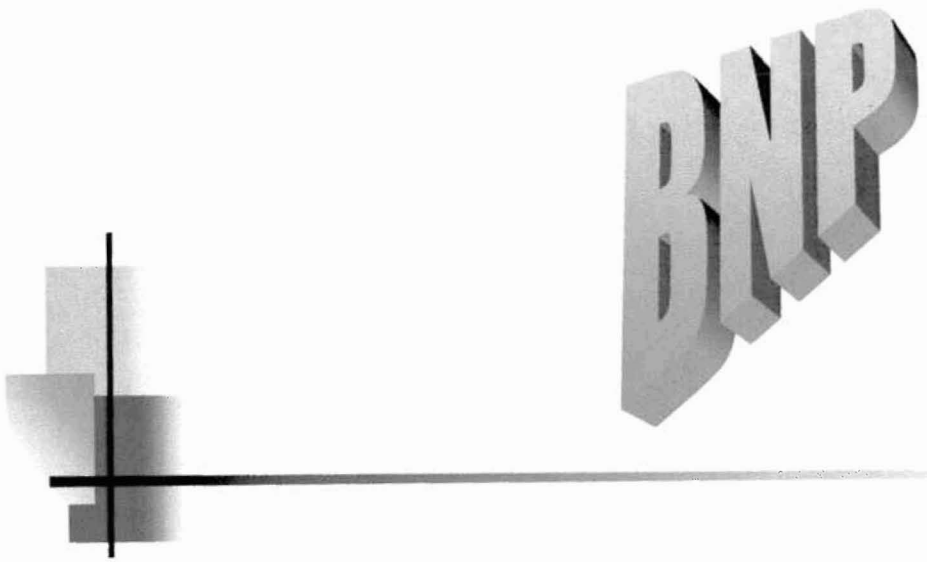

INITIAL LICENSE EXAM

2007

SCENARIO FOUR

Brunswick Steam Electric Plant, Unit No. 2

BRUNSWICK JULY-AUG EXAM - 325, 324/2007-301
FINAL SIMULATOR SCENARIO (4 OF 4)

2007-301
FINAL SCENARIO 4 OF 4

Progress Energy

Facility:	BRUNSWICK	Scenario No.: 4	Op Test No.: **2007 NRC**
Examiners:	_____	Operators:	_____
	_____		_____
	_____		_____

Initial Conditions: A plant startup is in progress. Reactor Power is approximately 4%

GP-2 has been completed with the exception of steps 5.3.55, 5.3.60, 5.3.61, and 5.3.62

The "B" SJAE is in Full Load; the "A" SJAE is shut down

Reactor Pressure is being held at 800 psig to support EHC electrical testing.

Power increase by control rod withdrawal has been authorized to provide additional bypass valve opening.

The Nuclear Engineer has been contacted and continuous rod withdrawal may be used.

Turnover: Continue plant startup IAW GP-2 at step 5.3.55

Place the SJAEs in half load. Currently in 2OP-30.

Continue in GP-10 at Sequence A2X, step 24, Item 251 and raise power, using control rods, to achieve one bypass valve open. Do not exceed 8% power.

Critical Task: See Scenario Summary

Event No.	Malf. No.	Event Type*	Event Description
1	N/A	N-SRO N-BOP	Place SJAEs in half load.
2	N/A	R-SRO R-RO	Increase reactor power
3	N1019F	I-SRO I-RO	IRM "C" Fails "Downscale"
4	Overrides	TS-SRO	HCU Alarm (TS)
5		C-SRO C-BOP	"A" SPE Fan Trips
6	NI024F, Overrides	I/C-SRO I-RO C-BOP	Seismic Event, spurious start of EDG, IRM upscale (TS) (AOP)

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

2) * = Critical Task/Step

7	NI018F RP011F RW013F RW016F EE030M Overrides	M-ALL	Seismic aftershock, ATWS, RWCU Unisolable Leak (EOP) (AOP)
8	CF035F	C-SRO C-BOP	FW injection Valve FW-V120 or Startup Level Control Valve fails closed (dependent on which method of feed is chosen by the operator)
* (N)ormal, (R)eactivity, (I)nstrument, (C)omponent, (M)ajor			

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

2) * = Critical Task/Step

SCENARIO DESCRIPTION

BRUNSWICK 2007 NRC Scenario #4

The plant is at approximately 4% power and a startup is in progress IAW GP-2. The SJAEs must be placed in half load.

As control rods are withdrawn, IRM "C" will fails Downsale The operator must recogize that the IRM "C" is failed. When diagnosed, the SRO will consult TS (3.3.1-RPS) and declare IRM "C" inoperable and direct the RO to bypass IRM "C".

Once the startup continues, Scram Accumulator 34-19 will alarm on low pressure. The crew will dispatch an AO to investigate/charge the HCU. The crew will reference Tech Spec 3.1.5.C.2. and declare the control rod accumulator inoperable if it cannot be recharged within 1 hour.

After TS are addressed for the accumulator the "B" Steam Packing Exhauster will trip requiring starting of the "A" Steam Packing Exhauster.

A seismic event will occur. This will cause the spurious start of the EDG 3 and a high alarm trip of IRM F. A half scram will not occur and this must be diagnosed by the crew. AOP-13 will be entered and the EDG can be secured. IAW Tech Specs (3.3.1), a half scram must be inserted due to the IRM high alarm trip and it will be successful. I&C will also be notified to pull fuses IAW OI-18.

A seismic aftershock will then occur causing IRM A to trip on high alarm but RPS will fail and a manual scram must be inserted. Numerous control rods will fail to insert and 2-EOP-1-LPC must entered for the ATWS Control Rods must be inserted manually and/or SLC injected (**Critical Task)** to shut down the reactor. Additionally, a leak will develop in the RWCU system, RWCU will fail to isolate on the SLC initiation and power will be lost to MCC 2XC.

Attempts to isolate the RWCU leak will be ongoing but will fail. The crew will enter 0EOP-03-SCCP as temperatures and sump levels begin to rise in the Reactor Building. When room flood levels in two areas of the Rx Building exceed max safe levels, Emergency Depressurization will be required **(Critical Task).** The crew must terminate and prevent injection prior to ED per 2EOP-01-LPC **(Critical Task). NOTE:** In the event the crew inserts control rods and enters 2EOP-01-RVCP prior to reflood, Terminate and Prevent would not be required and would not be a critical task.

After the ED, a failure will occur on either the RFPT S/U level control valve or the 2FW-V120 (High Pressure Feedwater Heaters bypass valve) to restore and control vessel level following emergency depressurization. The failure will occur on whatever method is first used by the operator to feed the vessel.

The scenario can be terminated once emergency depressurization occurs and reactor water level has recovered and is stable in the normal band

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

2) * = Critical Task/Step

PROGRESS ENERGY CAROLINAS
BRUNSWICK TRAINING SECTION

2007 NRC EXAM SCENARIO # 4

SCENARIO DESCRIPTION

BRUNSWICK 2007 NRC Scenario #4

The plant is at approximately 4% power and a startup is in progress IAW GP-02. The SJAE must be placed in half load.

As control rods are withdrawn, IRM "C" will fail Downscale. The operator must recognize that the IRM "C" is failed. When diagnosed, the SRO will consult TS (3.3.1-RPS) and declare IRM "C" inoperable and direct the RO to bypass IRM "C".

Once the startup continues, Scram Accumulator 34-19 will alarm on low pressure. The crew will dispatch an AO to investigate/charge the HCU. The crew will reference Tech Spec 3.1.5.C.2. and declare the control rod accumulator inoperable if it cannot be recharged within 1 hour.

After TS are addressed for the accumulator the "B" Steam Packing Exhauster will trip requiring starting of the "A" Steam Packing Exhauster.

A seismic event will occur. This will cause the spurious start of the EDG 3 and a high alarm trip of IRM "F". A half scram will not occur and this must be diagnosed by the crew. AOP-13 will be entered and the EDG can be secured. IAW Tech Specs (3.3.1), a half scram must be inserted due to the IRM high alarm trip and it will be successful. I&C will also be notified to pull fuses IAW OI-18.

A seismic aftershock will then occur causing IRM "A" to trip on high alarm but RPS will fail and a manual scram must be inserted. Numerous control rods will fail to insert and 2-EOP-1-LPC must be entered for the ATWS. Control Rods must be inserted manually and/or SLC injected **(Critical Task)** to shutdown the reactor. Additionally, a leak will develop in the RWCU system, RWCU will fail to isolate on the SLC initiation and power will be lost to MCC 2XC.

Attempts to isolate the RWCU leak will be ongoing but will fail. The crew will enter 0EOP-03-SCCP as temperatures and sump levels begin to rise in the Reactor Building. When room flood levels in two areas of the Rx Building exceed max safe levels, Emergency Depressurization will be required **(Critical Task).** The crew must terminate and prevent injection prior to ED per 2EOP-01-LPC **(Critical Task) NOTE:** In the event the crew inserts rods and enters 2EOP-01-RVCP prior to reflood, Terminate and Prevent would not be required and would not be a critical task.

SCENARIO DESCRIPTION

BRUNSWICK 2007 NRC Scenario #4

After the ED, a failure will occur on either the RFPT S/U level control valve or the 2FW-V120 (High Pressure Feedwater heaters bypass valve) to restore and control vessel level following emergency depressurization. The failure will occur on whatever method is first used by the operator to feed the vessel.

The scenario can be terminated once emergency depressurization occurs and reactor water level has recovered and is stable in the normal band

SIMULATOR SETUP

Initial Conditions

IC	182
Rx Pwr	4%
Core Age	EOC

EVENTS

Event Number	Trigger	Trigger Description	
1	NA	NA	Place both SJAE's in half load
2	NA	NA	Increase Reactor Power
3	1	Manual	IRM "C" fails downscale
4	2	Manual	HCU 34-19 Alarm
5	8	Manual	Trip of "A" SPE
6	3	Manual	Seismic Event, spurious start of an Emergency Diesel Generator, IRM Upscale (Technical Specifications, AOPs)
7	4	Manual	Seismic aftershock, ATWS, RWCU Unisolable Leak EOP, AOP
8	6/7	Manual	Emergency Depressurization/Startup Level Control Valve failure

SIMULATOR SETUP

Interventions Summary
(Shaded entries = Active)

Malfunctions Summary

Malf ID	Mult ID	Description	Current Value	Target Value	Rmptime	Actime	Dactime	Trig
N1015F		IRM B FAILS HI	TRUE	TRUE				
N1019F		IRM C FAILS DOWNSCALE	FALSE	TRUE				1
N1024F		IRM F FAILS HI	FALSE	TRUE				3
N1013F		IRM A FAILS HI	FALSE	TRUE				4
EE030M	2XC	INDIVIDUAL BUS FAILURE	FALSE	TRUE				4
RW016F		G31-F004 FAILURE TO AUTO CLOSE	TRUE	TRUE				
RW013F		RWCU BRK IN TRIANGLE ROOM 77'	0.00	100.0000	00:10:00			4
RP011F		ATWS 4	TRUE	TRUE				
CF035F		S/U LVL CONT VLV FAILS CLOSED	FALSE	TRUE				7
RP005F		AUTO SCRAM DEFEAT	TRUE	TRUE				

Remotes Summary

Remf ID	Mult ID	Description	Current Value	Target Value	Rmptime	Actime	Trig
EP_IAEOPJP1		BYPASS LL-3 GROUP 1 ISOL (SEP-10)	OFF	ON			5

Override Summary

Tag ID	Description	Position/ Target	Actual Value	Override Value	Rmptime	Actime	Dactime	Trig
Q2BQQUAD	ACCUM-ROD DISPLAY	ON/OFF	OFF	ON				2
K4F14A	DIESEL GEN. AUTO-MODE START	START	OFF	ON			00:00:02	3
K1410A	RWCU VLV G31-F004	NORM	ON	ON				
K1410A	RWCU VLV G31-F004	CLOSE	OFF	OFF				
K1410A	RWCU VLV G31-F004	OPEN	OFF	OFF				
K4511C	STM PACKING EXHAUSTER B	NORMAL	ON	OFF				8
K4511C	STM PACKING EXHAUSTER B	START	OFF	OFF				8
K4511C	STM PACKING EXHAUSTER B	STOP	OFF	ON				8
K4511C	STM PACKING EXHAUSTER B	CLOSE	OFF	ON				8
K4403A	FW HEATER 4&5 BYPASS VLV CLOSE	OPEN	OFF	OFF				7

SIMULATOR SETUP

Annunciator Summary

Window	Description	Tagname	Override Type	OVal	AVal	Actime	Dactime	Trig
6-1	CRD ACCUM LO PRESS/HI LEVEL	ZA761	ON	ON	OFF			2
6-4	SEISMIC EVENT	ZUA2864	ON	ON	OFF			3
1-4	SOUTH RHR RM FLOOD LEVEL HI-HI	ZUA1214	ON	ON	OFF			6
2-5	STM PACKING EXHAUSTER B OVLD TRIP	ZUA225	ON	ON	OFF			8

Batch Files

File	Trigger	Description
NRC Scenario S4.bat	9	Auto deletes annunciator A-7-6-1 and Control Rod 34-19 Accum lamp after 20 min
NRC Scenario S4-1.bat	11	Auto deletes FW-V120 switch override and sets SULCV demand to zero

Special Instructions

Load scenario file 2007 NRC Scenario 4.scn

Copy batch files NRC Scenario S4.bat and NCR Scenario S4-1.bat from memory stick E Drive to F Drive on bsimpc00.

Bypass IRM "B"

Provide GP-10 Seq A2X markup for startup continuation at Step 24, Item 251

Provide GP-02 with all steps marked complete except steps 5.3.55, 5.3.60, 5.3.61, and 5.3.62.

SHIFT BRIEFING

Plant Status

A plant startup is in progress. Reactor power is approximately 4%.

0GP-02 has been completed with the exception of steps 5.3.55, 5.3.60, 5.3.61, and 5.3.62.

The "B" SJAE is operating in Full Load; the "A" SJAE is shut down.

Reactor pressure is being held at 800 psig to support EHC electrical testing.

Power increase by control rod withdrawal has been authorized to provide additional bypass valve opening.

Nuclear Engineer has been contacted and continuous rod withdrawal may be used.

Equipment Out of Service

IRM "B" is bypassed and failed upscale

Plan of the Day

Continue plant startup in accordance with 0GP-02.

Following shift turnover, place both SJAEs in half load IAW 2OP-30.

Continue in GP-10 at Sequence A2X, step 24, Item 251.and raise power, using control rods, to achieve one bypass valve open. Do not exceed 8% power.

SCENARIO INFORMATION

Examiner Notes

Procedures Used in Scenarios:

EVENT 1

- 2OP-30, Sections, 5.2 and 8.2

EVENT 2

- 0GP-02

EVENT 3

- Annunciator procedure A-5 1-4, IRM Downscale
- Annunciator Procedure A-5 2-2, Rod Out block
- Technical Specifications 3.3.1.1
- TRM 3.3 Table 3.3-1

EVENT 4

- Annunciator Procedure A-7 6-1, CRD Accumulator Lo Press/Hi Level
- Technical Specifications 3.1.5.C

Event 5

- Annunciator Procedure UA-2 2-5, Steam Packing Exhauster B OVLD Trip
- Annunciator Procedure UA-2 4-5, Gland Seal Vacuum Loss
- OP-26.1, Section 8.1

Event 6

- Annunciator Procedure UA-28 6-4, Seismic Event
- 0AOP-13
- Technical Specifications 3.3.1.1.A.1
- 0OP-39, Section 7.1

Procedures Used in Scenarios (continued):

EVENT 7

- Annunciator Procedure
- 2EOP-01-RSP (Reactor Scram Procedure)
- 2EOP-01-LPC (Level Power Control)
- 0EOP-03-SCCP (Secondary Containment Control Procedure)
- 0EOP-04-RRCP (Radiological Release Control Procedure)

EVENT 8

- Feedwater Level Control "Hard Card"
- 2EOP-01-RVCP (Reactor Vessel Control Procedure)

Critical Tasks

Control Rods must be inserted manually per 0EOP-01-LEP-02 AND/OR SLC initiated to shut down the reactor.

Emergency depressurize the reactor when room flood levels in two areas of the Reactor Building exceed MAX SAFE levels.

Terminate and Prevent injection prior to ED such that there is no uncontrolled injection resulting in a power excursion of greater than 10%.

NOTE: Terminate and Prevent is only required prior to ED when an ATWS is present. IF control rods have been inserted and the crew has exited 0EOP-01-LPC (Level Power Control) prior to ED, then Terminate and Prevent is not required.

EVENT 1 SHIFT TURNOVER, ALIGNING SJAE "A" AND "B" TO HALF LOAD

The crew will align SJAE operation for both SJAE trains in-service in half load.

Malfunction required:

- None

Objectives:

SCO Directs BOP to place "A" and "B" SJAEs in half load in accordance with 2OP-30.

BOP Aligns 2A and 2B SJAE Trains for half load operation IAW 2OP-30.

Success Path:

2A and 2B SJAE trains are aligned for half load operation IAW 2OP-30.

Simulator Operator Activities:

- **WHEN** requested, adjust 2-CO-FV49 signal to adjust Condensate Header pressure.
- IF contacted, as TBAO, for SJAE alignment, state all AO actions are complete including placing the H2/O2 monitors in service.

Required Operator Actions

SRO

- Direct BOP to align SJAEs for half load operation IAW 2OP-30, sections 8.2. and 5.2.

BOP

- Aligns SJAEs for half load operation IAW 2OP-30, sections 8.2. and 5.2.
- Notifies E&RC Steam Jet Air Ejectors are in half load.

EVENT 1 SHIFT TURNOVER, ALIGNING SJAE "A" AND "B" TO HALF LOAD

APPLICANT'S ACTIONS OR BEHAVIOR:

EVENT 2 INCREASE REACTOR POWER

Malfunction required:

- None

Objectives:

SCO Directs RO to increase reactor power with control rods per GP-02.

RO Pulls control rods to increase reactor power.

Success Path:

Rx power increasing, RO monitors reactor parameters.

Simulator Operator Activities:

- None

Required Operator Actions

SRO

- Directs increasing reactor power per GP-02.

RO

- As directed, increases Rx power per GP-02 with control rods. Monitors Rx power, pressure, and level. Uses sequence (GP-10) A2X, step 251, Rod 38-15, from position 08-12.

EVENT 2 INCREASE REACTOR POWER

APPLICANT'S ACTIONS OR BEHAVIOR:

EVENT 3 IRM "C" FAILS DOWNSCALE

The crew will raise reactor power and respond to a failure of IRM "C".

Malfunctions required:

- IRM "C" will fail "downscale".

Objectives:

SCO — Recognizes the downscale failure of IRM "C," declares IRM "C" inoperable and determines the impact utilizing Technical Specifications. (3.3.1.1-RPS- Tracking LCO – not in an action statement) (TRM Rod Block- 3.3, Table 3.3-1)

During/following the assessment of IRM "C", directs the RO to place IRM "C" in bypass.

Contacts I&C for troubleshooting assistance on IRM "C"

RO — Stops control rod withdrawal.

While raising power, observes and reports that IRM "C" is downscale

When directed, places IRM "C" in bypass.

References Annunciator Procedures

Success Path:

During withdrawal of control rods for power ascension, IRM "C" is identified as failing downscale and declaration of inoperability and bypassing of it are accomplished. Part of the inoperability determination will be that there are adequate IRMs to meet minimum required.

Simulator Operator Activities:

- **WHEN** control rod withdrawal is commenced and directed by lead examiner, activate **TRIGGER 1** (IRM "C" Fails Downscale).
- **WHEN** asked, as I&C, to assist in the investigation of the failure, acknowledge the request.

EVENT 3 IRM "C" DOWNSCALE

Required Operator Actions

Instrumentation Response – IRM "C" fails downscale

SRO

- Evaluates report of IRM "C" failure to respond to the power change and declares IRM "C" inoperable.
- Contacts I&C to request support in the investigation of the IRM "C" failure.
- Recognizes the downscale failure of IRM "C," declares IRM "C" inoperable and evaluates Tech Spec impact:

  Tech Spec 3.3.1.1 (RPS) Tracking LCO – no actions required

  TRM 3.3, Table 3.3-1 (Rod Block) Tracking TRM – no actions required

- Directs RO to bypass IRM "C ".

RO

- Responds to the following Annunciators:
  - 2-A-5 1-4, IRM DOWNSCALE
  - 2-A-5 2-2, ROD OUT BLOCK
- Stops control rod withdrawal
- Identifies and reports the failure of IRM "C" to respond to the withdrawal of control rods.
- When directed, bypasses IRM "C" per APP directions.

EVENT 3 IRM "C" DOWNSCALE

APPLICANT'S ACTIONS OR BEHAVIOR:

EVENT 4 HCU ALARM

The crew respond to an HCU accumulator alarm.

Malfunction required:

- HCU 34-19 will receive an accumulator low gas pressure/hi water level alarm – actual cause will be a low gas pressure.

Objectives:

SCO Correctly evaluates the condition of the accumulator as inoperable per TS 3.1.5.C. Control Rod will be inoperable if accumulator is not returned to operable within one hour (TS 3.1.5.C.2)

RO Responds to annunciator 2-A-7 6-1, CRD Accumulator Lo Press/Hi Level.

Success Path:

SCO obtains information regarding the HCU and correctly evaluates the HCU accumulator as being inoperable due to low accumulator gas pressure. (Technical Specifications).

Simulator Operator Activities:

- **WHEN** directed by the lead examiner, initiate **TRIGGER 2** (HCU 34-19 low pressure alarm)
- **WHEN** contacted as the building auxiliary operator, wait 3 minutes and report that the HCU alarm is due to low accumulator nitrogen pressure, and that the pressure is 930 psig.
- **WHEN** directed as the auxiliary operator to recharge the HCU accumulator, acknowledge the request and activate **TRIGGER 9** (Automatically deletes the accumulator lamp and annunciator overrides after 20 minutes)
- **WHEN** annunciator A-7 6-1 clears and control rod 34-19 accumulator lamp extinguishes (20 min after Trigger 9 is activated) then notify control room that the accumulator is charged.

EVENT 4 HCU ALARM

Required Operator Actions

Normal Plant Operation – Assessing Technical Specifications due to a parameter outside establish bands (HCU accumulator alarm due to low nitrogen pressure)

SRO

- Successfully evaluates that the low nitrogen pressure on HCU 34-19 as resulting in an inoperability on the associated HCU.

  Tech Spec 3.1.5.C: One or more control rod scram accumulators inoperable with reactor steam dome pressure <950 psig

  C.1: Immediately verify rods with inoperable accumulators are fully inserted (affected rod is fully inserted)

  C.2: Declare associated control rod inoperable within 1 hour (success path is to re-charge accumulator).

- Directs RO to have Auxiliary Operator charge accumulator

RO

- Responds to annunciator 2-A-7 6-1, CRD ACCUM LO PRESS/HI LEVEL

RO/BOP

- Dispatches AO to determine whether the alarm is due to low pressure or high level.

EVENT 4 HCU ALARM

APPLICANT'S ACTIONS OR BEHAVIOR:

EVENT 5 "B" SPE FAN TRIPS

The crew will respond to a trip of the "B" SPE and will place the "A" SPE in service

Malfunctions required:

2B Steam Packing Exhauster Trip.

Objectives:

SCO Diagnoses trip of 2B Steam Packing Exhauster.

Directs placing the 2A Steam Packing Exhauster in service per OP-26.1, Section 8.1.

BOP Responds to annunciators:
2-UA-2 2-5 STEAM PACKING EXHAUSTER B OVLD TRIP
2-UA-2 4-5, GLAND SEAL VACUUM LOSS

Diagnoses trip of 2B Steam Packing Exhauster.

As directed, places 2A Steam Packing Exhauster in service per OP-26.1,Section 8.1.

Success Path:

Places 2A SPE in service.

Simulator Operator Activities:

- **WHEN** directed by the lead examiner, activate **TRIGGER 8** (Trip of "B" Steam Packing Exhauster)
- **WHEN** asked acknowledge MVD-V51 is open
- **WHEN** asked acknowledge MVD-V52 is closed
- **IF** asked, as AO, to investigate SPE "B" breaker, report that there are no indications of trouble with the breaker.

EVENT 5 "B" SPE FAN TRIPS

Required Operator Actions

SCO

- Diagnoses trip of 2B Steam Packing Exhauster.
- Directs placing the 2A Steam Packing Exhauster per OP-26.1, Section 8.1.

BOP

- Responds to annunciators:
  2-UA-2 2-5 STEAM PACKING EXHAUSTER B OVLD TRIP
  2-UA-2 4-5, GLAND SEAL VACUUM LOSS
- Diagnoses trip of 2B Steam Packing Exhauster.
- As directed, places 2A Steam Packing Exhauster in service per OP-26.1,Section 8.1.

RO/BOP

- Dispatches AO to investigate cause of SPE "B" trip.

APPLICANT'S ACTIONS OR BEHAVIOR:

EVENT 6 SEISMIC EVENT, IRM UPSCALE, SPURIOUS DIESEL GENERATOR START

The crew will respond to a seismic event annunciator, IRM "F" failing upscale without causing a half scram signal on the "B" RPS channel, and a spurious start of Emergency Diesel Generator #3.

Malfunctions required:

The seismic event annunciator will alarm, IRM "F" will fail upscale without a change in reactor power, the #3 Emergency Diesel Generator will receive a spurious automatic start signal.

Objectives:

SCO Enters 0AOP- 13.0 and contacts the National Earthquake Center to verify the validity of the alarm.

Diagnoses the condition with IRM "F" and directs the RO to insert a manual scram signal on the "B" RPS channel

Contacts I&C for assistance in investigating the start of #3 Emergency Diesel Generator and the failure of IRM "F".

Directs the BOP to dispatch personnel into the field to investigate for potential damage due to the earthquake.

RO Observes and reports the upscale failure of IRM "F" and a failure of a scram signal to be generated on the "B" RPS channel

When directed, inserts a manual scram signal on the "B" RPS channel.

BOP When directed, enters and executes 0AOP- 13.

When directed, secures #3 Emergency Diesel Generator and places it in standby.

Success Path:

The crew will enter and execute 0AOP-13, dispatch personnel to investigate for damage from the earthquake, insert a scram signal on the "B" RPS channel, and return #3 Emergency Diesel Generator to a standby condition.

EVENT 6 SEISMIC EVENT, IRM UPSCALE, SPURIOUS DIESEL GENERATOR START

Simulator Operator Activities:

- **WHEN** directed by the lead examiner, activate **TRIGGER 3** (Seismic Event, spurious start of Emerg DG #3, IRM "F" fails upscale)
- **WHEN** contacted as AO to monitor and investigate DG# auto start, report that DG#3 is running properly and there is no indication of the cause of the auto start.
- **WHEN** contacted as the National Earthquake Center, confirm that an earthquake has occurred with an epicenter at Charleston, SC. Also state that a magnitude has not yet been determined.
- **WHEN** contacted as I&C to investigate IRM "F" failure, acknowledge request.
- **WHEN** contacted as I&C to investigate the #3 Emergency Diesel Generator, acknowledge the request, wait 3 minutes, and report to the control room that the diesel start was due to spurious relay actuations caused by the seismic event and that investigation has confirmed that no damage to the diesel circuitry has occurred and that the diesel can be secured and returned to standby.
- **WHEN** contacted as the auxiliary operators to enter the buildings and inspect for damage, acknowledge the request.

EVENT 6 SEISMIC EVENT, IRM UPSCALE, SPURIOUS DIESEL GENERATOR START

Required Operator Actions

Abnormal Operating Procedures – Seismic Event

SRO

- Enters 0AOP-13 and directs BOP to execute applicable steps to support investigation of the seismic event (includes contacting National Earthquake Center)
- Recognizes that failure of "B" RPS to trip on the failure of IRM "F".
- Directs the RO to insert a manual trip of RPS "B".
- Contacts I&C to support investigation of IRM "F" failure.
- References TS 3.3.1.1.A.1 - Place channel in trip per OI-18 within 12 hours (Table 3.3.1.1-1.a.).
- Contact I&C to investigate DG#3 auto start.

RO

- Informs SRO of IRM "F" upscale and failure of the signal to cause a scram signal on the "B" RPS system.
- Monitors Plant Parameters as directed by 0AOP-13.
- When directed by the SRO, insert a manual trip of RPS "B".

BOP

***EVALUATOR NOTE:** Opposite unit personnel will perform back panel actions for indications on seismic monitor.

- When directed, enter and execute 0AOP-13 in response to the seismic event.
- Responds to annunciator UA-28 6-4 "Seismic Event"
- When directed, secure #3 Emergency Diesel Generator and return it to a standby lineup per OP-39, Section 7.1.

EVENT 6 SEISMIC EVENT, IRM UPSCALE, SPURIOUS DIESEL GENERATOR START

Required Operator Actions (continued)

RO/BOP

- Dispatch AO's to monitor DG#3 and perform walkdowns as required by 0AOP-13.

APPLICANT'S ACTIONS OR BEHAVIOR:

EVENT 7 SEISMIC AFTERSHOCK, ATWS, RWCU UNISOLABLE LEAK

The crew will respond to a failure to scram and an unisolable leak on the RWCU system located inside the Secondary Containment.

Malfunctions required:

- RPS Channel "A" will fail to initiate a scram signal when IRM "A" fails upscale, resulting in an ATWS condition. A leak will develop on the RWCU system in the Secondary Containment, and will not be able to be isolated due to a failure of the 2-G31-F004 and a loss of power to the 2-G31-F001.

Objectives:

SCO

Enters 2EOP-01-LPC (Level Power Control) and directs the actions of the crew in response to the ATWS. Directs LEP-02 and SLC initiation.

Enters 0EOP-03-SCCP (Secondary Containment Control Procedure) and directs the actions of the crew based on the unisolable leak from RWCU.

Enters 0AOP-05.0 due to the unisolable leak from RWCU in the Secondary Containment.

RO

Recognizes and reports the failure of IRM "A" to cause a reactor scram signal to be generated and attempts to manually insert a scram on the RPS "A" channel.

When directed, enters and executes LEP-02.

When directed, initiates SLC.

Initiates ARI per hard card and places mode switch to shutdown.

EVENT 7 SEISMIC AFTERSHOCK, ATWS, RWCU UNISOLABLE LEAK

Objectives (continued):

BOP

Recognizes and reports a failure of RWCU to isolate and attempts to close the valves by operator action.

Recognizes and reports the failure of the 2-G31-F004 to close and the loss of power to the 2-G31-F001.

Observes and reports annunciators relating to Secondary Containment parameters, specifically relating to room flooding status for evaluation of Secondary Containment Control Procedure.

Success Path:

The crew will correctly diagnose the ATWS and the unisolable leak in the Secondary Containment and respond correctly according to 2EOP-01-LPC, 0EOP-03-SCCP and 0AOP-05.

EVENT 7 SEISMIC AFTERSHOCK, ATWS, RWCU UNISOLABLE LEAK

Simulator Operator Activities:

- **WHEN** directed by the lead examiner, activate **TRIGGER 4** (Seismic aftershock, ATWS, RWCU Unisolable leak).
- **WAIT** 1 minute and report to the control room that there is steam on the 50 ft of the Reactor Building and everyone is leaving the building.
- **IF** directed to close FP-PIV-33, acknowledge request, wait 3 minutes, then report PIV-33 closed.
- **IF** requested, as I&C, to perform surveys, acknowledge request.
- **IF** requested to defeat the Low Level 3, Group 1 isolation signal IAW SEP 10, wait 3 minutes and actuate **TRIGGER 5.**
- **IF** directed, as AO, to reclose Substation E7 feeder breaker to MCC 2XC, acknowledge request.
- **IF** directed to attempt to reset the breaker on the 2-G31-F004, acknowledge the request, wait 1 minute, and notify the control room that the Reactor Building cannot be accessed due to the steam.
- **WHEN** requested, wait 3 minutes and notify control room that the LEP-02, Section 3 jumpers are installed.

EVENT 7 SEISMIC AFTERSHOCK, ATWS, RWCU UNISOLABLE LEAK

Required Operator Actions:

SRO

- Recognizes failure of automatic scram and directs RO to insert a manual scram.
- Determines Reactor Power is >2% (ATWS) goes to Level-Power Control
- Enters 2EOP-01-LPC (Level Power Control) and directs the actions of the crew in response to the ATWS.

NOTE: To shutdown reactor, directs LEP-02 to manually insert control rods and/or initiate SLC. **(Critical Task)**

- Q leg of EOP-01-LPC if Reactor Power is >2%
  - Ensures/directs RO take the reactor mode switch to Shutdown when steam flow is <3Mlbm/hour
  - Ensures/directs that RO manually initiate ARI
  - Directs "RO to place Recirc Controllers to 10%
  - Determines power is >2%
  - Directs RO to trip both Recirc Pumps
  - Determines power is >2%
  - Directs RO to initiate SLC (determines G31-F004 does not close)
  - Directs BOP to coordinate attempts to reset G31-F004 breaker
  - Recognizes G31-F001 does not have power
  - Directs BOP to inhibit ADS
  - Directs RO to perform LEP-02 (Alternate Control Rod Insertion)
  - Monitors SLC Tank Level
- Q leg of EOP-01-LPC if Reactor Power is <2%
  - Ensures/directs RO take the reactor mode switch to Shutdown when steam flow is <3Mlbm/hour
  - Ensures/directs that RO manually initiate ARI
  - Directs "RO to place Recirc Controllers to 10%
  - Determines power is <2%
  - Evaluates if Reactor can be shutdown before Suppression Pool temperature exceeds 110°F.

Required Operator Actions (continued):

SRO (cont.)

- If YES:
  - Directs RO to perform LEP-02 (Alternate Control Rod Insertion)
  - Monitors SLC Tank Level
- If NO:
  - Directs RO to initiate SLC (determines G31-F004 does not close)
  - Directs BOP to coordinate attempts to reset G31-F004 breaker
  - Recognizes G31-F001 does not have power
  - Directs BOP to inhibit ADS
  - Directs RO to perform LEP-02 (Alternate Control Rod Insertion)
  - Monitors SLC Tank Level

o L leg of EOP-01-LPC if power is >2%

- o There are duplicate action of the RC/Q leg not listed
- o Bypass Group 1 Low Level isolation per (SEP-10)
- o Determines reactor power >2%
- o Deteremines reactor level >90"
- o Directs terminate and prevent injection to suppress power
  - Condensate/Feedwater
  - HPCI
  - RHR
  - Core Spray
  - Alternate Coolant Injection

EVENT 7 SEISMIC AFTERSHOCK, ATWS, RWCU UNISOLABLE LEAK

Required Operator Actions (continued):

SRO (cont.)

- When level is at 90" assesses Table 3
  - Power >2%
  - Suppression Pool Temp >110°F
  - RPV Level > TAF
  - SRV Open/being used for pressure control or drywell pressure >1.7 psig
- If Table 3 = YES then
- Continue lowering level until any Table 3 condition is not met
- Direct controlling of level between LL4 and the level deliberately lowered to for power suppression (variable, based on efficiency and promptness of actions)

***NOTE:** If reactor power is below 2%, lowering level to 90" is not required.

- L leg of EOP-01-LPC if power is <2%
  - There are duplicate action of the RC/Q leg not listed
  - Bypass Group 1 Low Level isolation per (SEP-10)
  - Assess Table 3 not met and control level between LL-4 and 200"

- P leg of EOP-01-LPC
  - Direct RO/BOP stabilize maintain reactor pressure 800 psig to 1000 psig using EHC pressure control (bypass valves) and/or SRVs

EVENT 7 SEISMIC AFTERSHOCK, ATWS, RWCU UNISOLABLE LEAK

Required Operator Actions (continued):

SRO (cont.)

- Enters 0EOP-03-SCCP (Secondary Containment Control Procedure) due to high area temperatures (50 ft reactor building) and/or High Room Flood Levels and directs the actions of the crew based on the unisolable leak from RWCU.
  - Direct actions IAW AOP-05.0 due to steam leak in the Reactor Building
  - Evaluates Ventilation exhaust rad has not exceeded 4 mr
    - If YES
    - Directs isolation of Rx Bld HVAC
    - Directs SBGT initiation
  - Evaluates if Rx Bld Vent Temp Hi annunciator (UA-03 6-2) is in alarm
    - If YES
    - Directs isolation of Rx Bld HVAC
    - Directs SBGT initiation
  - **NOTE:** If NO to vent rad and vent temp and Rx Bld Ventilation is isolated then directs restart of Rx Bld ventilation
  - Directs alignment of Service Water to the vital header
  - Evaluates if a primary system is discharging into the reactor building (Yes for these conditions)
  - Determines cooldown is not allowed if ATWS conditions exist (guidance on LPC flowchart)
  - Evaluates if area temperature alarms have reached their alarm points
    - 2-A-2, 5-7 Steam Leak Det Ambient Temp Hi
    - 2-A-2, 6-8 RB 20/50 Ft Elev Temp Hi
  - Directs BOP to investigate the alarms, if received
  - Evaluates Secondary Containment water levels and determines cannot anticipate Emergency Depressurization due to ATWS (guidance on LPC flowchart)

- When second area water level >Max Safe water level, recognizes Emergency Depressurization is required and utilizes Level-Power control for guidance.

- Recognizes that NO26A & B are not operable due to steam leak in the Rx Bldg (Caution 1)
- Requests SEP-10 jumpers installed to defeat Low Level III Group One isolation.

EVENT 7 SEISMIC AFTERSHOCK, ATWS, RWCU UNISOLABLE LEAK

Required Operator Actions (continued):

RO

- Recognizes and reports the failure of IRM "A" to cause a reactor scram signal to be generated and attempts to manually insert a scram on the RPS "A" channel.
- When directed, inserts manual scram.
    - Recognizes and reports failure of rods to insert (ATWS)
    - Places ARI to Trip (IAW SCRAM Hard Card)
- Places Reactor Mode Switch to shutdown (immediate operator action or as directed by SRO)
- Places Reactor Mode Switch to shutdown (immediate operator action or as directed by SRO)
- Places Recirc Controllers to 10% (per scram hard card or as directed by SRO)
- When directed, trips both reactor Recirc Pumps
- When directed, initiates SLC
    - Identifies and reports the G31-F004 does not close on SLC initiation.

EVENT 7 SEISMIC AFTERSHOCK, ATWS, RWCU UNISOLABLE LEAK

Required Operator Actions (continued):

BOP

- When directed, controls reactor pressure 800 psig to 1000 psig using Bypass Valves or SRV's,
- When directed, controls reactor water level 170" to 200" using Feedwater and Condensate
- Recognizes and reports the failure of the 2-G31-F004 to close and the loss of power to the 2-G31-F001.

- Directs AO to close FP-PIV-33 per 0AOP-13.

- Observes and reports annunciators relating to Secondary Containment parameters, specifically relating to room flooding status for evaluation of Secondary Containment Control Procedure.

- Recognizes the failure of the RWCU isolation valves to close, attempts to close them through manual action, and reports the results to the SCO.

    - Directs AO to attempt reclosure of Bus E7 feeder breaker to MCC 2XC.

- Carries out actions necessary to control reactor level and pressure as directed by the SCO.

RO/BOP

- When directed, inhibits ADS.
- When directed, perform LEP-02, Alternate Control Rod Insertion

****(Critical Task)**** When directed manually inserts control rods per LEP-02 and initiates SLC

- Terminate/prevent injection of Condensate and Feed
    - Trip both reactor Feed Pumps
    - Close 2-FW-V6/V8 (or FW-V118/V119)
    - Place SULCV in Manual/Close
- Terminate HPCI
    - Trip Turbine
    - When HPCI is at zero speed, place aux. oil pump in Pull-To-Lock (PTL)
- If running, place RHR and Core Spray Pump "Control Switches to "OFF"

EVENT 7 SEISMIC AFTERSHOCK, ATWS, RWCU UNISOLABLE LEAK

Required Operator Actions (continued):

RO/BOP (cont.)

- When directed, start injection source to maintain level within the established level band (most probable system will be HPCI)
  - HPCI
    - Open E41-F059
    - Start Vacuum Pump
    - Open E41-F001
    - Start Aux Oil Pump
    - Open E41-F006 (auto open on valve is failed, but valve will open when control switch is operated.
    - Adjust Flow Controller to desired injection rate.

- When directed, establishes and controls reactor pressure in a band 800 psig to 1000 psig.
  - Using EHC Pressure control and/or SRVs
- Per AOP-05.0
  - Evacuates reactor building of unnecessary personnel
  - Directs Auxiliary Operator to unlock and close PIV-33
  - Notifies E&RC to sample/survey/control area.
  - Acknowledges and reports annunciators
    - 2-A-2, 5-7 Steam Leak Det Ambient Temp Hi
    - 2-A-2, 6-8 RB 20/50 Ft Elev Temp Hi
  - When directed, investigates high temperature annunciators
- Monitors for and reports alarm status changes for Secondary Containment parameters.

EVENT 7 **SEISMIC AFTERSHOCK, ATWS, RWCU UNISOLABLE LEAK**

APPLICANT'S ACTIONS OR BEHAVIOR:

EVENT 8 EMERGENCY DEPRESSURIZATION/START-UP LEVEL CONTROL VALVE FAILURE

The crew will respond to a flooding condition in two areas of the Secondary Containment requiring Emergency Depressurization, followed by a failure of the Startup Level Control Valve in the "Closed" position or the failure to open of valve 2-FW-V120. Either of these valves will permit makeup to the reactor vessel via the Condensate and Feedwater system. The first one attempted for use by the operator will fail.
NOTE: Anticipating Emergency Depressurization with an ATWS is not allowed.

Malfunctions required:

Flooding will occur in two areas of the Secondary Containment with a primary system causing the flooding, requiring Emergency Depressurization. Upon depressurization, the Startup Level Control Valve OR 2-FW-V120 will fail closed.

Objectives:

SCO

Direct actions associated with 0EOP-03-SCCP (Secondary Containment Control Procedure) to Emergency Depressurize the reactor when two area flood levels reach max safe.

Directs BOP to open 7 ADS valves to Emergency Depressurize the reactor and to control injection sources.

BOP

When directed, Emergency Depressurizes the reactor.

When attempting to restore feedwater flow, correctly diagnoses and reports either the failure of the Startup Level Control Valve **OR** the 2-FW-V120 has failed. Uses the one method that is available to feed the reactor.

Success Path:

Crew recognizes the flooding condition in the Secondary Containment requiring Emergency Depressurization, successfully depressurizes the reactor, recognizes the failure of the Startup Level Control Valve OR the 2-FW-V120 valve.

EVENT 8 EMERGENCY DEPRESSURIZATION/START-UP LEVEL CONTROL VALVE FAILURE

Simulator Operator Activities

- **WHEN** directed by the lead examiner, initiate **TRIGGER 6. This TRIGGER wiil cause the final HI-HI room level leading to the Emergency Depressurization.**
- ****NOTE:** Do not activate trigger 7 if SULCV is open.****
- **WHEN** 7 ADS valves are opened and injection condensate and feed has been terminated and prevented (SULCV is shut), then activate **TRIGGER 7** (Fails SULCV and FW-V120 closed).
- ***NOTE: WHEN** the operator attempts to open the SULCV, the FW-V120 override will auto delete and if the operator attempts to open FW-V120, the SULCV malfunction will auto delete.***

Required Operator Actions

SCO

Direct actions associated with 2EOP-01-LPC (Level Power Control) to Terminate and Prevent injection **(Critical Task)** and then Emergency Depressurize the reactor when two area flood levels reach max safe **(Critical Task)**.

- Direct RO/BOP to terminate and prevent injection from
  - Condensate and Feed
  - HPCI
  - RHR
  - Core Spray
  - Alternate Coolant Injection
- When systems are terminated and prevented, directs opening of 7 ADS valves
- When reactor pressure is below the Minimum Alternate Flooding Pressure per Table 2 (120 psig with 7 SRVs open)
- Directs RO/BOP to slowly increase injection to restore level above LL4

NOTE: Terminating and preventing of injection prior to depressurization is only required if in 2EOP-01-LPC. If all rods have been inserted and the crew is in EOP-01-RVCP (Reactor Vessel Control Procedure) terminate and prevent are not required.

EVENT 8 EMERGENCY DEPRESSURIZATION/START-UP LEVEL CONTROL VALVE FAILURE

Required Operator Actions (continued)

BOP

(Critical Task) When directed, terminates and prevents injection to prevent uncontrolled injection and power transient.

- Trip Reactor Feed Pumps
- Close FW-V6/V8 (or FW-V118/V119)
- Place SULCV in manual close
- Trip HPCI, when turbine stops, place Aux Oil Pump in Pull-To-Lock
- After receiving a start signal, stop the RHR and Core Spray Pumps by placing their respective control switches to stop.

NOTE: Terminate and prevent is only required if in 2EOP-02-LPC (Level Power Control) procedure.

- **(Critical Task)** When directed, opens 7 ADS Valves to Emergency Depressurize the reactor
- When attempting to restore feedwater flow, correctly diagnoses and reports either the failure of the Startup Level Control Valve OR the 2-FW-V120 has failed. Uses the one method that is available to feed the reactor.
- When reactor pressure is less than the minimum alternate flooding Pressure, recommence injection to restore level above LL4.
    - Injecting with Condensate
        - Open the Startup Level Control Valve by inceasing the demand signal on the SULCV controller,

          OR

        - Partially open to 2-FW-V120 by turning the control switch to the open position (throttle valve).

NOTE: If Condensate is used, recognize the failure of the SULCV or the 2-FW-V120 to respond, requiring the candidate to go to the opposite valve

EVENT 8 EMERGENCY DEPRESSURIZATION/START-UP LEVEL CONTROL VALVE FAILURE

APPLICANT'S ACTIONS OR BEHAVIOR:

EVENT 8 EMERGENCY DEPRESSURIZATION/START-UP LEVEL CONTROL VALVE FAILURE

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

Title -

Path - E:\NRC Scenarios\2007 NRC Scenario 4.scn

mfi:NI015F,True,00:00:00,00:00:00, 0
mfi:NI019F,True,00:00:00,00:00:00, 1
mfi:NI024F,True,00:00:00,00:00:00, 3
mfi:NI013F,True,00:00:00,00:00:00, 4
mfi:EE030M,True,,00:00:00,00:00:00, 4,2XC
mfi:RW016F,True,00:00:00,00:00:00, 0
mfi:RW013F, 100,00:10:00,00:00:00,00:00:00, 4
mfi:RP011F,True,00:00:00,00:00:00, 0
mfi:CF035F,True,00:00:00,00:00:00, 7
mfi:RP005F,True,00:00:00,00:00:00, 0
rfi:EP_IAEOPJP1,ON,00:00:00, 5
tri:10, !K4403NWD && MCF035F
tri:11, P2812G1Y >= 0.200 && MCF035F
trc:9, bat:F:\NRC Scenario S4.bat
trc:10, MFD:CF035F
trc:11, bat:F:\NRC Scenario S4-1.bat
doi:Q2BQQUAD,ON/OFF,ON,00:00:00,00:00:00, 2
dii:K4F14A,START,ON,00:00:00,00:00:02, 3
dii:K1410A,ASIS,00:00:00,00:00:00, 0
dii:K4511C,NORMAL,OFF,00:00:00,00:00:00, 8
dii:K4511C,START,OFF,00:00:00,00:00:00, 8
dii:K4511C,STOP,ON,00:00:00,00:00:00, 8
dii:K4511B,CLOSE,ON,00:00:00,00:00:00, 8
dii:K4403A,OPEN,OFF,00:00:00,00:00:00, 7
ani:ZA761, ON, 00:00:00, 00:00:00, 2
ani:ZUA2864, ON, 00:00:00, 00:00:00, 3
ani:ZUA1214, ON, 00:00:00, 00:00:00, 6
ani:ZUA225, ON, 00:00:00, 00:00:00, 8

TITLE - NRC Scenario S4
Path - E:\NRC Scenario S4.bat
Saved on 6-30-2007

PAUSE:00:20:00
DOD:Q2BQQUAD
AND:ZA761

TITLE - NRC Scenario S4
Path - E:\NRC Scenario S4-1.bat
Saved on 7-3-2007

DID:K4403A
All:P2812G1Y,0,00:00:00,00:00:00,00:00:00