RVCP, LPC and PCCP to address plant conditions.

### ***Simulator Operator Actions:***

- WHEN** directed by lead examiner, activate **TRIGGER 4.**  
(steam leak upstream of flow restrictors)
- If asked as additional operator to install jumpers per LEP-02 Section 3, acknowledge request.
- If asked as I&C to investigate failure of Rod Select switch, acknowledge request.
- If requested to install jumpers to bypass LL3 Gp.1 Isol per SEP-10, wait 2 minutes and initiate **TRIGGER 7.**

## EVENT 7 MAIN STEAM SYSTEM LEAK IN THE DRYWELL / SCRAM / ATWS

### *Required Operator Actions*

#### SRO

- Direct crew to enter and execute AOP-14.0
- Enter and execute Reactor Scram Procedure
- Enter and execute Reactor Vessel Control Procedure
- Enter and execute Level / Power Control Procedure
  - Direct RO initiate ARI
  - Direct RO place RR pumps to 10%
  - Request RO report reactor power
  - Direct RO perform LEP-02 Alternate Rod Insertion
  - Direct BOP Inhibit ADS
  - Direct BOP perform SEP-10 Bypass Gp.1 Isolation
  - Direct BOP place RNA switches to OVERRIDE/RESET
  - Direct BOP maintain reactor water level 170-200 inches
  - Direct BOP maintain reactor pressure 800-1000 psig
- Enter and execute Primary Containment Control Procedure

#### BOP

- Enter and execute AOP-14
- Perform Scram actions
- Stabilize reactor pressure below 1050 psig as directed by SRO
- Inhibit ADS as directed by SRO
- Perform SEP-10 Bypass Gp1 Low Level Isolation as directed by SRO
- Place Div 1&2 RNA switches to OVERRIDE/RESET as directed by SRO
- Maintain reactor water level as directed by SRO

#### RO

- Enter and execute AOP-14
- Perform Scram actions
- Recognize 5 rod ATWS and report to SRO
- Initiate ARI as directed by SRO
- Place RR pump speed controllers to 10% as directed by SRO
- Report reactor power is <2% as requested from SRO
- Perform LEP-02 Alternate Control Rod Insertion as directed by SRO
- Recognize failure of Rod Select switch and report to SRO



## EVENT 8                    DRYWELL SPRAYS WITH SPRAY VALVE FAILURES

The crew will attempt to spray the drywell; spray valve failures will prevent spraying.

Malfunctions required:

- 'A' RHR Loop THINK switch failure
- 'B' RHR loop Drywell Spray valve failure

### ***Objectives:***

#### SRO

- Execute PCCP to combat degrading drywell conditions
- Execute L/PC to combat ATWS conditions

#### BOP

- Execute PCCP actions as directed by SRO
- Execute L/PC actions as directed by SRO

#### RO

- Execute PCCP actions as directed by SRO
- Execute L/PC actions as directed by SRO

### ***Success Path:***

Enter and execute L/PC and Primary Containment Control Procedure;  
Recognize equipment failures and take corrective actions.

### ***Simulator Operator Actions:***

- If contacted as I&C to investigate failure of THINK switch, acknowledge request.
- If contacted as I&C or operator to investigate failure of Drywell Spray valve, acknowledge request.

## EVENT 8

## DRYWELL SPRAYS WITH SPRAY VALVE FAILURES

### Required Operator Actions:

#### SRO

- Execute Level/Power Control Procedure
- Execute Primary Containment Control Procedure
  - Evaluate level instrument operability using Caution 1
  - Direct BOP start all available drywell coolers
  - Direct BOP Spray the suppression pool per SEP-03
  - Direct BOP Spray the drywell per SEP-02
  - Direct BOP to place torus cooling in service per hard card
- If informed by BOP/RO of THINK switch failure, contact I&C for troubleshooting assistance.
- If informed by BOP/RO of Drywell Spray valve failure, contact I&C and/or Ops for troubleshooting assistance.

#### BOP/RO

- Maintain reactor pressure and level as directed by SRO
- Place Suppression Pool cooling in service as directed by SRO
- Spray the suppression pool per SEP-03 as directed by SRO
- Spray the drywell per SEP-02 as directed by SRO
  - Ensure WELL WTR TO VITAL HDR 'V141' is closed
  - Ensure 'V111' or 'V117' is OPEN
  - Ensure RR pumps are tripped
  - Place drywell cooler switches to OFF
  - If coolers continue to run, request LOCA lockout switches
  - Place LPCI INITIATION OVERRIDE switch in Manual/Override
  - Place CNT SPRAY CNTRL switch to Manual
  - "A" Loop RHR – recognize failure of THINK SWITCH and report to SRO
  - Ensure at least one RHR pump running
  - Ensure TORUS CLG ISOL VLV 'F024' is closed
  - Confirm SAFE region of Drywell Spray Initiation graph
  - Verify torus level less than +21 inches
  - Open DRYWELL SPRAY INBD ISOL VLV 'F021'
  - Throttle open DRYWELL SPRAY OUTBD ISOL VLV 'F016'
  - "B" Loop RHR - Recognize failure of spray valve and report to SRO



## **EVENT 9    EMERGENCY DEPRESSURIZATION WITH ATWS CONDITIONS**

The crew will initiate emergency depressurization under ATWS conditions.

Malfunctions required:

- None

### ***Objectives:***

#### SCO

- Execute EOPs to combat Emergency Depressurization conditions

#### BOP

- Execute PCCP actions as directed by SRO
- Execute L/PC actions as directed by SRO

#### RO

- Execute PCCP actions as directed by SRO
- Execute L/PC actions as directed by SRO

### ***Success Path:***

Terminate and prevent injection to the reactor vessel and perform emergency depressurization

### ***Simulator Operator Actions:***

- None

## EVENT 9 EMERGENCY DEPRESSURIZATION WITH ATWS CONDITIONS

### *Required Operator Actions*

#### SRO

- Execute Primary Containment Control Procedure
  - Recognize the inability to restore and maintain drywell average air temperature <300F
  - Direct Emergency Depressurization from Level Power Control
    - Direct BOP terminate and prevent injection to the reactor vessel
    - Direct BOP Open Seven ADS valves
    - When reactor pressure is below the minimum alternate flooding pressure (120 psig) direct slowly increase injection to the reactor vessel
    - Direct establish water level 170-200 inches

#### BOP

- Maintain reactor pressure and level as directed by SRO
- Terminate and prevent injection into the reactor vessel as directed by SRO
- Open 7 ADS valves as directed by SRO
- When reactor pressure reaches 120 psig, reestablish level control as directed by SRO

#### RO

- Maintain reactor pressure and level as directed by SRO
- Terminate and prevent injection into the reactor vessel as directed by SRO
- Open 7 ADS valves as directed by SRO
- When reactor pressure reaches 120 psig, reestablish level control as directed by SRO



**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**