Draft Submittal

BRUNSWICK OCT/NOV 2004

EXAM 50-325, 324/2004-301
OCTOBER 29, 2004 &
NOVEMBER 2 - 10, 2004

1. Operating Test Simulator Scenarios

Brunswick Nuclear Plant

Initial Examination **DRAFT** Scenarios

Examination Report Nos.

05000325/2004301 - 05000324/204301

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Prep - September 18 - 22, 2004
Exam Weeks - November, 1 - 5 & 8 - 12, 2004

Facility: Brunswick Date of Examination: 11/1/2004 Operating Test Number: 1-2004

	1. GENERAL CRITERIA	Initials a	b*	c#
a.	The operating test conforms with the previously approved outline; changes are consistent with sampling requirements (e.g., 10 CFR 55.45, operational importance, safety function distribution).	CR	[illegible]	jpb
b.	There is no day-to-day repetition between this and other operating tests to be administered during this examination.	CR	[illegible]	jpb
c.	The operating test shall not duplicate items from the applicants' audit test(s)(see Section D.1.a).	CR	[illegible]	jpb
d.	Overlap with the written examination and between different parts of the operating test is within acceptable limits.	CR	[illegible]	jpb
e.	It appears that the operating test will differentiate between competent and less-than-competent applicants at the designated license level.	CR	[illegible]	jpb
	2. WALK-THROUGH	--	--	--
a.	Each JPM includes the following, as applicable: · initial conditions · initiating cues · references and tools, including associated procedures · reasonable and validated time limits (average time allowed for completion) and specific designation if deemed to be time critical by the facility licensee · specific performance criteria that include: - detailed expected actions with exact criteria and nomenclature - system response and other examiner cues - statements describing important observations to be made by the applicant - criteria for successful completion of the task - identification of critical steps and their associated performance standards - restrictions on the sequence of steps, if applicable	CR	[illegible]	jpb
b.	Repetition from operating tests used during the previous licensing examination is within acceptable limits (30% for the walk-through) and do not compromise test integrity.	CR	[illegible]	jpb
c.	At least 20 percent of the JPMs on each test are new or significantly modified.	CR	[illegible]	jpb
	3. SIMULATOR CRITERIA	--	--	--
a.	The associated simulator operating tests (scenario sets) have been reviewed in accordance with Form ES-301-4 and a copy is attached.	CR	[illegible]	jpb

	Printed Name / Signature	Date
a. Author	Curt Robert / Curt Robert	9/15/04
b. Facility Reviewer(*)	Tony Pearce / [illegible]	091504
c. NRC Chief Examiner (#)	Richard S. Baldwin / [illegible] / Timothy C. Kolb / [illegible]	10/6/04
d. NRC Supervisor	G.T. Hopper / [illegible]	10/7/04

NOTE: * The facility signature is not applicable for NRC-developed tests.
Independent NRC reviewer initial items in Column "c;" chief examiner concurrence required.

Facility: Brunswick Date of Exam: 11/1/04 Scenario Numbers: 1 / 2 / 3 / 4 Operating Test No.: 1-2004

	QUALITATIVE ATTRIBUTES	Initials a	b*	c#
1.	The initial conditions are realistic, in that some equipment and/or instrumentation may be out of service, but it does not cue the operators into expected events.	CR		
2.	The scenarios consist mostly of related events.	CR		
3.	Each event description consists of · the point in the scenario when it is to be initiated · the malfunction(s) that are entered to initiate the event · the symptoms/cues that will be visible to the crew · the expected operator actions (by shift position) · the event termination point (if applicable)	CR		
4.	No more than one non-mechanistic failure (e.g., pipe break) is incorporated into the scenario without a credible preceding incident such as a seismic event.	CR		
5.	The events are valid with regard to physics and thermodynamics.	CR		
6.	Sequencing and timing of events is reasonable, and allows the examination team to obtain complete evaluation results commensurate with the scenario objectives.	CR		
7.	If time compression techniques are used, the scenario summary clearly so indicates. Operators have sufficient time to carry out expected activities without undue time constraints. Cues are given.	CR		
8.	The simulator modeling is not altered.	CR		
9.	The scenarios have been validated. Pursuant to 10 CFR 55.46(d), any open simulator performance deficiencies have been evaluated to ensure that functional fidelity is maintained while running the planned scenarios.	CR		
10.	Every operator will be evaluated using at least one new or significantly modified scenario. All other scenarios have been altered in accordance with Section D.5 of ES-301.	CR		
11.	All individual operator competencies can be evaluated, as verified using Form ES-301-6 (submit the form along with the simulator scenarios).	CR		
12.	Each applicant will be significantly involved in the minimum number of transients and events specified on Form ES-301-5 (submit the form with the simulator scenarios).	CR		
13.	The level of difficulty is appropriate to support licensing decisions for each crew position.	CR		

	TARGET QUANTITATIVE ATTRIBUTES (PER SCENARIO; SEE SECTION D.5.d)	Actual Attributes	--	--	--
1.	Total malfunctions (5-8)	9 / 10 / 8 / 8	CR		
2.	Malfunctions after EOP entry (1-2)	2 / 2 /3 / 4	CR		
3.	Abnormal events (2-4)	4 / 4 / 5 / 3	CR		
4.	Major transients (1-2)	1 / 1 / 1 / 1	CR		
5.	EOPs entered/requiring substantive actions (1-2)	2 / 2 / 2 / 2	CR		
6.	EOP contingencies requiring substantive actions (0-2)	1 / 1 / 0 / 2	CR		
7.	Critical tasks (2-3)	2 / 2 / 2 / 4	CR		

DRAFT

OPERATING TEST NO.: 1-2004

Applicant Type	Evolution Type	Minimum Number	Scenario Number							
			1		2		3		4	
			RO	BOP	RO	BOP	RO	BOP	RO	BOP
RO	Reactivity	1*	2		3		5		2,5	
	Normal	1*		1,2		1		1	4	1
	Instrument / Component	4*	3,5, 6	4,5	2,3, 4	1,4	2,4	1,3,5	2,5	3,5
	Major	1	7	7	5-8	5-8	6-8	6-8	6-12	6-12

As RO	Reactivity	1*	2	3	5	2,5
	Normal	0				4
	Instrument / Component	2*	3,5,6	2,3,4	2,4	2,5
	Major	1	7-9	5-8	6-8	6-12
SRO-I						
As SRO	Reactivity	0	2	3	5	2,5
	Normal	1*	1,2	1	1	4
	Instrument / Component	2*	3-6	1-4	1-5	2,5
	Major	1	7-9	5-8	6-8	6-12

SRO-U	Reactivity	0	2	3	5	2,5
	Normal	1*	1,2	1	1	4
	Instrument / Component	2*	3-6	1-4	1-5	2,5
	Major	1	7-9	5-8	6-8	6-12

Instructions:
(1) Enter the operating test number and Form ES-D-1 event numbers for each evolution type.
(2) Reactivity manipulations may be conducted under normal or *controlled* abnormal conditions (refer to Section D.5.d) but must be significant per Section C.2.a of Appendix D. * Reactivity and normal evolutions may be replaced with additional instrument or component malfunctions on a one-for-one basis.
(3) Whenever practical, both instrument and component malfunctions should be included; only those that require verifiable actions that provide insight to the applicant's competence count toward the minimum requirement.

Author: Curt Robert

NRC Reviewer: T.C. Kolb/

Competencies	SRO				RO				BOP			
	SCENARIO				SCENARIO				SCENARIO			
	1	2	3	4	1	2	3	4	1	2	3	4
Interpret / Diagnose Events and Conditions	1-8	1-8	1-8	2-12	2-8	2-8	2,4 5-8	2,4, 5-12	1,2 4-8	1,4 5,8	1,3 5-8	1,3 5-12
Comply With and Use Procedures (1)	1-8	1-8	1-8	2-12	2-8	2-8	2,4 5-8	2,4, 5-12	1,2 4-8	1,4 5,8	1,3 5-8	1,3 5-12
Operate Control Boards (2)					2-8	2-8	2,4 5-8	2,4, 5-12	1,2 4-8	1,4 5,8	1,3 5-8	1,3 5-12
Communicate and Interact	1-8	1-8	1-8	1-12	2-8	2-8	2,4 5-8	2,4, 5-12	1,2 4-8	1,4 5,8	1,3 5-8	1,3 5-12
Demonstrate Supervisory Ability (3)	1-8	1-8	1-8	1-12								
Comply With and Use Tech. Specs. (3)	1-5	1-4	1-4	2-5								

Notes:

(1) Includes Technical Specification compliance for an RO.
(2) Optional for an SRO-U.
(3) Only applicable to SROs.

Instructions:

Circle the applicant's license type and enter one or more event numbers that will allow the examiners to evaluate every applicable competency for every applicant.

Author: Curt Robert

NRC Reviewer: T.C. Kolb / Tkolb

Facility: Brunswick | Scenario No.: NRC-2004-1 | Op-Test No.: 1

Examiners: _____ Operators: _____

Initial Conditions: Attached

Turnover: Attached

Event No.	Malf. No.	Event Type*	Event Description
1	N/A	N (BOP) I (BOP) I (SRO)	Perform PT-07.2.4a, failed flow instrument.
2	N/A	R (RO)	Power increase Recirc. Flow
3	ES014F	I (RO) I (SRO)	Inadvertent HPCI initiation.
4	IAUPB2 A6	I (BOP) I (SRO)	Main Stack Rad. Monitor P/S loss, SBGT fails to start.
5	EE030M	C (BOP)	MCC 2TD Trips.
6	MS003F RP005F ES004F	M (ALL) I (RO) C (BOP) S (RO)	EHC Failure, Electrical ATWS, SRV Fails open HPCI failure
7/8	CA020F	M (ALL)	Broken SRV Tailpipe, PSP function lost, ED required
8/9	ES015F K1227A	C (RO) I (BOP)	HPCI Power Supply Failure, RHR Spray Logic Failure

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

SHIFT BRIEFING

Plant Status

The plant is operating at 80% power, middle of cycle. A control rod sequence exchange has just been performed and power is being raised to maximum. The load dispatcher has requested a temporary hold at 80% power.

Equipment Out of Service

SLC Pump 2B is under clearance for pump rebuild and is expected to remain out of service for 2 days.

OPRM System is INOPERABLE due to an existing 10CFR21 issue. The OPRM System is still functional but is considered INOPERABLE per Technical Specifications.

No other equipment is out of service.

Plan of the Day

Maintain power at 80% until contacted by the load dispatcher, then raise power to maximum.

PT-07.2.4A, Core Spray Pump Loop A operability is in progress and completed up to step 7.8 (Pump Testing). Complete PT-07.2.4A as soon as shift turnover is complete.

No other special activities are scheduled for this shift.

Facility: Brunswick Scenario No.: NRC-2004-2 Op-Test No.: 1

Examiners: _____ Operators: _____

_____ _____

_____ _____

Initial Conditions: Attached

Turnover: Attached

Event No.	Malf. No.	Event Type*	Event Description
1	ES020F	N (BOP) C (BOP) C (SRO)	Perform PT-10.1.1, failed RCIC Governor.
2	NI053M	I (RO) I (SRO)	LPRM Failure
3	RD027M	C (RO) R (RO)	Control Rod Drift
4	ZUA432 ZUA412	C (BOP) C (RO) I (SRO)	Feed Pump trips, limiter #2 fails.
5	RW013F RW015F RW016F	M (ALL) C (RO) C (BOP)	RWCU System Rupture, Failure to isolate, SCRAM, Core Spray Max Safe Water Level
6	BATCH	C (RO)	SRVs lose power, perform AEDP

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

SHIFT BRIEFING

Plant Status

The plant is operating at maximum power, beginning of cycle.

RHR Loop 2B is running in suppression pool cooling in preparation for RCIC Operability Testing.

SBGT Fan 2A is running in preparation for RCIC Operability Testing.

Equipment Out Of Service

No other equipment is out of service

Plan of the Day

Maintain current power.

0PT-10.1.1 is complete up to Pump Operability Testing (Section 7.10). Perform RCIC Pump Operability Testing per 0PT-10.1.1. All required personnel have been notified and are ready for pump testing.

Facility: Brunswick Scenario No.: NRC-2004-3 Op-Test No.: 1

Examiners: _____ Operators: _____

_____ _____

_____ _____

Initial Conditions: Attached

Turnover: Attached

Event No.	Malf. No.	Event Type*	Event Description
1	ZUA2141 ZUA2121	N (BOP) C (BOP) C (SRO)	E-BUS Transfer, DG3 Ground, Failure to trip
2	RD018F	C (RO)	CRD Suction Filter Plugged, CRD Pump Trip
3	NB001F	I (RO) I (SRO)	Ruptured test cap on reference leg causing RIP isolation.
4	ES019F	C (RO) I (SRO)	RCIC Logic Bus power supply failure.
5	CN012F	C (BOP) R (RO)	Condenser Tube Leak
6	CN001F	C (BOP)	Lowering Condenser Vacuum, Turbine Trip, BOP buses fail to transfer.
7	RD045F	M (ALL)	SDV Rupture

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

SHIFT BRIEFING

Plant Status

The plant is operating at 80% power, middle of cycle.

Bus E3 loads are on Diesel Generator #3 to support maintenance activities on the 2D to E3 Master/Slave Breakers.

A control rod sequence exchange has just been performed and power is being raised to maximum. The load dispatcher has requested a temporary hold at 80% power.

Equipment Out of Service

BOP Bus 2D to E3 Master/Slave Breakers were under clearance. The maintenance activities on the Master/Slave Breakers are complete and the clearance has been lifted.

No other equipment is out of service.

Plan of the Day

Maintain power at 80% until contacted by the load dispatcher, then raise power to maximum.

Perform a Control Room manual transfer of Bus E3 from the Diesel Generator to the normal feeder as soon as shift turnover is complete.

No special activities are scheduled for this shift.

PROGRESS ENERGY CAROLINAS
BRUNSWICK TRAINING SECTION

NRC SIMULATOR EXAM SCENARIO

NRC-2004-1

LESSON TITLE: Core Spray Operability PT, Inadvertant HPCI initiation, Main Stack Rad. Monitor Power Supply Loss, Loss of MCC 2TD, EHC Pressure Regulator Failure, ATWS, SRV failed open with failed tailpipe, ED on PSP.

REVISION NO: 00 APPROXIMATE TIME REQUIRED: 75 Mins.

RECOMMENDED BY: _____
Instructor/Developer DATE

CONCURRENCE BY: _____
Line Superintendent/Supervisor DATE

APPROVED BY: _____
Superintendent/Supervisor Training DATE

SCENARIO DESCRIPTION

The plant is operating at 80% power, Middle Of Cycle with SLC Pump 2B under clearance.

Core Spray Loop A operability PT will be performed. When the test return valve is opened, the loop flow instrumentation will fail to respond. Core Spray A should be declared Inoperable.

When power has been increased by ≈10%, HPCI will inadvertently initiate. The crew will respond per AOP-03.0 and terminate HPCI operation. A scram on high flux may occur if HPCI is not terminated. HPCI will be declared Inoperable and Tech Specs addressed.

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

MCC 2TD will trip. This results in loss of power to the running Stator Cooling pump. The standby pump fails to auto start and must be manually started to prevent a turbine trip. The MCC loss also results in a loss of Recirc Pump 2B due to oil pump B2 tripping and oil Pump B3 fails to start automatically or manually. Recirc MG Set 2B oil pressure drops below the trip setpoint but fails to trip. The MG set must be manually tripped. This places the plant in Region B – Immediate Exit region of the power to flow map. Recirculation flow must be increased or control rods must be inserted to exit Region B.

The EHC pressure regulator will fail resulting in opening of Turbine Control and Bypass valves to the Max Combined Flow limit (110%). Steam line pressure drops to the MSIV isolation setpoint and the MSIVs close. The reactor fails to auto scram and manual scram also will fail. ARI will fail to auto initiate on high RPV pressure. The rods can be inserted by manually initiating ARI.

RPV pressure will spike high due to the MSIV closure and RPS failure. SRVs will lift on high pressure. SRV F will fail to reclose when rods are inserted and RPV pressure lowers. The tail pipe on SRV F will rupture in the suppression chamber airspace shortly after the valve sticks open resulting in rapidly rising containment pressure and temperature.

Feed flow is lost to the RPV due to MSIV closure. HPCI may be manually started to restore RPV level but will fail shortly after being started.

If containment spray is attempted the B RHR Spray logic will fail and E11-F016A will not OPEN. Suppression chamber pressure will rise above the safe value for Pressure Suppression Pressure requiring emergency depressurization. Low pressure ECCS and Condensate must be operated during depressurization to prevent uncontrolled injection.

When the reactor has been depressurized, the containment spray will be repaired and can be placed in service then the scenario can be terminated.

SIMULATOR SETUP

Initial Conditions

IC	13
Rx Power	96%
Core Age	MOC

Scenario File:
Title - NRC 2004-1
Path - A:\NRC 2004 1.scn
Saved on 09-04-2004 at 13:03:53

mfi:ES014F,True,00:00:00,00:00:00, 1
mfi:EE030M,True,,00:00:00,00:00:00, 5,2TD
mfi:MS003F,True,00:00:00,00:00:00, 6
mfi:RP005F,True,00:00:00,00:00:00, 6
mfi:ES004F,True,00:00:00,00:00:00, 7
mfi:CA020F,True,00:04:00,00:00:00, 7
mfi:ES015F,True,00:00:00,00:00:00, 9
mfi:RC029F,True,00:00:00,00:00:00, 0
mfi:RP006F,True,00:00:00,00:00:00, 6
rfi:ED_IAUPB2A6,OPEN,00:00:00, 2
rfi:SL_IASLRB,OPEN,00:00:00, 0
tri:3, K6101WOV
tri:4, K6103WOV
tri:7, Q1508RRJ
tri:8, K2626BTE
trc:3, did:k6101a
trc:4, did:k6103a
trc:8, did:k2625a
aoi:G1A07G1L,ASIS,00:00:00,00:00:00, 0
doi:Q2625SRE,ON/OFF,OFF,00:00:00,00:00:00, 0
doi:Q2625SWE,ON/OFF,ON,00:00:00,00:00:00, 0
dii:K2625A,INOP,ON,00:00:00,00:00:00, 0
dii:K2625A,AUTO,OFF,00:00:00,00:00:00, 0
dii:K2625A,TRIP,OFF,00:00:00,00:00:00, 0
dii:K1D26A,ASIS,00:00:00,00:00:00, 0
dii:K1727A,ASIS,00:00:00,00:00:00, 0
dii:K6101A,OFF,ON,00:00:00,00:00:00, 0
dii:K6103A,OFF,ON,00:00:00,00:00:00, 0
dii:K5412A,AUTO,OFF,00:00:00,00:00:00, 0
dii:K2709A,AUTO,OFF,00:00:00,00:00:00, 0
dii:K2709A,RESET,ON,00:00:00,00:00:00, 0
dii:K2709A,START,OFF,00:00:00,00:00:00, 0

Materials
PT-07.2.4A

Special Instructions

Prior to loading scenario file, reduce reactor power to 80% and zero DVM.

Start Stator Coolant Pump B, and secure Stator Coolant Pump A in Auto

Copy/Paste scenario file using the scenario editor or type in scenario as shown.

Take snapshot if running multiple times for ease of setup.

Place red cap on SLC Pump 2B control switch.

Ensure ENP-24 for IC-13 @ P603, **ENSURE Power/Flow Map for OPRM INOPERABLE is Attached**.

Critical Tasks

Insert control rods by manually initiating ARI.

Emergency depressurize the reactor when suppression chamber pressure cannot be maintained in the Safe region of the Pressure Suppression Pressure Limit.

SHIFT BRIEFING

Plant Status

The plant is operating at 80% power, middle of cycle. A control rod sequence exchange has just been performed and power is being raised to maximum. The load dispatcher has requested a temporary hold at 80% power.

Equipment Out of Service

SLC Pump 2B is under clearance for pump rebuild and is expected to remain out of service for 2 days.

OPRM System is INOPERABLE due to an existing 10CFR21 issue. The OPRM System is still functional but is considered INOPERABLE per Technical Specifications.

No other equipment is out of service.

Plan of the Day

Maintain power at 80% until contacted by the load dispatcher, then raise power to maximum.

PT-07.2.4A, Core Spray Pump Loop A operability is in progress and completed up to step 7.8 (Pump Testing). Complete PT-07.2.4A as soon as shift turnover is complete.

No other special activities are scheduled for this shift.

EVENT 1 SHIFT TURNOVER/CORE SPRAY PT

The crew responds to a Core Spray Loop A flow instrument failure during full flow test surveillance.

Malfunctions required – 1; Core Spray Loop A discharge flow instrument override at 0 gpm.

Objectives:

BOP - Perform Core Spray System Operability Test Per PT-07.2.4A.

BOP – Secure the Core Spray System and place it in the standby lineup following diagnosis of the failed flow instrument.

SRO – Refer to Technical Specifications and recognize that the Core Spray flow instrument inoperability results in actions required as stated in LCO 3.5.1 ECCS Operating.

Success Path – Secure Core Spray lineup and refer to Tech Spec 3.5.1 and determine Action A (7 day) applies.

Plant Response

SPECIFIC CAUSE – While performing the Core Spray pump operability test the Core Spray Loop A discharge flow instrument, E21-FI-R601A, fails downscale.

THE FOLLOWING INDICATIONS SHOULD BE OBSERVED:
1. *CORE SPRAY PUMP A* pump discharge pressure on *E21-PI-R600A*, increases to greater than or equal to 300 psig in less than or equal to 5.0 seconds.
2. *CORE SPRAY PUMP A* pump discharge flow E21-FI-R601A indicates 0 gpm when the Full Flow Test E21-F015A valve is opened.

Simulator Operator Activities
- ☐ **Set up the simulator per the setup**
- ☐ **When asked, as RBAO report CS suction pressure is 6 psig, lubricant level is normal, and you are stationed to monitor system piping**
- ☐ **When requested, report SW-V128 is open (Room Cooler SW valve)**
- ☐ **If asked as RBAO you hear flow noise locally but no local indication of pump flow rate**
- ☐ **If asked as I&C to investigate, acknowledge the request**

EVENT 1 SHIFT TURNOVER/CORE SPRAY PT

Required Operator Actions

SRO
Normal Operation – PT-07.2.4A
☐ Direct BOP to continue PT-07.2.4A performance.

RO
During normal operation
☐ Monitor plant during PT performance.

APPLICANT'S ACTIONS OR BEHAVIOR:

EVENT 1 SHIFT TURNOVER/CORE SPRAY PT

Required Operator Actions

BOP

Normal Operation – PT-07.2.4A

- ☐ **OBSERVE** *CORE SPRAY PUMP A* suction pressure (stopped) as indicated on *E21-PI-R001A* **AND RECORD** on Attachment 2. (Local report from AO required.)
- ☐ **ENSURE** one of the following valves is open: SW-V117 or SW-V111 to align cooling to the vital header – Operator opens SW-V111 **or** SW-V117 with control switch at P601.
- ☐ **ENSURE** *VITAL HEADER XTIE VLV, SW-V118*, is open at P601.
- ☐ **ENSURE** *WELL WATER TO VITAL HEADER VALVE, SW-V141*, is closed at P601.
- ☐ **STATION** an operator to monitor system piping for excessive motion and water hammer when a Core Spray pump is started.
- ☐ **ENSURE** proper *CORE SPRAY PUMP A* lubricant level. (Request AO to report)
- ☐ **START** *CORE SPRAY PUMP A* while monitoring pump discharge pressure on *E21-PI-R600A*, **AND CONFIRM** pressure increases to greater than or equal to 300 psig in less than or equal to 5.0 seconds.
- ☐ **RECORD** the time that *CORE SPRAY PUMP A* was started.
- ☐ **ENSURE** the following:
  - ☐ *CORE SPRAY DIVISION I ROOM COOLER FAN* has started. (XU-3)
  - ☐ *SERVICE WATER OUTLET VALVE, SW-V128*, is open. (local, AO reports)
- ☐ **THROTTLE OPEN** Core Spray *FULL FLOW TEST BYP VLV, E21-F015A*, to obtain greater than or equal to 4625 gpm as indicated on *E21-FI-R601A*. ***Determine that E21-FI-R601A fails to indicate actual flow and reports instrument malfunction.***

APPLICANT'S ACTIONS OR BEHAVIOR:

EVENT 1 SHIFT TURNOVER/CORE SPRAY PT

Required Operator Actions

SRO

Event 1- Core Spray Flow Instrument Malfunction

☐ Direct Core Spray A be shutdown and returned to standby lineup.

☐ Direct I&C to investigate.

☐ Refer to Tech Spec 3.5.1 and determine Action A (7 day) applies.

RO

Event 1 – Core Spray Flow Instrument Malfunction.

☐ Monitor plant during PT performance.

BOP

Event 1- Core Spray Flow Instrument Malfunction

☐ Recognize and report Core Spray discharge flow instrument malfunction.

☐ Return Core Spray to standby alignment –

- ☐ STOP Core Spray Pump
- ☐ Close E21-F015A.
- ☐ Close E21-F031A

APPLICANT'S ACTIONS OR BEHAVIOR:

EVENT 2 LOAD DISPATCHER REQUEST/POWER INCREASE

The crew raises power to 90% using reactor recirculation flow and stops to perform Alternate Power Verification per GP-12.

Malfunctions required – None.

Objectives:

RO – Raise reactor power with reactor recirculation flow. Perform alternate power verification in accordance with GP-12.

BOP – Monitor remainder of the plant during power ascension. Ensure compliance with GP-12

SRO – Direct power ascension using reactor recirculation flow per GP-12.

Success Path – Raise reactor power towards maximum with recirculation flow in accordance with GP-12.

Plant Response

1. Normal indications for reactor power ascension.

Simulator Operator Activities

- ☐ **After SRO evaluates Core Spray Inoperability, call control room as load dispatcher and request BNP2 raise power to rated.**
- ☐ **If contacted as NE report rods at desired pattern and power should be raised to maximum using flow.**

EVENT 2 LOAD DISPATCHER REQUEST/POWER INCREASE

Required Operator Actions

SRO

Normal Operation – Power Increase

☐ Direct power be raised using Recirc flow per GP-12.

☐ Direct alternate power verification at 90% power.

APPLICANT'S ACTIONS OR BEHAVIOR:

EVENT 2 LOAD DISPATCHER REQUEST/POWER INCREASE

Required Operator Actions

RO

Normal Operation – Power Increase

☐ Monitor the plant

☐ Raise reactor power by increasing Recirc flow per GP-12 and OP-02.

- **INCREASE** Recirculation Pump speed in increments as directed by the Unit SCO by slowly turning the *RECIRC PUMP 2A(2B) SPEED CONTROL* potentiometer in the clockwise direction.
- **NOTE:** The following indications should be observed to ensure proper response to increased speed demand from a Recirculation Pump speed controller:

  a. Recirculation Pump speed increases.

  b. Recirculation loop flow increases.

  c. Reactor power increases.

- **WHEN** increasing or decreasing Recirculation Pump speeds with Recirculation Pump A(B) speed control potentiometer, **THEN** small changes of 2% to 4% should be made keeping the pump speeds within 20% when below 58 x 10^6 lbs/hr core flow or within 10% when ≥ 58 x 10^6 lbs/hr core flow.

BOP

Normal Operation – Power Increase

☐ Monitor plant during PT performance.

APPLICANT'S ACTIONS OR BEHAVIOR:

EVENT 2 LOAD DISPATCHER REQUEST/POWER INCREASE

Required Operator Actions

BOP

Normal Operation – Power Increase

☐ Perform alternate power verification per GP-12 Attachment 2 at approximately 90% power.

- Obtain valid Heat Balance (Display 820) and record on Table 1.
- **OBTAIN** LPRM % PWR (Display 861, Filtered LPRM Readings Edit) **AND RECORD** in Table 1.
- **OBTAIN** Total Steam Flow (Mlb/hr) (from individual steam flow indicators or computer point B041).
- Run MAN program (type in heat balance power and steam flow), or NE (screen 6) to obtain steam flow alternate power and record in Table 1.
- Compare Heat Balance to other alternate indications, (Heat Balance > all alternate indications, or within 5%.)

APPLICANT'S ACTIONS OR BEHAVIOR:

EVENT 3 HPCI INITIATION

The crew responds to an inadvertent HPCI initiation.

Malfunctions required – 1; ES014F, Inadvertent HPCI Initiation.

Objectives:

BOP – Reduce reactor power with reactor recirculation flow as necessary to prevent a reactor scram.

RO – Secure HPCI after diagnosing misoperation.

SRO – Direct shift response to a moderator temperature decrease due to an inadvertent HPCI initiation per AOP-03.0

Success Path – Diagnose HPCI malfunction and secure HPCI. Reduce reactor power as necessary to prevent a reactor scram

Plant Response

THE FOLLOWING AUTOMATIC ACTIONS AND ANNUNCIATORS SHOULD BE OBSERVED:

1. The HPCI Initiation Seal-In white lamp will illuminate when the K6 relay energizes due to the false low reactor water level signal energizing the K2, K3 and K52 auto start relays. The Auxiliary Oil Pump and Vacuum Pump will receive a start signal from the seal in logic and all valves will reposition when the automatic initiation relays are energized.
2. When reactor water level increases to ≥ 192" (C32-LR-608) annunciator REACTOR WATER LEVEL HIGH/LOW (A-07 2-2) is actuated.
3. IF reactor power increases to greater than the APRM rod block set point annunciator APRM UPSCALE (A-06 2-8) is actuated.
4. IF HPCI pump discharge flow is less than 400 gpm, fifteen (15) seconds after the E41-F001 starts to OPEN annunciator HPCI FLOW LO (A-01 1-4) is actuated.

EVENT 3 HPCI INITIATION

Simulator Operator Activities

- ☐ **When power has been raised ≈10% and the BOP operator is performing an Alternate Power Verification, INITIATE TRIGGER 1 to initiate the HPCI system.**
- ☐ **If asked as I&C to investigate, acknowledge the request.**

EVENT 3 HPCI INITIATION

Required Operator Actions

SRO

Event 3 - HPCI Initiation

- ☐ Direct entry into AOP-03.0.
- ☐ Direct termination of HPCI operation.
- ☐ Direct reduction of reactor power if necessary to prevent a scram.
- ☐ Contact I&C to investigate HPCI failure.
- ☐ Refer to Tech Spec 3.5.1. Determine Action D applies (Verify RCIC Operable and restore HPCI to Operable within 14 days).
- ☐ Refer to OI-01.07 and determine reportability requirements (8 hour for loss of single train, item 3.4 on Attachment 1).

APPLICANT'S ACTIONS OR BEHAVIOR:

EVENT 3 HPCI INITIATION

Required Operator Actions

BOP
Event 3 – HPCI Initiation

☐ Reduce reactor power as required to prevent a reactor scram if directed by the SCO

- **DECREASE** the speed of 2A(2B) Recirc Pumps, keeping recirculation loop flows approximately the same.

☐ Monitor the plant.

RO
Event 3 - HPCI Initiation

☐ Diagnose and report inadvertent HPCI initiation.

☐ Enter and announce AOP-03.0.

☐ Verify by two independent methods the initiation is not valid

☐ Terminate HPCI operation as follows:

- Depress and hold turbine trip push button
- When HPCI turbine coasts to 0 RPM, place Aux Oil Pump to Pull-To-Lock.
- Release trip push button
- Ensure HPCI remains shutdown.

APPLICANT'S ACTIONS OR BEHAVIOR:

EVENT 4 POWER LOSS TO MAIN STACK RAD MONITOR

The crew responds to a loss of power to the main stack radiation monitor and a SBGT AUTO Start failure.

Malfunctions required – 3; IAUPB2A6, UPS 2A to Sample detection Skid breaker OPEN.
K6101A, SBGT Push A – OFF
K6103A; SBGT Push B - OFF

Objectives:

BOP – Diagnose loss of power to the Main Stack Radiation Monitor.

BOP- Verify Group 6 and Secondary Containment isolation.

BOP – Diagnose AUTO Start Failure of SBGT and manually Start SBGT.

SRO – Refer to Tech Spec., TRM, and ODCM in response to the Loss of Power to the Main Stack Radiation Monitor.

Success Path – Diagnose Main Stack Monitor loss of power and SBGT failure. Start SBGT.

Plant Response

THE FOLLOWING AUTOMATIC ACTIONS AND ANNUNCIATORS SHOULD BE OBSERVED:

Annunciators that will be received

2-UA-03-5-4 Process OG Vent Pipe Radiation Hi-Hi
2-UA-03-6-3 Process Sample OG Vent Pipe DNSC/INOP
2-UA-03-6-4 Process OG Vent Pipe Radiation Hi
2-UA-05-3-5 SBGT SYS B Failure
2-UA-05-4-6 SBGT SYS A Failure.
2-UA-05-6-7 Rx Bldg Static Press Diff-Low
2-UA-05-6-10 Rx Bldg Isolated

A Loss of Power to the Main Stack Radiation Monitor 2-D12-RM-80S and Sample Detection Skid Normal Power Supply will result in:

1. A full Group 6 isolation on Unit 1 and Unit 2 (all Group 6 valves will close)
2. Reactor building ventilation will isolate
3. SBGT trains SHOULD AUTO start due to stack rad monitor trip signal but will not due to malfunction. **SBGTs must be manually started to maintain Secondary containment negative pressure.**

EVENT 4 POWER LOSS TO MAIN STACK RAD MONITOR

Simulator Operator Activities

- ☐ **When the crew has responded to the inadvertent HPCI initiation, INITIATE TRIGGER 2 to drop power to the main stack rad monitor**
- ☐ **If asked to investigate, report UPS panel 2A to the Stack Rad Monitor is tripped**
- ☐ **If contacted as I&C to investigate, acknowledge the request, if asked do not recommend transfer to alternate power until the cause of the trip is investigated**

EVENT 4 POWER LOSS TO MAIN STACK RAD MONITOR

Required Operator Actions

SRO

Event 4 – Power Loss to Main Stack Radiation Monitor

- ☐ Direct actions of the APPs for the Main Stack Rad monitor
- ☐ Direct verification of auto actions
- ☐ Direct manually starting SBGT
- ☐ Direct I&C to investigate and determine if the stack rad monitor can be transferred to Unit 1 power supply. (OI-50.5)
- ☐ Refer to Tech Spec 3.3.6.1 (PCIS Instrumentation), determine Function 2c is inoperable, determine actions A and B apply (single channel), then C and F after 1 hour
- ☐ Refer to TRM 3.4 (post accident monitoring), determine Function 5 is inoperable and condition A applies
- ☐ Refer to ODCM 7.3.2 (gaseous effluent monitoring), determine function 1 is inoperable, Conditions A and B apply (grab samples) and notify E&RC

APPLICANT'S ACTIONS OR BEHAVIOR:

EVENT 4 POWER LOSS TO MAIN STACK RAD MONITOR

Required Operator Actions

RO

Event 4 – Power Loss to Main Stack Radiation Monitor

☐ Monitor the plant.

BOP

Event 4 – Power Loss to Main Stack Radiation Monitor

☐ Recognize and report loss of power to the stack rad monitor

☐ Refer to APPs and verify auto actions

☐ Determine SBGT did not auto start and manually start

- Places SBGT A and B control switches in ON and verifies negative pressure restored by observing pressure indication and alarm clearing.

☐ Determine Secondary Containment is isolated

- Verifies that Rx. Bldg. BFIVs indicate closed

☐ Determine Group 6 has isolated

- May use Group 6 Hard Card

☐ Dispatch AO to investigate power loss

☐ If CS Fan Cooling Unit Inlet Press Low alarms (RHR Room cooler starting) align vital header. (May still be in service from PT)

- Places Control Switch for SW-V111 in OPEN **OR**
- Holds control switch for SW- V117 until the valve is full OPEN

APPLICANT'S ACTIONS OR BEHAVIOR:

EVENT 5 MCC 2TD TRIPS

The crew responds to a loss of power to MCC 2TD.

Malfunctions required – 1; EE030M, Individual Bus Failure to MCC 2TD

Objectives:

RO/BOP – Diagnose loss of power to MCC 2TD.

SRO – Direct trip of 2B Reactor Recirc. Pump and start of 2A Stator Cooling Pump.

RO – Trip 2B Reactor Recirculation Pump.

BOP – Start 2A Stator Cooling Pump

Success Path – Determine impact of MCC 2TD loss of power. Start 2A Stator Cooling pump to prevent turbine trip and trip 2B Recirc pump. Exit Region B and complete AOP-4.0 actions.

Plant Response

THE FOLLOWING IMPORTANT AUTOMATIC ACTIONS AND ANNUNCIATORS SHOULD BE OBSERVED:

1. Stator Coolant Pump B trips, Pump A fails to auto start (can be manually started)
2. Recirc MG B oil pump B2 trips, oil pump B3 fails to start (auto or manual)
3. Recirc Pump B fails to auto trip on low oil pressure (manual trip available)
4. Flow and power lower, plant enters Region B
5. Important Annunciators:
    a. A-07 1-6 FLUID DRIVE B SCOOP TUBE LOCK
    b. A-07 6-4 FLUID DRIVE B LUBE OIL PRESS LO
    c. UA-06 2-5 SUB 2F 480V FEEDER BKR TRIP
    d. UA-02 1-8 STAT COOLANT INLET FLOW-LOW
    e. UA-02 1-9 LOSS OF STAT COOLANT TRIP CKT ENER
    f. UA-02 2-8 STAT COOLANT PRESS-LOW

Simulator Operator Activities

- ☐ **When actions for the Main Stack Radiation Monitor are complete, INITIATE TRIGGER 5**
- ☐ **If contacted as reactor engineer, report you will monitor thermal limits**
- ☐ **If contacted as chemistry for samples, acknowledge request**
- ☐ **If requested as I&C to investigate, acknowledge the request**
- ☐ **If requested as RBAO to close C12-F014A wait 2 mins. then modify RM RD_VHRD14A to 0.70.**

EVENT 5 MCC 2TD TRIPS

Required Operator Actions

SRO
Event 4 – MCC 2TD Trips

- ☐ Direct starting stator coolant pump A
- ☐ Direct tripping Recirc Pump B
- ☐ Direct entry into AOP-04.0
- ☐ Determine region of operation on power/flow map (computer display 806 may be used for reference)
- ☐ Direct actions to exit Region B
- ☐ Refer to Tech Spec 3.4.1 and COLR for SLO, determine APLHGR limit and APRM setpoints must be modified in six hours
- ☐ Direct I&C to investigate failures
- ☐ Direct GP-12 actions for power change

APPLICANT'S ACTIONS OR BEHAVIOR:

EVENT 5 MCC 2TD TRIPS

Required Operator Actions

RO

Event 4 – MCC 2TD Trips

☐ Diagnose failure of Recirc Pump B to trip and manually trip

- Places 2B Recirc Pump MG-Set supply breaker in OFF

☐ Enter and announce AOP-04.0

☐ Determine if valid core flow indication exists on process computer (WTCF), if not determine core flow using Figure 1

☐ Determine region of operation on power/flow map (computer display 806 may be used for reference)

☐ Raise Recirc flow with Recirc pump A or insert control rods to exit Region B

☐ Reduce CRD flow to 30 gpm

- Adjust CRD FCV setpoint tape to 30 gpm.
- CLOSE PCV-F003 to raise drive water D/P
- A-05 2-1 may alarm and actions require dispatching an AO to throttle close F014A

☐ Monitor for THI

☐ Notify chemistry for sampling requirements

BOP

Event 4 – MCC 2TD Trips

☐ Manually start Stator Coolant Pump A

- Places 2A Stator Coolant Pump CS in ON

APPLICANT'S ACTIONS OR BEHAVIOR:

EVENT 6 EHC FAILURE/ELECTRICAL ATWS

The crew responds to EHC Pressure Regulator Malfunction.

Malfunctions required – 3; MS003F, Press Reg Fails High
RP005F, Auto Scram Defeat
RP006F. Manual Scram Defeat

Objectives:

RO/BOP – Diagnose EHC Malfunction and Electrical ATWS.

SRO – Direct trip of ARI.

RO – Trip ARI.

BOP – Assist Scram actions and RPV Level Pressure Control

Success Path – Diagnose EHC, RPS, and ARI failure. Manually initiate ARI.

Plant Response

- ☐ Turbine and bypass valves open to Max Combined flow limit (110%).
  STM LN LO PRESS A (A-04 1-8) alarms
  STM LN LO PRESS B (A-04 2-8) alarms
- ☐ Steam line pressure lowers to 850 psig closing MSIVs (Group 1).
- ☐ Pressure rapidly rises lifting SRVs.
  SAFETY/RELIEF VALVE OPEN (A-03 1-10) alarms
  SAFETY OR DEPRESS VLV LEAKING (A-03 1-1) alarms
- ☐ RPS fails to initiate an auto scram.
- ☐ ARI fails to auto actuate on high pressure.
- ☐ Manual scram fails.
- ☐ SRV F fails to close after opening.
- ☐ Rods inserted by manually initiating ARI.
- ☐ HPCI available for injection by taking Aux Oil Pump out of Pull-To-Lock.

Simulator Operator Activities

- ☐ When the crew has responded to the loss of MCC 2TD, **INITIATE TRIGGER 6** to fail EHC.

EVENT 6 EHC FAILURE/ELECTRICAL ATWS

Required Operator Actions

SRO
Event 6 – EHC Malfunction/ATWS

- ☐ Enter and direct scram procedure, EOP-01-RSP.
- ☐ If rods not yet inserted, transition to Level/Power Control, EOP-01-LPC.
- ☐ Direct manual scram.
- ☐ Direct Mode Switch to Shutdown when steam flow is <3 mlb/hr.
- ☐ Direct ARI to be initiated if not already completed by RO.
- ☐ If EOP-01-LPC has been entered, when control rods inserted, exit LPC and enter Reactor Vessel Control Procedure, EOP-01-RVCP.

APPLICANT'S ACTIONS OR BEHAVIOR:

EVENT 6 EHC FAILURE/ELECTRICAL ATWS

Required Operator Actions

RO

Event 6 – EHC Malfunction/ATWS

☐ Diagnose and report loss of EHC pressure control.

☐ Recognize MSIV closure and failure to auto scram, insert manual reactor scram by depressing manual scram pushbuttons.

☐ Recognize/report failure of RPS manual scram.

☐ Place Mode Switch to Shutdown

☐ Manually initiate ARI.

- Place ARI keylock in Trip
- Place ARI CS in Trip

☐ Recognize and report when control rods are inserted.

BOP

☐ Diagnose and report loss of EHC pressure control.

☐ Recognize MSIV closure and control pressure by opening SRVs as required.

APPLICANT'S ACTIONS OR BEHAVIOR:

EVENT 7 SRV F Failed OPEN/ HPCI power supply loss.

The crew responds to failed OPEN SRV and loss of HPCI.

Malfunctions required – 2; ES004F, SRV F Fails OPEN
ES015F, HPCI Power Supply Loss

Objectives:

RO/BOP – Diagnose and mitigate SRV F failed OPEN.

SRO – Direct AOP-30 actions to attempt to close SRV F.

SRO – Direct EOP-01-RVCP actions to maintain RPV level 170"-200"

RO/BOP – Maintain RPV level and Pressure with failed open SRV.

Success Path – Diagnose SRV failure and HPCI power supply loss. Perform actions to attempt to CLOSE SRV and operate other injection systems to maintain RPV level.

Plant Response

- ☐ SRV F remains OPEN
  - SAFETY/RELIEF VALVE OPEN (A-03 1-10) alarms
  - SAFETY OR DEPRESS VLV LEAKING (A-03 1-1) alarms
- ☐ HPCI flow is lost

Simulator Operator Activities

- ☐ If requested as I&C to investigate spray logic, acknowledge the request.
- ☐ After HPCI is started, wait approximately 30 seconds and **INITIATE TRIGGER 9** to fail HPCI controller power supply.

If asked as I&C to investigate HPCI power loss, acknowledge the request.

EVENT 7 SRV F Failed OPEN/ HPCI power supply loss.

Required Operator Actions

SRO

Event 7 – SRV F failed OPEN/HPCI power supply loss

- ☐ Direct entry into AOP-30 SRV Failures.
- ☐ Enter Reactor Vessel Control Procedure, EOP-01-RVCP (if not already entered) and Primary Containment Control Procedure, EOP-02-PCCP.
- ☐ Direct RPV level be restored and maintained +170-200".

APPLICANT'S ACTIONS OR BEHAVIOR:

EVENT 7 SRV F Failed OPEN/ HPCI power supply loss.

Required Operator Actions

RO

Event 7 – SRV F failed OPEN/HPCI power supply loss

☐ Diagnose and report failed open SRV and perform actions of AOP-30.

- Cycle control switch several times leaving switch in CLOSE.
- Request that the fuses in the order listed in Attachment 1 for the affected safety/relief valve be pulled

☐ Start HPCI to restore and maintain RPV level +170- 200".

- Start Aux Oil Pump.
- Verify system response.

☐ Diagnose and report failure of HPCI controller power supply.

- Depress and hold HPCI Trip push button
- When HPCI turbine RPM is approximately zero, PLACE the HPCI Auxiliary Oil Pump control switch in Pull-to-Lock.
- When HPCI Turbine Control Valve, E41-V9, indicates full closed, release the HPCI turbine trip push button.

APPLICANT'S ACTIONS OR BEHAVIOR:

EVENT 8 SRV F Tailpipe ruptured CTMT. Spray logic failed.

The crew responds to failed SRV tail pipe rupture.

Malfunctions required – 1; CA020F, SRV F Tailpipe ruptures.

Objectives:

RO/BOP/SRO – Diagnose SRV F tailpipe rupture.

SRO – Direct containment spray and emergency depressurization due to failed SRV tailpipe with SRV failed OPEN.

RO/BOP – Perform Emergency Depressurization

Success Path – Diagnose SRV failure and PSP violation. Perform emergency depressurization.

Plant Response

SPECIFIC CAUSE

The SRV vacuum breaker failed closed during the last operation resulting in water being drawn up into the tail pipe. When the SRV is opened, a water hammer occurs which results in a tail pipe rupture above the Suppression Pool water level.

- ☐ SRV F tail pipe ruptures in the suppression chamber air space 4 minutes after opening.
  RHR HIGH DRYWELL PRESS (A-03 4-9) alarms
  PRI CONTAIN PRESS HI TRIP (A-05 5-6) alarms
- ☐ Suppression chamber and drywell pressure rapidly rise.
- ☐ Suppression chamber pressure leads drywell pressure and torus-drywell vacuum breakers lifting indicate broken SRV tailpipe.
- ☐ RHR unavailable for spray due to failure of spray logic.
- ☐ Pressure suppression pressure limit is exceeded.

Simulator Operator Activities

- ☐ If requested as I&C to investigate spray logic, acknowledge the request.
- ☐ After HPCI is started, wait approximately 30 seconds and **INITIATE TRIGGER 9** to fail HPCI controller power supply.
- ☐ If asked as I&C to investigate HPCI power loss, acknowledge the request.

EVENT 8 **SRV F Tailpipe ruptured CTMT. Spray logic failed.**

Required Operator Actions

SRO

Event 8 – SRV F Tailpipe ruptured/CTMT Spray logic failed

- ☐ Direct initiation of suppression chamber spray.
- ☐ Direct initiation of drywell spray.
- ☐ Direct I&C to investigate failure of spray logic.
- ☐ Determine leak is in suppression chamber based on higher suppression chamber pressure and/or vacuum breaker operation.
- ☐ When PSPL exceeded, determine emergency depressurization is required.

APPLICANT'S ACTIONS OR BEHAVIOR:

Required Operator Actions

RO/BOP

Event 8 – SRV F Tailpipe ruptured/CTMT Spray logic failed

- ☐ Diagnose and report rapidly rising containment pressures.
- ☐ Determine leak is in suppression chamber based on higher suppression chamber pressure and/or vacuum breaker operation.
- ☐ Attempt to initiate spray per SEP-02 and/or SEP-03.
- ☐ Diagnose and report failure of RHR Loop B spray logic.
- ☐ Diagnose and report failure of E11-F016A.

APPLICANT'S ACTIONS OR BEHAVIOR:

EVENT 8 EMERGENCY DEPRESSURIZATION

The crew performs Emergency Depressurization based upon exceeding PSPL graph.

Malfunctions required – NA

Objectives:

SRO – Direct emergency depressurization due to failed SRV tailpipe with SRV failed OPEN.

RO/BOP – Perform Emergency Depressurization

RO/BOP – Control injection systems during depressurization.

Success Path – Perform emergency depressurization.

Plant Response

- ☐ RCIC may trip due to elevated suppression chamber pressure.
- ☐ Low pressure ECCS initiates when RPV pressure drops below 410 psig (Core Spray injects at 300 psig, RHR injects at 200 psig).
- ☐ Condensate begins to inject at approximately 400 psig if FW-V6 and FW-V8 (Feedwater Heater outlet isolation valves) are not closed.

Simulator Operator Activities

- ☐ After ADS valves have been opened, if I&C has been directed to investigate RHR spray logic, delete switch override K1727A and report logic repaired OR If I&C has been requested to investigate failure of A RHR spray valve F016A delete override K1D26A.

EVENT 8 EMERGENCY DEPRESSURIZATION

Required Operator Actions

SRO

Event 8 – Emergency Depressurization

☐ Direct low pressure ECCS be operated to prevent uncontrolled injection.

☐ Direct Condensate be operated to prevent uncontrolled injection.

☐ Direct 7 ADS valves opened.

RO/BOP

Event 8 – Emergency Depressurization

☐ Open 7 ADS valves.

☐ Override RHR and Core Spray Pumps off when RPV pressure drops below 410 psig if injection is not required for RPV level control.

☐ Verify LOCA actuations. (May use Hard Card)

☐ Operate the condensate system to prevent uncontrolled injection (close FW-V6 and FW-V8).

APPLICANT'S ACTIONS OR BEHAVIOR:

EVENT 9 REACTOR DEPRESSURIZED

The crew restores RPV level and stabilizes Primary Containment parameters.

Malfunctions required – NA

Objectives:

SRO – Direct placing drywell sprays in service per SEP-02.

RO/BOP – Place drywell sprays in service per SEP-02.

Success Path – Place drywell sprays in service per SEP-02.

Plant Response

- ☐ RHR Outboard Injection valves E11-F017A/B can be closed 5 minutes after opening.
- ☐ Only one loop of RHR available for containment cooling/spray since a LPCI signal present and one loop's spray logic is failed.

Simulator Operator Activities

- ☐ When the Reactor has been depressurized, the scenario may be terminated.
- ☐ If desired, request the SCO classify the event per the E Plan.

EVENT 8 REACTOR DEPRESSURIZED

Required Operator Actions

SRO

Event 8 – Reactor Depressurized

☐ Direct RPV level be maintained +170-200".

☐ Direct RHR be placed in drywell and suppression chamber spray when injection valves E11-F017A and/or B can be closed.

☐ Refer to Caution 1 for level instrument operability.

☐ As time permits direct placing H2/O2 monitors (4409 & 4410) in service.

APPLICANT'S ACTIONS OR BEHAVIOR:

EVENT 8 REACTOR DEPRESSURIZED

Required Operator Actions

RO

Event 8 – Reactor Depressurized

☐ Operate available injection systems (Condensate, RHR, Core Spray) to maintain +170-200".

☐ Place RHR Loop A(B) into drywell and suppression chamber spray per SEP-02 and SEP-03:

Close E11-F017A(B).

Verify Drywell Coolers and Recirc Pumps tripped.

Place "Think Switch" to Manual.

Start RHR Pump.

Verify safe region of spray initiation limit and torus level <+21".

Open E11-F021A(B).

Open E11-F016 A(B). to establish flow 8000-10,000 GPM-(drywell spray)

Start RHR Service Water (open service water supply valve, place LPCI override switch to override, start RHR SW Pumps and throttle open E11-F068A or B (4000 GPM max – 1 pump, 8000 GPM max – 2 pump).

Close RHR HX Bypass E11-F048A(B).

Open E11-F028 A(B) and E11-F027A(B) (torus spray – SEP-03)

☐ If directed, place H2/O2 (4409 & 4410) monitors in service.

APPLICANT'S ACTIONS OR BEHAVIOR:

PROGRESS ENERGY CAROLINAS
BRUNSWICK TRAINING SECTION

NRC SIMULATOR EXAM SCENARIO

NRC 2004-2

LESSON TITLE: RCIC Test, RHR Suction Strainer Clogged, Control Rod Drift, Feed Pump Trip and Limiter #2 Failure, RWCU System Rupture and Failure to Isolate, SCRAM, Core Spray Max Safe Water Level, SRVs lose power AEDP.

REVISION NO: 00 APPROXIMATE TIME REQUIRED: 75 Mins.

RECOMMENDED BY: Curt Robert
Instructor/Developer DATE

CONCURRENCE BY: _____
Line Superintendent/Supervisor DATE

APPROVED BY: _____
Superintendent/Supervisor Training DATE

SCENARIO DESCRIPTION

The plant is operating at maximum power, middle of cycle. RWCU Pump B is under clearance and expected to remain out of service until next shift.

The crew will perform a RCIC Operability Test. When RCIC is started the governor will fail resulting in low speed oscillation. RCIC must be tripped to prevent prolonged low speed operation.

The RHR Loop B suction strainer will become clogged and the Loop in Suppression Pool Cooling must be shutdown and declared INOPERABLE.

A control rod will drift into the core. The operator should attempt to arrest the rod but will be unsuccessful. The cause will be reported as a leaking scram valve. The rod should be individually scrammed to correct the problem. The NE will recommend power reduction via Recirculation flow prior to restoring the rod to its original position.

Reactor Feed Pump B thrust bearing wear trip condition will occur, but the pump will fail to automatically trip. The crew will manually trip the Reactor Feed Pump. Reactor level will lower to the low level alarm, but the Recirc Pumps will run back to limiter #1 instead of limiter #2. This places the plant in the Region B of the power/flow map requiring control rod insertion to exit the region.

A line rupture will develop in the RWCU system in the 77' elevation. The G31-F001 valve will thermal out mid position, and the G31-F004 will trip magnetically. The 50' elevation temperature will rise requiring a manual scram prior to reaching the maximum safe operating temperature.

Area temperatures and water levels will rise. With the leak being on water vs. steam system, water levels will be the primary challenge. Initially South Core Spray will exceed max normal, then max safe water level. Then South RHR will exceed max normal then max safe water level. The crew is directed to consider anticipating emergency depressurization as soon as EOP-03-SCCP directs inserting a manual scram. If the crew does not anticipate emergency depressurization (rapid depressurization to the main condenser), emergency depressurization will be required with 2 areas above max safe water level.

The crew will respond to the loss of SRVs by entering the Alternate Emergency Depressurization Procedure. The crew will equalize around and open MSIVs and rapidly depressurize to the main condenser. This will allow low pressure systems to reflood the reactor vessel.

When AEDP has been performed and RPV level has been restored to the normal band, the scenario may be terminated.

SIMULATOR SETUP

Initial Conditions

IC	11
Rx Power	96%
Core Age	BOC

Scenario File:

Title - NRC 2004-2
Path - A:\NRC 2004 2.scn
Saved on 09-04-2004 at 14:49:09

mfi:ES020F,True,00:00:00,00:00:00, 1
mfi:RH019F, 80,00:00:30,00:00:00,00:00:00, 2
mfi:MS005F,True,00:00:00,00:00:00, 9
mfi:RW013F, 100,00:06:00,00:00:00,00:00:00, 5
mfi:RW015F,True,00:00:00,00:00:00, 0
mfi:RW016F,True,00:00:00,00:00:00, 0
mfi:RC024F,True,00:00:00,00:00:00, 10
mfi:RC025F,True,00:00:00,00:00:00, 10
mfi:RD027M,True,,00:00:00,00:00:00, 3,46-23
mfi:XY013F,True,00:00:00,00:00:00, 0
rfi:RW_ZVRW001M,OFF,00:00:00, 6
rfi:RW_ZVRW004M,OFF,00:00:00, 7
tri:6, Q1314LGK
tri:7, Q1410LGK
tri:9, K2503PP7
tri:10, ZA722 == True
tri:11, K2620JYD
trc:11, mfd:rd027m, 46-23
doi:Q1314LGK,ON/OFF,ON,00:00:00,00:00:00, 6
doi:Q1314RRK,ON/OFF,ON,00:00:00,00:00:00, 6
doi:Q2110LGK,ON/OFF,OFF,00:00:00,00:00:00, 0
ani:ZUA434, ON, 00:00:00, 00:00:00, 4
ani:ZUA414, ON, 00:00:00, 00:00:00, 4
ani:ZUA424, ON, 00:00:00, 00:00:00, 4
ani:ZA245, ON, 00:00:00, 00:00:00, 6
ani:ZUA1214, ON, 00:00:00, 00:00:00, 8
ani:ZA722, OFF, 00:00:00, 00:00:00, 10

Materials

PT-10.1.1 completed up to pump testing

Special Instructions

Place RHR Loop B in suppression pool cooling. Start RHR Pump B. Ensure NSW Pump 2A is running in support of RHR SW Loop B (PRIOR to loading scenario file). Start SBGT A, ensure open SGT-V8 and V9.

Load malfunctions/overrides, or load scenario file if available.

Ensure ENP-24 for IC-11 @ P603.

Critical Tasks

Perform recovery of control rod following control rod drift without crossing control rod tips.

Anticipate Emergency Depressurization or Perform Alternate Emergency Depressurization.

SHIFT BRIEFING

Plant Status

The plant is operating at maximum power, beginning of cycle.

RHR Loop 2B is running in suppression pool cooling in preparation for RCIC Operability Testing.

SBGT Fan 2A is running in preparation for RCIC Operability Testing.

Equipment Out Of Service

No other equipment is out of service

Plan of the Day

Maintain current power.

0PT-10.1.1 is complete up to Pump Operability Testing (Section 7.10). Perform RCIC Pump Operability Testing per 0PT-10.1.1. All required personnel have been notified and are ready for pump testing.

EVENT 1 SHIFT TURNOVER/RCIC TEST/GOVERNOR FAILURE

The crew performs a RCIC Pump Operability Test and responds to a RCIC Governor failure.

Malfunctions required – 1; ES020F

Objectives:

BOP - Perform RCIC Pump Operability Test per PT-10.1.1

BOP – Manually trip or shutdown RCIC to prevent prolonged low speed oscillation following diagnosis of the RCIC speed control failure.

SRO – Refer to Technical Specifications and Declare RCIC Inoperable.

Success Path – Manually trip or shutdown RCIC to prevent prolonged low speed oscillation and declare RCIC INOPERABLE.

Plant Response

- ☐ RCIC Pump Discharge pressure will decrease as the Governor Valve throttles closed. Pressure will oscillate until turbine speed decreases to a steady state value.
- ☐ RCIC Pump Discharge flow will decrease as the Governor Valve throttles closed. Flow will oscillate until the turbine speed decreases to a steady state value.
- ☐ RCIC Turbine Governor Valve will throttle shut and turbine speed will decrease. As speed decreases the Shaft Driven Oil Pump discharge pressure will decrease. Below a certain speed the oil pump discharge pressure is not sufficient enough to hold the Governor Valve closed. The valve then throttles open causing turbine speed to increase until oil pressure increases enough to throttle the Governor Valve Closed. Turbine Speed will oscillate and eventually reach some decreased steady state (approximately 700 rpm).
- ☐ RCIC PUMP DISCH FLOW LO (A-03 3-4)

Simulator Operator Activities

- ☐ Set up the simulator per the setup
- ☐ If requested, inform control room all personnel required for testing are on station and ready
- ☐ When requested, report lubricant level is normal and local suction pressure indicates 55 psig
- ☐ If requested, as system engineer recommend throttling bypass to CST as specified in the PT
- ☐ When requested, report as AO you are stationed to observe discharge piping and all non essential personnel are cleared from the turbine area
- ☐ After RCIC is started and initial test conditions have been established, initiate Trigger E1 to fail RCIC speed controller
- ☐ If requested as I&C to investigate the governor, acknowledge the request

EVENT 1 SHIFT TURNOVER/RCIC TEST/GOVERNOR FAILURE

Required Operator Actions

SRO

Normal Operation

☐ Conduct shift turnover shift briefing.

☐ Direct continuation of 0PT-10.1.1

RO

During normal operation

☐ Monitor plant during PT performance.

BOP

Normal Operation

☐ Perform board walk-down.

☐ Monitor the plant during RCIC PT

☐ Perform RCIC Pump testing per PT-10.1.1

- **OPEN** *COND PUMP DISCH INBD DRAIN VLV, E51-F004.*
- **CONFIRM** *RCIC SYSTEM PRESS LOW* (A-02 2-6) annunciator is clear.
- **DIRECT AO to ENSURE** the RCIC lubricant oil level is normal.
- **RECORD** RCIC pump suction pressure (stopped) indicated on *E51-PI-R002* (local) on Attachment 2.
- **RECORD** RCIC *CONDENSATE CHECK VALVE TO PUMP, E51-F011* and *RCIC CONDENSATE PUMP DISCHARGE LINE CHECK VALVE, E51-F047* are closed on Attachment 3.
- **CLOSE** *COND PUMP DISCH INBD DRAIN VLV, E51-F004.*
- **OPEN** *REDUNDANT ISOL TO CST VLV, E41-F011.*
- **START** *BAROMETRIC CNDSR VACUUM PUMP.*
- **OPEN** *COOLING WATER SUPPLY VLV, E51-F046.*

EVENT 1 SHIFT TURNOVER/RCIC TEST/GOVERNOR FAILURE

Required Operator Actions

BOP

Normal Operation

- **THROTTLE OPEN** *BYPASS TO CST VLV, E51-F022*, 2 to 4 seconds
- **DISPATCH** an auxiliary operator to observe the system discharge piping for excessive motion and water hammer during startup of the RCIC System.
- **EVACUATE** all personnel below the Reactor Building 20' elevation east half.
- **MONITOR** suppression pool temperature at intervals less than or equal to 5 minutes to ensure the average suppression pool temperature is less than 104°F.
- **OPEN** *TURBINE STEAM SUPPLY VLV, E51-F045.*
- **CONFIRM** RCIC turbine starts and develops a flow of greater than or equal to 400 gpm **AND RECORD** the start time
- **ADJUST** RCIC *FLOW CONTROL, E51-FIC-R600*, and *BYPASS TO CST VLV, E51-F022*, as necessary, to obtain a pump discharge pressure of greater than or equal to 1130 psig with a pump flow rate of greater than or equal to 400 gpm. **(Governor malfunction inserted here.)**

APPLICANT'S ACTIONS OR BEHAVIOR:

EVENT 1 SHIFT TURNOVER/RCIC TEST/GOVERNOR FAILURE

Required Operator Actions

SCO

Event 1 - RCIC Governor Failure

- ☐ Direct RCIC be tripped or shutdown to prevent low speed operation
- ☐ Direct I&C to investigate RCIC speed control failure
- ☐ Declare RCIC Inoperable, refer to Tech Spec 3.5.3 and determine Action A is required

BOP

Event 1 - RCIC Governor Failure

- ☐ Recognize/report speed control failure on RCIC
- ☐ Manually trip RCIC to prevent prolonged low speed oscillation.

APPLICANT'S ACTIONS OR BEHAVIOR:

EVENT 2 RHR SUCTION STRAINER PLUGGING

The crew responds to RHR Suction Strainer plugging.

Malfunctions required – 1; RH019F

Objectives:

RO – Diagnose RHR pump cavitation due to suction strainer plugging and secure B Loop of RHR Suppression Pool Cooling.

SRO – Direct that B Loop of RHR Suppression Pool Cooling be shutdown.

SRO – Refer to Technical Specifications and Declare B Loop RHR Inoperable.

Success Path – Diagnose RHR pump cavitation due to suction strainer plugging and secure B Loop of RHR Suppression Pool Cooling. Declare B Loop RHR Inoperable.

Plant Response

- ☐ A-3 2-1 CORE SPRAY OR RHR PUMPS RUNNING alarm clears
- ☐ E11-FI-R603B RHR B LOOP Discharge Flow lowers with no change in system valve position.
- ☐ BOP BUS 2C amps fluctuate indicating pump cavitation.

Simulator Operator Activities

- ☐ If requested to investigate RHR pump operation, inform control room that the pumps sound like they are cavitating.
- ☐ If requested to investigate as engineering or maintenance recommend removing control power fuses for RHR pumps B and D to prevent AUTO start until a clearance can be hung.

EVENT 2 RHR SUCTION STRAINER PLUGGING

Required Operator Actions

SCO

Event 2 – RHR Suction Strainer Plugging

☐ Direct B LOOP RHR be shutdown to prevent operation without suction.

☐ Direct maintenance to investigate B Loop RHR suction problem.

☐ Declare B Loop RHR Inoperable, refer to Tech Spec 3.5.1 and 3.6.2.3 and determine Action A is required for both.

RO

Event 2 – RHR Suction Strainer Plugging

☐ Recognize/report RHR suction problem.

☐ Shutdown B Loop RHR Suppression Pool Cooling per OP-17.

- **THROTTLE** *TORUS COOLING ISOL VLV, E11-F024B*, as necessary, to establish 6,000 to 10,000 gpm flow indicated on *E11-FI-R603B*.
- **STOP** one operating RHR Loop A(B) pump.
- **CLOSE** *TORUS COOLING ISOL VLV, E11-F024B*.
- **IMMEDIATELY STOP** the operating RHR Loop B pump being utilized for suppression pool cooling.
- **CLOSE** *TORUS DISCHARGE ISOL VLV, E11-F028B*.
- **OPEN** *HX 2A(2B) BYPASS VLV, E11-F048B*.
- **ENSURE** *MIN FLOW BYPASS VLV, E11-F007B*, is closed.
- **ENSURE** *HX 2A(2B) INLET VLV, E11-F047B*, is open.
- **ENSURE** *HX 2A(2B) OUTLET VLV, E11-F003B*, is open.

☐ DIRECT AO to remove control power fuses if directed by SCO to prevent AUTO start.

APPLICANT'S ACTIONS OR BEHAVIOR:

EVENT 3 CONTROL ROD DRIFT

The crew responds to a drifting control rod due to a leaking scram valve.

Malfunctions required – 1; RD027M, 46-23

Objectives:

RO – Respond to a control rod drift per APP and AOP-2.0.

SRO – Direct actions to mitigate a drifting control rod.

Success Path – Diagnose and arrest drifting control. Perform single rod scram to reseat the scram valve. Restore control rod to original position per reactor engineer's instruction.

Plant Response

- ☐ Rod Drift Alarm A5 3-2
- ☐ Rod 46-23 drifts into the core

Simulator Operator Activities

- ☐ When actions for shutdown of RHR SPC are complete, initiate **TRIGGER 3**
- ☐ If requested, as RBAO report scram discharge riser on HCU 46-23 is abnormally hot
- ☐ If contacted as Nuclear Engineer, request power be reduced to ≤80% using Recirc Flow. Then fully insert control rod 42-27 and fully insert 46-23, perform single rod scram of 46-23. If scram valve reseats withdraw control rod 46-23 back to position 48 and then withdraw 42-27 to position 22. Recommend single notch withdrawal to position 32, then continuous from 32 to 48 for control rod 46-23.

EVENT 3 CONTROL ROD DRIFT

Required Operator Actions

SCO

Event 3 – Control Rod Drift

- ☐ Direct actions of APP
- ☐ Contact I&C to investigate
- ☐ Contact NE for guidance
- ☐ Direct power reduction to ≤80% using Recirc Flow
- ☐ Direct control rod 42-27 be fully inserted.
- ☐ Direct 46-23 rod fully inserted then perform individual rod scram.
- ☐ Direct rod 46-23 be restored to position 48, and 42-27 be restored to 22.

APPLICANT'S ACTIONS OR BEHAVIOR:

EVENT 3 CONTROL ROD DRIFT

Required Operator Actions

RO

Event 3 – Control Rod Drift

- ☐ Recognize/report drifting rod, determine 46-23 drifting in
- ☐ Perform actions for rod drift APP
- ☐ Arrest drifting rod by performing notch withdraw.
- ☐ Use PPC Screen 810 to determine adjacent intermediate control rod 42-27.
- ☐ Dispatch AO to determine reason for rod drift
- ☐ Reduce power to ≤80% using Recirc Flow
- ☐ Fully insert rod 42-27
- ☐ Fully insert 46-23
- ☐ Insert individual rod scram for rod 46-23
- ☐ Reset rod drift
- ☐ Restore control rod 46-23 back to position 48

APPLICANT'S ACTIONS OR BEHAVIOR:

EVENT 4 RFP Thrust Bearing Wear Detector Trip

The crew responds to a RFP trip per AOP-23 and AOP-4.0.

Malfunctions required – 3; ZUA434, ON, ZUA414, ON, ZUA424 ON

Objectives:

BOP – Respond to RFP B Thrust Bearing Wear detector alarms and trip RFP B after diagnosing trip failure.

RO – Reduce power as necessary to prevent a scram due to the RFP trip.

RO – Diagnose Recirc Runback to limiter #1 instead of limiter #2.

SRO – Direct actions to mitigate a RFP trip per AOP-23 and AOP-4.0.

Success Path – Diagnose failure of RFP B to trip. Trip RFP B. Diagnose runback circuit failure. Perform action necessary to exit Scram Avoidance Region of power Flow map per AOP-4.0.

Plant Response

- ☐ RFP B fails to trip on high thrust bearing wear
- ☐ Recirc runback to limiter #1 when RFP is tripped

Simulator Operator Activities

- ☐ Immediately after the crew has withdrawn control rod 46-23, initiate **TRIGGER 4** to activate Feed Pump B alarms
- ☐ If asked to investigate RFP B, and the RFP has not been tripped, report very loud noise and severe vibration on RFPT B

EVENT 4 RFP Thrust Bearing Wear Detector Trip

Required Operator Actions

SCO

Event 4 – RFP Thrust Bearing Wear Detector Trip

- ☐ Direct RFP B be manually tripped
- ☐ Direct power reduction per AOP-23.0 to stabilize RPV level
- ☐ Direct entry into AOP-23.0
- ☐ Direct entry into AOP-04.0
- ☐ Determine operation in Scram Avoidance Region of power/flow map
- ☐ Direct raising recirc flow or control rod insertion to exit Scram Avoidance Region.
- ☐ Direct maintenance to investigate RFP B
- ☐ Direct I&C to investigate failure of RFP to trip and failure of limiter #1

APPLICANT'S ACTIONS OR BEHAVIOR:

EVENT 4 RFP Thrust Bearing Wear Detector Trip

Required Operator Actions

BOP

Event 4 – RFP Thrust Bearing Wear Detector Trip

- ☐ Recognize/report RFP alarms
- ☐ Determine RFP B should have tripped
- ☐ Manually trip RFP B
- ☐ Dispatch AO to investigate RFP B
- ☐ Refer to OP-32 for shutdown of 1st Feed Pump

RO

Event 4 – RFP Thrust Bearing Wear Detector Trip

- ☐ Announce entry into AOP-23.0
- ☐ Reduce Recirc pump speed demand to 45%, (AOP-23 immediate action))
- ☐ Recognize and report failure of limiter #1
- ☐ Enter/announce AOP-04.0
- ☐ Determine operation in SAR of power/flow map
- ☐ **RAISE** core flow or **INSERT** control rods in accordance with 0ENP-24.0, Form 2, Immediate Reactor Power Reduction Instructions to exit SAR

APPLICANT'S ACTIONS OR BEHAVIOR:

EVENT 5 RWCU Rupture

The crew responds to a RWCU rupture per APPs and AOP-5.0.

Malfunctions required – 3; RW013F, RW015F, RW016F

Objectives:

BOP – Respond to reactor building ARM alarm and perform actions in AOP-5.0 for high radiation in the reactor building.

RO – Diagnose RWCU rupture and failure to isolate.

SRO – Direct actions to mitigate a RWCU rupture per AOP-5.0.

Success Path – Diagnose RWCU rupture and attempt isolation.

Plant Response

- ☐ 50' temperature rises and exceeds max normal
- ☐ Reactor Building ARM alarm
- ☐ G31-F001 and G31-F004 fail to close, leak is unisolable
- ☐ Group 1 isolates.

Simulator Operator Activities

- ☐ When the crew has stabilized the plant after the RFP trip, initiate **TRIGGER 5** to start the RWCU rupture
- ☐ When Rx Bldg ARM alarms, report as RBAO steam on 50' elevation and you have left the building
- ☐ If requested to close PIV-33, wait 3 minutes and report closed If asked as Unit 1, report fire alarms Unit 2 Rx Bldg.

EVENT 5 - RWCU Rupture
Required Operator Actions

SCO
Event 5 - RWCU Rupture

- ☐ Direct entry into AOP-05.0
- ☐ Enter and direct EOP-03-SCCP
- ☐ Direct verification of auto actions
- ☐ Direct evacuation of the reactor building
- ☐ Diagnose leak from RWCU and direct RWCU isolation
- ☐ Direct RHR room coolers be started
- ☐ Direct service water aligned to the vital header
- ☐ Contact engineering to perform EQ evaluation
- ☐ If reactor building loses negative pressure, enter and execute RRCP for unmonitored release, and request field surveys

APPLICANT'S ACTIONS OR BEHAVIOR:

EVENT 5 – RWCU Rupture
Required Operator Actions

RO
Event 5 - RWCU Rupture

- ☐ Diagnose as RWCU leak and attempt to manually isolate, recognize and report RWCU inboard and outboard valve failures and inability to isolate RWCU
- ☐ Align service water to the vital header (SW-V117 or SW-V111) if not already done

BOP
Event 5 - RWCU Rupture

- ☐ Enter and announce AOP-05.0
- ☐ Direct PIV-33 be closed
- ☐ Evacuate the reactor building
- ☐ Start the RHR room coolers
- ☐ Monitor Reactor Building pressure, report when positive
- ☐ Inform HP of RB conditions

APPLICANT'S ACTIONS OR BEHAVIOR:

EVENT 6 Reactor Scram

The crew performs initial reactor scram actions.

Malfunctions required – 2; MS015F, XY013F

Objectives:

BOP – Respond to reactor building ARM alarm and perform actions in AOP-5.0 for high radiation in the reactor building.

RO – Diagnose RWCU rupture and failure to isolate.

RO/BOP – Diagnose Group 1 isolation and respond to control pressure.

RO/BOP – Diagnose Group 2 isolation failure and isolate Group 2.

SRO – Direct actions to mitigate a RWCU rupture per AOP-5.0.

SRO – Direct isolation of Group 2.

Success Path – Diagnose RWCU rupture and attempt isolation.

Plant Response

- ☐ 50' temp exceeds max normal, N026A/B Inoperable
- ☐ If RPV level drops below 150 on N004s, no direct indication of RPV level until Recirc Pumps are tripped (then N036/N037 are available) (Indirect indications of RPV level available through various level alarms and initiation status lights)
- ☐ HPCI injection required to maintain RPV level >TAF (injection valve fails to auto open if LL2 reached)
- ☐ HPCI injection @ 4300 gpm will cause rapid lowering of RPV pressure

Simulator Operator Activities

- ☐ After the scram is inserted, ensure GP 1 isolation occurs.
- ☐ If contacted to evaluate EQ envelopes, acknowledge the request
- ☐ If requested as E&RC to perform E&RC-2020, PEP-03.4.7 and/or field surveys, acknowledge the request

EVENT 6 – Reactor Scram
Required Operator Actions

SCO
Event 6 – Reactor Scram

- ☐ Before 50' reaches max safe temp, direct a manual reactor scram
- ☐ Enter and direct EOP-01-RSP
- ☐ Determine entry into EOP-01-RVCP is required, enter and direct
- ☐ Direct verification of group isolations. (Group 2 failed)
- ☐ Direct maintaining RPV level 170-200" (determine N026A/B inoperable)
- ☐ Direct starting HPCI to maintain level
- ☐ Direct pressure control using SRVs
- ☐ Direct tripping Recirc Pumps for RPV level instrument indication (if level drops below range of N004s)

APPLICANT'S ACTIONS OR BEHAVIOR:

EVENT 6 – Reactor Scram
Required Operator Actions

RO
Event 6 – Reactor Scram

- ☐ Insert a manual scram as directed by SCO
- ☐ When steam flow <3 million lbm/hr, place Mode switch to Shutdown (immediate action)
- ☐ When APRMs downscale, trip main turbine (immediate action)
- ☐ Ensure level setdown to +170" (immediate action)
- ☐ Determine immediate action to trip a feed Pump not applicable
- ☐ Diagnose MSIV closure, control pressure with SRVs and restore/maintain RPV level 170-200" (using N004A/B/C)
- ☐ Diagnose failure of GP 2 to isolate and perform isolation manually.
- ☐ Manually start HPCI to maintain RPV level (open injection valve if LL2 initiation)
- ☐ If level drops below range of N004s, recognize and report no direct RPV level indication is available (indirect indication is available)

BOP
Event 6 – Reactor Scram

- ☐ Assist RO with immediate actions as required
- ☐ Trip Recirc pumps if directed by SCO

APPLICANT'S ACTIONS OR BEHAVIOR:

Event 7 – Core Spray MAX SAFE Water Level

The crew performs actions of EOP-03-SCCP.

Malfunctions required – 1, All SRVs lose power

Objectives:

RO – Control RPV level and pressure with limited instrumentation available.

RO/BOP – Assess secondary containment parameters as conditions degrade.

RO/BOP – Diagnose Loss of SRV power and report condition to SCO.

SRO – Direct actions to mitigate a RWCU rupture per EOP-03-SCCP.

Success Path – Commence cooldown or consider anticipation to ED. Diagnose loss of SRV power and look ahead to OPEN MSIVs.

Plant Response

- ☐ South Core Spray flood level hi & hi-hi alarms received
- ☐ 50' temp may exceed MSOT, since 2 max safes in different tables, ED not required
- ☐ After South Core Spray Hi-Hi, S RHR Hi alarms
- ☐ All SRVs lose power after SCS Hi-Hi alarm

Simulator Operator Activities

- ☐ If SCO has called for EQ envelop evaluation, after South Core Spray exceeds Max Safe Level (Hi-Hi alarm), inform SCO that temperature EQ limits have been exceeded on 50' Reactor Building
- ☐ After UA-12 1-3, SCS Hi-Hi alarms insert batch file all SRVs lose power and delete MS005F.
- ☐ When it is desired to see the crew perform AEDP initiate **TRIGGER 8** to override UA-12 1-4 SRHR Flood Level Hi-Hi ON.

Event 7 – Core Spray MAX SAFE Water Level
Required Operator Actions

SCO
Event 7 – Core Spray MAX SAFE Water Level

- ☐ Recognize an area above MSOWL and a different area above MSOT
- ☐ Determine different tables and ED is not required
- ☐ Consider anticipating ED per RVCP
- ☐ Direct crew on implications of loss of SRV power. (Need to OPEN MSIVs)

APPLICANT'S ACTIONS OR BEHAVIOR:

EVENT 7 – Core Spray MAX SAFE Water Level
Required Operator Actions

RO/BOP
Event 7 – Core Spray MAX SAFE Water Level

☐ Recognize and report flood level alarms for S Core Spray and S RHR

☐ Continue to maintain RPV level +170-200 inches using HPCI as required

☐ Diagnose Loss of SRV Power

☐ If directed perform **Equalization Around and Opening of MSIVs For Anticipation of Emergency Depressurization**

_____: IF IN MODE 3 AND CONDENSER VACUUM IS LOW, THEN ENSURE VACUUM BYPASS SWITCHES ARE IN BYPASS
_____: PLACE MSIV CONTROL SWITCHES TO CLOSE
_____: RESET GROUP 1 ISOLATION
_____: OPEN OUTBOARD MISVs
_____: OPEN MS-F020
_____: OPEN B21-F019
_____: CLOSE MS-V28
_____: CLOSE MVD-F021
_____: OPEN B21-F016
_____: OPEN MS-F038A, B, C, AND D
_____: ENSURE STEAM LINE PRESSURE IS INCREASING DOWN STREAM OF OUTBOARD MSIVs
_____: CLOSE MS-V46, V47, V48, V49, AND V35.
_____: WHEN LESS THAN 50 PSID OR 200 PSID ACROSS THE VALVE FOR A RAPID RECOVERY, OPEN INBOARD MSIVs
_____: OPEN MVD-F021
_____: OPEN MVD-V5005
_____: OPEN MS-V46, V47, V48, V49, AND V35.
_____: ENSURE OPEN MS-V43, MS-V44, MS-V45, MS-V37/V39, MS-V41/ V42, MS-V36
_____: OPEN MS-V28
_____: CONTINUE WITH PRESSURE CONTROL STEPS AS DIRECTED BY THE EOPs

APPLICANT'S ACTIONS OR BEHAVIOR:

_____
_____
_____
_____
_____
_____
_____

Event 8 – LOSS OF ADS/SRV POWER

The crew performs actions of EOP-01-AEDP.

Malfunctions required – 1, All SRVs lose power

Objectives:

RO/BOP – Perform Alternate Emergency Depressurization Procedure.

SRO – Direct Alternate Emergency Depressurization Procedure.

Success Path – Commence cooldown or consider anticipation to ED. Diagnose loss of SRV power and look ahead to OPEN MSIVs.

Plant Response

- ☐ SRVs will not operate except on mechanical setpoint

Simulator Operator Activities

- ☐ If asked to investigate loss of SRV power report circuit #11 on DC panels 4A and 4B is tripped, if requested to reset, report tripped again.
- ☐ If requested to bypass low condenser vacuum activate MS_IAGP1BYP
- ☐ When requested to install circuit alterations for AEDP, modify remote functions as requested, EP_IAEOPJ16 and J10

☐ **Event 8 – LOSS OF ADS/SRV POWER**

Required Operator Actions

SCO

Event 8 – LOSS OF ADS/SRV POWER

☐ Direct I&C to investigate SRV power loss

☐ Anticipate the need to perform EOP-01-AEDP

APPLICANT'S ACTIONS OR BEHAVIOR:

EVENT 8 – LOSS OF ADS/SRV POWER
Required Operator Actions

RO/BOP
Event 8 – LOSS OF ADS/SRV POWER

☐ Perform EOP-01-AEDP

- EVACUATE the Unit 1 and 2 Turbine Buildings BY SOUNDING the Unit 1 and Unit 2 Turbine Building evacuation alarms and announce the evacuation. ALSO, REQUEST the SCO to notify the TSC that the Turbine Building is being evacuated due to potential high radiation conditions during the alternate emergency depressurization.

- IF a high drywell pressure ECCS initiation signal (1.7 psig) exists, THEN PREVENT injection from those Core Spray and RHR pumps NOT required to assure adequate core cooling prior to depressurizing below 400 psig.

- Prior to depressurizing below 440 psig, OPERATE the condensate system to prevent uncontrolled injection.

- PLACE all MSIV switches to "CLOSE".

- PLACE the control switches for SAMPLE INBD ISOL VLV, B32-F019 and SAMPLE OTBD ISOL VLV, B32-F020 to "CLOSE".

APPLICANT'S ACTIONS OR BEHAVIOR:

EVENT 8 – LOSS OF ADS/SRV POWER
Required Operator Actions

RO/BOP
Event 8 – LOSS OF ADS/SRV POWER

☐ Perform EOP-01-AEDP

- Request that the jumpers to bypass ALL Group 1 isolation signals be installed and leads lifted in EHC to bypass condenser vacuum be lifted.
- ENSURE RNA-5262 and 5261 are in Override/Reset
- OPEN F028A-D
- ENSURE the following valves are open:
    - MAIN STEAM LINE DRAIN VLV, MS-F020
    - MAIN STEAM LINE DRAIN OTBD ISOL VLV, B21-F019
    - MAIN STEAM LINE DRAIN INBD ISOL VLV, B21-F016
    - MAIN STEAM LINE DRAIN VLV, MS-F038A
    - MAIN STEAM LINE DRAIN VLV, MS-F038B
    - MAIN STEAM LINE DRAIN VLV, MS-F038C
    - MAIN STEAM LINE DRAIN VLV, MS-F038D

APPLICANT'S ACTIONS OR BEHAVIOR:

EVENT 8 – LOSS OF ADS/SRV POWER
Required Operator Actions

RO/BOP
Event 8 – LOSS OF ADS/SRV POWER

☐ Perform EOP-01-AEDP

- ENSURE the following valves are closed:
  - MAIN STEAM LINE DRAIN VLV, MVD-F021
  - MN STM LN BEFORE SV DRNS, MS-V46
  - MN STM LN BEFORE SV DRNS, MS-V47
  - MN STM LN BEFORE SV DRNS, MS-V48
  - MN STM LN BEFORE SV DRNS, MS-V49
  - Unit 2 Only: MN STM TO BPV CHEST DRN VLV, 2-MS-V35
  - MN STM SPLY MSR RFP SJAE, MS-V28
- IF pressure in the main steam lines is NOT increasing, THEN ENSURE Main Steam Drain Header Isolation Valve, MVD-V5005, is closed, if accessible.
- WHEN the differential pressure across the MSIVs is less than 200 psid, THEN OPEN the following valves:
  - INBOARD MSIV A VLV, B21-F022A
  - INBOARD MSIV B VLV, B21-F022B
  - INBOARD MSIV C VLV, B21-F022C
  - INBOARD MSIV D VLV, B21-F022D
- DEPRESS AND HOLD the bypass valve opening jack INCREASE push button UNTIL ALL bypass valves are full open, irrespective of the resulting cooldown rate and offsite radioactivity release rate.

APPLICANT'S ACTIONS OR BEHAVIOR:

Facility: Brunswick Scenario No.: NRC-2004-4 Op-Test No.: 1

Examiners: _____ Operators: _____

Initial Conditions: Attached

Turnover: Attached

Event No.	Malf. No.	Event Type*	Event Description
1	N/A	N (BOP) C (SRO)	Shift EHC Pumps
2	ED_IAFGRID P2740A1I	C (RO) R(RO) C(SRO) R(SRO)	Grid frequency lowers, Failed RCR controller
3	EL_IALSN S2B	C (BOP) C(SRO)	NSW Pump Trip.
4	CF022F	C (RO) C(BOP) C(SRO)	FW Heater Tube Leak.
5	MS002F	C (RO) C (SRO)	Main Steam Line Break
6	RP011F	M (ALL)	High Powered ATWS
7	SL_IASLRA K2624A ES027F	I/C (ALL)	SLC Pump Trip, ARI, and RCIC O/S

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

SHIFT BRIEFING

Plant Status

The plant is operating at 80% power 2 weeks following a refueling outage (Beginning Of Cycle). Power is currently being maintained at 80% at the load dispatcher's request.

Equipment Out Of Service

SLC Pump 2B is under clearance after tripping on overload during surveillance testing. I&C is investigating.

CSW Pump 2C is under clearance for planned maintenance and is scheduled to be returned to service in four hours.

No other equipment is out of service.

Plan of the Day

Maintain current power.

Transfer EHC pump operation to the Standby Pump when shift turnover is complete. The System Engineer requests that the Standby Pump be placed in service to obtain pump motor performance monitoring data.

No other activities are scheduled for this shift.

PROGRESS ENERGY CAROLINAS
BRUNSWICK TRAINING SECTION

NRC SIMULATOR EXAM SCENARIO

NRC-2004-4

LESSON TITLE: Shift EHC Pumps, Low System Frequency, NSW Pump Trip, Feedwater Heater Tube Break, Main Steam Line Break, High Power ATWS

REVISION NO: 00 APPROXIMATE TIME REQUIRED: 75 Mins.

RECOMMENDED BY: _____
Instructor/Developer DATE

CONCURRENCE BY: _____
Line Superintendent/Supervisor DATE

APPROVED BY: _____
Superintendent/Supervisor Training DATE

SCENARIO DESCRIPTION

The plant is operating at 80% power, Beginning Of Cycle. SLC Pump 2B and CSW Pump 2C are under clearance for maintenance. The crew will shift EHC pumps after turnover.

The load dispatcher will request power be raised to maximum due to loss of generation. Frequency will drop to 59.8 Hz requiring the crew to enter AOP-22 and raise power. Recirculation Pump 2A speed control circuit will fail and begin to increase. The crew should respond per AOP-04.0 and lock the scoop tube. Frequency will return to normal.

NSW Pump 2B will trip. The standby pump will fail to auto start. The crew will respond per AOP-18.0 and manually start the standby NSW pump.

A tube leak will occur in HP Feedwater Heater 4B. The leak will grow in severity sufficient to initiate an extraction steam trip. Feedwater temperature will slowly lower ≈20°F and Reactor power will slowly rise ≈3% if operator action is not taken.

The crew will respond to the reduction in Feedwater temperature in accordance with AOP-03.0 and reduce power as necessary. The crew will remove the Feedwater Heater from service per OP-32. Power must be lowered to ≤80%.

A steam leak will develop in the Turbine Building. Turbine Building ARMs will alarm and the crew will respond in accordance with AOP-05.0. A few minutes later, a Group 1 signal on high Turbine Building area temperature will occur, but the MSIVs will fail to auto close, requiring manual closure. Most control rods will fail to fully insert when the reactor scrams. The crew will respond per EOP-01-LPC. When SLC is initiated, RWCU will fail to automatically isolate. Several minutes after starting SLC, Pump 2A will trip requiring alternate boron injection.

The crew will be required to lower reactor water level by terminating and preventing injection. Table 3 conditions will require lowering of Reactor level until APRMs are downscale or Reactor water level reaches Top of Active Fuel. RCIC will initially trip on overspeed when started. If requested the overspeed trip will be reset and RCIC can be started.

The crew will also enter Primary Containment Control due to elevated Suppression Pool temperature and place RHR in Suppression Pool cooling. Pool cooling is limited by availability of Service Water Pumps (1 NSW, 2 CSW).

Rod insertion will be available via RMCS. ARI logic will initially fail to reset and subsequent manual scram actions are not available.

When RPV water level is stabilized, and suppression pool cooling is in service, ARI logic will be repaired making rod insertion available by manual scram. When all control rods are inserted and level is being restored to the normal band, the scenario may be terminated.

SIMULATOR SETUP

Initial Conditions

IC	11
Rx Pwr	90%
Core Age	BOC

Scenario File:

```
# Title - NRC 2004-4
# Path - A:\NRC 2004 4.scn
# Saved on 09-05-2004 at 12:26:14

mfi:MS006F,True,00:00:00,00:00:00, 0
mfi:RP011F,True,00:00:00,00:00:00, 0
mfi:RW015F,True,00:00:00,00:00:00, 0
mfi:RW016F,True,00:00:00,00:00:00, 0
mfi:CF022F, 920000,00:00:00,00:00:00,00:00:00, 3
mfi:MS002F, 1,00:10:00,00:00:00,00:00:00, 4,A
mfi:ES027F,True,00:00:00,00:00:10, 6
rfi:ED_IABKCF11,OUT,00:00:00, 0
rfi:EL_IALSNS2B,TRIP,00:01:00, 2
rfi:SL_IASLRA,OPEN,00:02:00, 5
rfi:SL_IASLRB,OPEN,00:00:00, 0
tri:1, G2740G4 > 0.75
tri:5, Q2211RRO
tri:6, Q1618RR1
dii:K2624A,ASIS,00:00:00,00:00:00, 0
dii:K4B20A,AUTO,OFF,00:00:00,00:00:00, 0
aoi:G2740G4,0.00,00:00:00,00:00:00,00:00:00, 1
aii:P2740A1I,1.000000,00:00:20,00:00:00,00:00:00, 1
ani:ZUA1861, ON, 00:00:00, 00:01:00, 2
ani:ZUA1410, ON, 00:01:00, 00:00:02, 2
```

Materials

ENP-24 for IC-11

Special Instructions

Post Exam In Progress Stop Signs at all simulator entrances.

Reduce Power to 80% and zero DVM.

Advance all chart recorders to indicate steady state conditions.

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

Ensure appropriate keys have blanks in switches.

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

Reset alarms on SJAE, MSL, and RWM NUMACs.

Ensure reference material is in appropriate location.

Verify all logbooks have blank sheets only.

Place red cap on control switch for SLC Pump B.

Place red cap on control switch for CSW Pump 2C.

Load malfunctions/overrides.

Load CAE file if available.

Ensure ENP-24 for IC-11 present @ P603.

Critical Tasks

Manually close the MSIVs.

Initiate SLC prior to suppression pool temperature exceeding 110°F.

Insert control rods per LEP-02

Lower RPV level to suppress power, and maintain RPV level >LL4 per EOP-01-LPC.

SHIFT BRIEFING

Plant Status

The plant is operating at 80% power 2 weeks following a refueling outage (Beginning Of Cycle). Power is currently being maintained at 80% at the load dispatcher's request.

Equipment Out Of Service

SLC Pump 2B is under clearance after tripping on overload during surveillance testing. I&C is investigating.

CSW Pump 2C is under clearance for planned maintenance and is scheduled to be returned to service in four hours.

No other equipment is out of service.

Plan of the Day

Maintain current power.

Transfer EHC pump operation to the Standby Pump when shift turnover is complete. The System Engineer requests that the Standby Pump be placed in service to obtain pump motor performance monitoring data.

No other activities are scheduled for this shift.

EVENT 1 Turnover/Normal Operation Shift EHC Pumps

The crew places the Standby EHC Pump in service per OP-26.2 Section 8.5.

Malfunctions required – N/A.

Objectives:

BOP – Transfer EHC Pumps per OP-26.2 Section 8.5.

SRO – Direct Transfer of EHC Pumps per OP-26.2 Section 8.5.

Success Path – Place Standby EHC Pump in service.

Plant Response
☐ UA-02 5-1 Standby Hydraulic Fluid Pump NOT in AUTO

Simulator Operator Activities
☐ None

EVENT 1 Turnover/Normal Operation Shift EHC Pumps

Required Operator Actions

SRO
☐ Conduct shift turnover shift briefing.
☐ Direct BOP to Shift EHC Pumps per OP-26.2.

RO
☐ Monitor plant during performance.

BOP

☐ Transfer EHC Pumps per OP-26.2

- **START** standby *EHC PUMP 2B.*
- **Request AO to CHECK** local discharge pressure indicator, *2-EHC-PI-HFPM-B,* indicating greater than 1575 psig.
- **WHEN** at least 30 seconds have elapsed, **THEN STOP** *EHC PUMP 2A.*
- **ENSURE** EHC pressure is between 1575 psig and 1625 psig when the turbine is reset as indicated on *EHC FLUID PRESSURE, EHC-PI-EPT-6.*
- **WHEN** pressure on the 2A pump returns to 0 psig, **THEN PLACE** *EHC PUMP 2A* control switch to *AUTO.*

APPLICANT'S ACTIONS OR BEHAVIOR:

EVENT 2 LOWERING GRID FREQUENCY/Failed RCR Pump B Speed Controller

The crew responds to a lowering grid frequency and failed Recirculation Pump Speed Controller.

Malfunctions required – 2; ED_IAFGRID, 59.8
P2740A1I fails to 100% over 20 sec.

Objectives:

BOP – Respond to annunciator UA-6 1-2 and AOP-22 for low system frequency.

RO – raise power in response to Low System Frequency.

RO – Respond to failed RCR Pump Speed Controller per AOP-3.0.

SRO – Direct power increase in response to Low System Frequency per AOP-22.

SRO – Direct entry into AOP-3.0 for a failed RCR Pump Speed Controller.

Success Path – Raise reactor power to stabilize grid and lock B RCR pump scoop tube in response to a failed speed controller.

Plant Response
- ☐ Generator under frequency alarms (UA-6 1-2).
- ☐ EHC Set Speed light goes out.
- ☐ EHC Increasing Speed light illuminates.
- ☐ RCR Pump B Speed Control failure results in speed demand signal ramping to 100%.

Simulator Operator Activities
- ☐ When the crew has shifted EHC pumps, call control room as load dispatcher, report loss of generation has resulted in unstable grid conditions and request power be raised to 100%, then modify remote function ED_IAFGRID, 59.8.
- ☐ If contacted as NE, recommend power be raised using flow, no restrictions to rate apply.
- ☐ After the scoop tube has been locked for RCR Pump 2B if contacted as NE, recommend power be raised with A RCR Pump without exceeding flow mismatch limits.
- ☐ When power has been raised to at least 93%, modify remote function ED_IAFGRID, 60. Call control room as load dispatcher and report grid stability has been restored.

EVENT 2 LOWERING GRID FREQUENCY/Failed RCR Pump B Speed Controller

Required Operator Actions

SCO

- ☐ Direct power be raised to 96%.
- ☐ Direct entry into AOP-22.0.
- ☐ Direct entry into AOP-03.0
- ☐ Direct Recirc Pump B scoop tube locked
- ☐ Determine if Recirc Pump speeds are within mismatch limits
- ☐ If speeds are outside mismatch limits, declare Recirc Loop A to be out of service per LCO 3.4.1. Determine per OI-01.08 that SLO with FWHOOS is prohibited
- ☐ Direct I&C to investigate speed control failure

APPLICANT'S ACTIONS OR BEHAVIOR:

EVENT 2 LOWERING GRID FREQUENCY/Failed RCR Pump B Speed Controller

Required Operator Actions

RO

☐ Raise reactor power to 96% by increasing Recirc flow per GP-12 and OP-02.

- **INCREASE** Recirculation Pump speed in increments as directed by the Unit SCO by slowly turning the *RECIRC PUMP 2A(2B) SPEED CONTROL* potentiometer in the clockwise direction.
- **NOTE:** The following indications should be observed to ensure proper response to increased speed demand from a Recirculation Pump speed controller:

  a. Recirculation Pump speed increases.

  b. Recirculation loop flow increases.

  c. Reactor power increases.
- **WHEN** increasing or decreasing Recirculation Pump speeds with Recirculation Pump A(B) speed control potentiometer, **THEN** small changes of 2% to 4% should be made keeping the pump speeds within 20% when below 58 x 10^6 lbs/hr core flow or within 10% when ≥ 58 x 10^6 lbs/hr core flow.

☐ Diagnose rising power and Recirc Pump speed increasing as the cause

☐ Lock Recirc Pump B Scoop Tube by placing the RCR B Scoop Tube Control Switch in TRIP

BOP

☐ Enter and announce AOP-22.0.

☐ Determine unrestricted operation at present frequency (5 minute time limit begins at 59.3 hertz).

APPLICANT'S ACTIONS OR BEHAVIOR:

EVENT 3 NSW PUMP 2B TRIP

The crew responds to the Trip of NSW Pump 2B.

Malfunctions required – 1; EL_IALSNS2B,TRIP

Objectives:

BOP – Diagnose AUTO start failure and start 2A NSW Pump.

SRO – Direct start of 2A NSW pump.

Success Path – Place 2A NSW Pump in service.

Plant Response
- ☐ UA-18 6-1 BUS E4 4KV MOTOR OVLD alarms
- ☐ NSW Pump 2B Trips 1 minute later.
- ☐ NSW Pump 2A fails to auto start on low header pressure

Simulator Operator Activities
- ☐ When actions to lock 2B Scoop Tube have been performed, initiate **TRIGGER 2** to trip NSW Pump 2B
- ☐ If asked to investigate, wait until pump trips and report 51 device actuation on ∅A, B & C for NSW Pump 2B @ E4
- ☐ If asked as Unit 1 report both NSW Pumps operable on Unit 1

EVENT 3 NSW PUMP 2B TRIP

Required Operator Actions

SCO

- ☐ Direct entry into AOP-18.0
- ☐ Direct NSW Pump 2A be manually started
- ☐ Direct I&C to investigate NSW Pump 2B trip and NSW Pump 2A failure to auto start
- ☐ Refer to Tech Spec 3.7.2 and determine tracking LCO exists (3 operable site NSW Pumps) NOTE: The bases for Service Water require auto starting of NSW on LOOP or on LOCA, but not low header pressure. The SCO may conservatively determine NSW Pump 2A is inoperable. In this case LCO 3.7.2, Condition B applies.

BOP

- ☐ Refer to overload alarm APP and dispatch AO to investigate
- ☐ Enter and announce AOP-18.0
- ☐ Recognize and report failure of NSW Pump 2A to auto start
- ☐ Manually start NSW Pump 2A
  - PLACE 2A NSW Pump select switch to MANUAL
  - PLACE 2A NSW Pump control switch to START
  - Verify header pressure restored and alarm clear.

APPLICANT'S ACTIONS OR BEHAVIOR:

EVENT 4 Normal Operation Reset 2B RCR Pump Scoop Tube

The crew resets 2B RCR Pump Scoop Tube.

Malfunctions required – N/A.

Objectives:

RO – Recover 2B RCR Pump Scoop Tube per OP-02, Section 8.4.

SRO – Direct Recovery of 2B RCR Pump Scoop Tube per OP-02, Section 8.4.

Success Path – Reset 2B RCR Pump Scoop Tube and match Recirc pump speeds.

Plant Response

☐ A-7 1-6 clear when scoop tube is reset.

Simulator Operator Activities

☐ When the crew has responded to the 2B NSW Pump trip delete P2740A1I override and then call the Control Room as I&C and report that the 2B RCR Pump Speed Controller has been repaired and nulled and the scoop tube can be reset.

EVENT 4 Normal Operation Reset 2B RCR Pump Scoop Tube

Required Operator Actions

SCO

☐ Direct 2B RCR pump scoop tube be reset per OP-02 Section 8.4.

☐ Direct recirc pump speeds be adjusted to match.

RO

☐ Reset 2B RCR Pump Scoop Tube per OP-02 Section 8.4.

- **CHECK** *RECIRC RUNBACK* A(B) light is off.
- **ADJUST** the potentiometer on the affected *RECIRC PUMP 2A(B) SPEED CONTROL* until the speed demand signal has settled out and is nulled with the actual pump speed (I&C placed controller to a nulled condition during repair.)
- **OBSERVE** the affected pump speed, loop flow and core flow for changes that would indicate a speed change when the scoop tube is unlocked.
- **PLACE** *SCOOP TUBE A(B) LOCK* switch to *RESET*.
- **CHECK** flow conditions stable.
- **CHECK** annunciator *FLUID DRIVE A(B) SCOOP TUBE LOCK,* A-6 2-4 (A-7 1-6), is clear.
- **WHEN** both Recirculation Pumps are reset, **THEN ADJUST** flow as directed by the Unit SCO.

APPLICANT'S ACTIONS OR BEHAVIOR:

EVENT 5 FW HEATER 4B TUBE LEAK

The crew responds to Feedwater Heater 4B tube leak per AOP-3.0.

Malfunctions required – 1; CF022F

Objectives:

BOP – Bypass and Isolate 4B Feedwater Heater.

SRO – Direct entry into AOP-3.0.

SRO – Direct 4B Feedwater Heater bypass per OP-32.

RO – Respond to feedwater temperature reduction per AOP-3.0 and reduce reactor power per ENP-24.

Success Path – Bypass and Isolate 4B Feedwater Heater.

Plant Response

- ☐ FW Heater 4B level rises initiating extraction trip
- ☐ FW temperature drops ≈20°F and reactor power rises ≈3% (without operator action to lower power)
- ☐ Major alarms UA-4 5-9 (Heater Hi/Lo) and UA-4 1-9 (Extraction Trip)

Simulator Operator Activities

- ☐ When the 2B RCR Pump Scoop Tube has been reset, initiate **TRIGGER 3** to activate feedwater heater tube leak
- ☐ If asked as TBAO to investigate, report indicated high level in FW Heater 4B and emergency drain opening by controller indication.
- ☐ If notified as NE, recommend power reduction to 80% until thermal limits are verified.

EVENT 5 FW HEATER 4B TUBE LEAK

Required Operator Actions

SCO

- ☐ Direct entry into AOP-03.0.
- ☐ Direct reactor power reduction to maintain power ≤96% per ENP-24 and AOP-03.0 immediate actions.
- ☐ Notify NE to monitor thermal limits.
- ☐ Refer to OP-35 to evaluate heater performance.
- ☐ Direct further power reduction as recommended by the NE.
- ☐ Direct bypassing of FW heater 4B & 5B per OP-32.
- ☐ CONFIRM with the Reactor Engineer a transient analysis has been performed for the current fuel cycle which allows unit operation with feedwater heaters bypassed.

APPLICANT'S ACTIONS OR BEHAVIOR:

EVENT 5 FW HEATER 4B TUBE LEAK

Required Operator Actions

RO

- ☐ Reduce reactor power to maintain power ≤96% per ENP-24 and AOP-03.0 immediate actions.
- ☐ Reduce reactor power per NE recommendation and SCO direction using ENP-24.

BOP

- ☐ Diagnose Heater alarms as high heater level and tube rupture in FW Heater 4B (May use PC Display 432).
- ☐ Dispatch AO to investigate at Heater level controller.
- ☐ Enter and announce AOP-03.0.
- ☐ Refer to OP-35 to evaluate heater performance.
- ☐ Refer to OP-32 for bypassing feedwater heaters.

APPLICANT'S ACTIONS OR BEHAVIOR:

EVENT 5 REMOVAL OF FW HEATER FROM SERVICE

Simulator Operator Activities

- ☐ If asked, as NE transient analysis is performed for current cycle with FW Heaters OOS (Supplemental Reload Section 8)
- ☐ When requested to operate MSR drain controls per OP-32 for FW Heater bypass, report actions are complete (no controls in simulator)
- ☐ When the FW Heaters are OOS, request as NE holding current power while thermal limits are checked

Plant Response

- ☐ FW temperature lowers as the FW Heaters 4B/5B are bypassed

Required Operator Actions

SCO

- ☐ Direct power reduction to at least ≤80%, and as recommended by the NE
- ☐ Direct FW Heater 4B/5B bypassed per OP-32
- ☐ Direct NE monitor thermal limits
- ☐ Ensure Final Feedwater Temperature Reduction is <110.3°F using Attachment 4

RO

- ☐ Reduce power as directed by the SCO

APPLICANT'S ACTIONS OR BEHAVIOR:

EVENT 5 REMOVAL OF FW HEATER FROM SERVICE

Required Operator Actions

BOP

☐ Bypass FW heaters 4B/5B per OP-32

- **IF** feedwater flow is to be bypassed to Feedwater Heater 4A(B) **AND** Feedwater Heater 5A(B), **THEN PERFORM** the following:
  - **CLOSE** *FW HTR 4A(B) EXTRACTION ISOL MOV, EX-V18.*
  - **CLOSE** *FW HTR 5A(B) EXTRACTION ISOL MOV, EX-(V22.*
  - **OPEN** *1ST STAGE SCAV STM TO CNDSR, MD-V92.*
  - **OPEN** *2ND STAGE SCAV STM TO CNDSR, MD-V94.*
  - **CLOSE** *1ST STG SCAV STM TO FW HTR 5A(B), MD-V91.*
  - **CLOSE** *2ND STG SCAV STM TO FW HTR 5A(B), MD-V93.*
- **STOP** a Heater Drain Pump.
- **ENSURE** *E(W) 1ST RH DT HIGH LVL CTRL, 2-MD-LC-1SRD-C-2 (2-MD-LC-1SRD-C-1),* is in *AUTO*
- Direct AO to operate MSR drain controllers (Steps 5i through 5v)
- **THROTTLE OPEN** *FW HTRS 4&5 BYP VLV,FW-V120,* for 15 seconds
- **CLOSE** *FW HTR 4A(B) INLET VLV, FW-V118(V119)*
- **CLOSE** *FW HTR 5A(B) OUTLET VLV,FW-V6(V8).*

APPLICANT'S ACTIONS OR BEHAVIOR:

EVENT 5 REMOVAL OF FW HEATER FROM SERVICE

Required Operator Actions

BOP

☐ Bypass FW heaters 4B/5B per OP-32

- **EVALUATE** reduction in final feedwater temperature for compliance with Loss of Feedwater Heating analysis as follows:

    a) **RECORD** current final feedwater temperature from PPC Display 825.

    b) **RECORD** 110.3°F Reduced FFWT value for current reactor power from Attachment 4.

    c) **CONFIRM** reduction in final feedwater temperature is less than 110.3°F by comparing the following: 8.7.2.6.a > 8.7.2.6.b

- **EVALUATE** reduction in final feedwater temperature as follows:

    - **RECORD** 84°F Reduced FFWT for current reactor power from Attachment 4.

    - **CONFIRM** reduction in final feedwater temperature is less than 84°F by comparing the 8.7.2.6.a 8.7.2.8.a

- **IF** feedwater temperature is greater than 10°F below design (2OI-03.2 checklist), **THEN ENSURE** reactor operation in accordance with applicable FWTR Power to Flow Map.

- **PERFORM** 0PT-01.8D, Core Thermal Power Calculation.

- **IF** high pressure feedwater heaters were removed from service **AND** rated power operation is desired, **THEN START** the standby condensate pump in accordance with Section 8.24 **AND RETURN** to Step 8.7.2.13.

- INCREASE unit load with Engineering and Unit SCO approval.

- **NOTIFY** the Feedwater System Engineer of Bypassed Heaters.

APPLICANT'S ACTIONS OR BEHAVIOR:

☐ **EVENT 6 MAIN STEAM LINE LEAK**

The crew responds to a Main Steam Line Break per AOP-5.0.

Malfunctions required – 1; MS002F

Objectives:

RO/BOP – Respond to a Turbine Building ARM alarm per APP and AOP-5.0.

SRO – Direct entry into AOP-5.0.

Success Path – Perform initial activities of AOP-5.0 and evacuate the Turbine Building.

Plant Response
- ☐ Turbine Building ARM alarm UA-03 5-7
- ☐ Turbine Building area temperatures rise toward Group 1 isolation setpoint
- ☐ STM TUNNEL Hi Temp SYS A/B A-06 3-6 and 4-6

Simulator Operator Activities
- ☐ When the crew has bypassed 4B and 5B FWH, initiate **TRIGGER 4** to activate MSL break.
- ☐ After the Turbine Building ARM alarms, call the Control Room as Turbine Building AO and report sound of steam leak on hot side, you cannot tell where from.

☐ **EVENT 6 MAIN STEAM LINE LEAK**

Required Operator Actions

SCO

☐ Enter and direct activities of AOP-05.0

☐ Direct evacuation of Turbine Building

☐ Consider manual scram and MSIV closure

RO/BOP

☐ Monitor the plant

☐ Reduce reactor power and/or scram if directed by the SCO

☐ Report Turbine Building ARM alarm

☐ Enter, announce and execute AOP-05.0.

☐ Evacuate Turbine Building as directed by SCO

APPLICANT'S ACTIONS OR BEHAVIOR:

EVENT 7 MSIV CLOSURE FAILURE/INITIAL ATWS ACTIONS

The crew responds to a failure of MSIVs to close and ATWS.

Malfunctions required – 2; RP011F and MS006F

Objectives:

RO/BOP – Recognize MSIV failure and manually close MSIVs.

RO/BOP – Perform actions to mitigate an ATWS per EOP-01-LPC.

SRO – Direct entry into EOP-01-LPC.

Success Path – Perform initial activities of AOP-5.0 and evacuate the Turbine Building.

Plant Response

- ☐ MSIVs fail to auto close on valid Group 1 signal, must be manually closed.
- ☐ Most Control Rods fail to insert.
- ☐ Pressure rises rapidly lifting SRVs, initiating ARI and tripping Recirc Pumps.
- ☐ RWCU fails to auto isolate when SLC is initiated
- ☐ SLC Pump A trips two minutes after initiation

Simulator Operator Activities

- ☐ If directed to reset breaker for SLC Pump 2A, report breaker immediately trips
- ☐ If directed to perform LEP-03 with CRD, wait 10 minutes and modify SL_IALEP03, ALT and SL_IASLCSP, ON

EVENT 7 MSIV CLOSURE FAILURE/INITIAL ATWS ACTIONS

Required Operator Actions

SCO

- ☐ Direct manual scram and closure of MSIVs
- ☐ Enter EOP-01-RSP and transition to LPC.
- ☐ Direct mode Switch to Shutdown
- ☐ Direct ARI initiated and Recirc Pumps tripped.
- ☐ Direct ADS inhibited.
- ☐ Direct pressure control using SRVs.
- ☐ Direct initiation of SLC and verification of RWCU isolation.
- ☐ Direct LEP-02 to be performed.
- ☐ Direct entry into LEP-03

APPLICANT'S ACTIONS OR BEHAVIOR:

EVENT 7 MSIV CLOSURE FAILURE/INITIAL ATWS ACTIONS

Required Operator Actions

RO/BOP

☐ Diagnose failure of MSIVs to auto close and manually close.

☐ Recognize and report ATWS.

☐ Place Mode Switch to Shutdown

☐ Verify ARI initiated and Recirc pumps tripped.

☐ Inhibit ADS

- PLACE ADS inhibit switches in INHIBIT

☐ Operate SRVs to control pressure as directed by the SCO.

- OPEN SRVS as required to stabilize pressure
- Use opening sequence per HARD CARD

☐ Initiate SLC (1 pump).

- PLACE SLC Control Switch in Pump A RUN position
  - Verifies discharge pressure
  - Verify squib valve continuity light out
  - Verify G31-F004 closure (FAILS to CLOSE)

☐ Manually isolate RWCU

- CLOSE G31-F001 and/or F004

APPLICANT'S ACTIONS OR BEHAVIOR:

EVENT 7 MSIV CLOSURE FAILURE/INITIAL ATWS ACTIONS

Required Operator Actions

RO/BOP

☐ Enter LEP-02 and drive control rods using RMCS.

- MONITOR reactor power on the APRMs until the IRM recorders are on scale.
- INSERT IRMs and MONITOR reactor power on the IRM recorders.
- DOWNRANGE the IRMs to bring them on scale.
- AFTER IRMs are on Range 3 or below INSERT SRMs.
- MONITOR reactor period on the SRM PERIOD meters while performing this procedure.

APPLICANT'S ACTIONS OR BEHAVIOR:

EVENT 7 MSIV CLOSURE FAILURE/INITIAL ATWS ACTIONS

Required Operator Actions

RO/BOP

- INSERT control rods by one or more of the following methods.
    - RESET RPS and INITIATE a manual scram, Section 3 on Page 13.
        - ENSURE the REACTOR MODE SWITCH is in "SHUTDOWN".
        - Request WCC INSTALL the jumpers to bypass the reactor scram
        - INHIBIT ARI by performing the following steps:
            - PLACE ARI AUTO/MANUAL INITIATION switch, C11(C12)-CS-5560, to "INOP".
            - PLACE ARI RESET switch (spring return), C11(C12)-CS-5562, to "RESET" and MAINTAIN for a minimum of five (5) seconds, THEN RELEASE.
            - VERIFY the red "TRIP" light located above C11(C12)-CS-5561 is off. **(Should diagnose ARI failure to reset and request I&C be notified of failure)**
        - ENSURE the DISCH VOL VENT & DRAIN TEST switch in ISOLATE.
        - Verify discharge volume vent and drain valves closed
        - RESET RPS
        - PLACE discharge volume vent and drain test switch in NORMAL
        - Verify discharge volume vent and drain valves OPEN
        - Verify A-05 1-6 clear and insert scram

APPLICANT'S ACTIONS OR BEHAVIOR:

EVENT 7 MSIV CLOSURE FAILURE/INITIAL ATWS ACTIONS

Required Operator Actions

- INSERT control rods with the Reactor Manual Control System, Section 5 on Page 20.
  - START both CRD pumps
  - PLACE FCV in MANUAL and OPEN FCV
  - BYPASS RWM
  - INSERT CR with EMERGENCY ROD IN control switch
- MAXIMIZE cooling water header pressure, Section 7 on Page 26.
  - START Both CRD Pumps
  - Inhibit ARI (Diagnose FAILURE)
  - PLACE discharge High Water Level Trip keylock switch in BYPASS
  - ENSURE the DISCH VOL VENT & DRAIN TEST switch in ISOLATE.
  - Verify discharge volume vent and drain valves closed
  - RESET RPS
  - PLACE DISCH VOL VENT & DRAIN TEST switch in NORMAL
  - Verify discharge volume vent and drain valves OPEN
  - Maximize cooling water D/P by opening PCV-F003 and FCV-F002

☐ Recognize/report loss of only SLC Pump

☐ Direct AO to perform actions for LEP-03 using CRD.

APPLICANT'S ACTIONS OR BEHAVIOR:

EVENT 8 LEVEL/POWER CONTROL ACTIONS

The crew actions to mitigate ATWS per EOP-01-LPC.

Malfunctions required – 2; RP011F and MS006F

Objectives:

RO/BOP – Perform LEP-02 to insert control rods.

RO/BOP – Direct performance of LEP-03 Alternate Boron Injection.

RO/BOP – Control reactor water level and pressure as directed by the SCO.

SRO – Direct entry into EOP-01-LPC.

Success Path – Perform actions of EOP-01-LPC.

Plant Response
- ☐ Suppression Pool starts heating up
- ☐ Power remains above APRM downscale
- ☐ RCIC initiates at LL2 and trips on overspeed

Simulator Operator Activities
- ☐ If requested to install jumpers for LEP-02, Section 3, wait 3 minutes and insert MF RP005F (Auto Scram Defeat), and report jumpers installed.
- ☐ If requested as I&C to investigate ARI reset failure, acknowledge request.
- ☐ If requested to reset RCIC overspeed trip, wait two minutes modify remote function RI_IARJTURB, RESET.

EVENT 8 LEVEL/POWER CONTROL ACTIONS

Required Operator Actions

SCO

☐ Enter and execute EOP-01-LPC.

☐ Determine level >90" and power above APRM downscale.

☐ Direct injection to the Reactor be terminated and prevented.

☐ When level reaches +90", evaluate Table 3, if Table 3 not yet met, establish a level band of LL4 to +90". (May choose to not establish injection at this time if Table 3 conditions are imminent to prevent having to terminate and prevent injection a second time)

☐ Direct I&C to investigate RPS reset failure

RO/BOP

☐ Terminate and prevent Condensate/Feedwater (FW-V6, V8, and V120 must be closed).

☐ Continue to drive control rods per LEP-02.

☐ Diagnose/report ARI reset logic failure.

☐ Terminate and prevent HPCI.

- PLACE AOP in PTL

☐ Continue to operate SRVs to control pressure.

☐ If directed, control level as directed by SCO.

☐ Recognize RCIC Turbine trip, diagnose as overspeed and dispatch AO to reset.

APPLICANT'S ACTIONS OR BEHAVIOR:

EVENT 9 SUPPRESSION POOL TEMPERATURE >95°F

The crew performs actions to mitigate suppression pool high temperature per EOP-02-PCCP.

Malfunctions required – N/A

Objectives:

RO/BOP – Place Suppression Pool Cooling in Service.

SRO – Direct Suppression Pool Cooling be placed in Service per EOP-02-PCCP.

Success Path – Place Suppression Pool Cooling in Service.

Plant Response

- ☐ Suppression pool temperature continues to rise.
- ☐ If level lowered to LL3, drywell temperature and pressure rises until drywell coolers restarted.
- ☐ Pool cooling limited by available SW pumps (1 NSW, 2 CSW)

Simulator Operator Activities

- ☐ If requested to defeat Drywell Cooler LOCA lockout, wait 3 minutes and execute batch file to defeat the LOCA lockout.

EVENT 9 SUPPRESSION POOL TEMPERATURE >95°F

Required Operator Actions

SCO

☐ Enter and execute EOP-02-PCCP.

☐ Direct actions to maximize suppression pool cooling.

RO/BOP

☐ Continue to insert control rods.

☐ Continue to control reactor pressure.

APPLICANT'S ACTIONS OR BEHAVIOR:

EVENT 9 SUPPRESSION POOL TEMPERATURE >95°F

Required Operator Actions

☐ Place both loops of RHR in suppression pool cooling per HARD CARD

ATTACHMENT 8
Page 1 of 2
Emergency Suppression Pool Cooling

NOTE: This attachment is **NOT** to be used for normal system operations.

START

RHR SW A LOOP (CONV)

____ : OPEN SW-V101

____ : CLOSE SW-V143

____ : IF LOCA SIGNAL IS PRESENT
PLACE RHR SW BOOSTER PUMPS
A & C LOCA OVERRIDE SWITCH
TO MANUAL OVERRIDE

____ : START RHR SW PMP

____ : ADJUST E11-PDV-F068A

____ : SUPPLY CLG WTR TO VITAL HDR

RHR SW A LOOP (NUC)

____ : OPEN SW-V105

____ : CLOSE SW-V143

____ : OPEN SW-V102

____ : IF LOCA SIGNAL IS PRESENT
PLACE RHR SW BOOSTER PUMPS
A & C LOCA OVERRIDE SWITCH
TO MANUAL OVERRIDE

____ : START RHR SW PMP

____ : ADJUST E11-PDV-F068A

____ : SUPPLY CLG WTR TO VITAL HDR

START
RHR LOOP A

____ : IF LOCA SIGNAL IS PRESENT, VERIFY
SPRAY LOGIC IS MADE UP

____ : IF E11-F015A IS OPEN, THEN
CLOSE E11-F017A

____ : START LOOP A RHR PMP

____ : OPEN E11-F028A

____ : THROTTLE E11-F024A

____ : THROTTLE E11-F048A

2/1061
S/1062

EVENT 10 TABLE 3 CONDITIONS MET

The crew lowers level to mitigate ATWS per EOP-01-LPC.

Malfunctions required – N/A

Objectives:

RO/BOP – Terminate and prevent injection.

SRO – Direct injection be terminated and prevented per EOP-01-LPC.

Success Path – Terminate and prevent injection and control RPV level and pressure as required per EOP-01-LPC.

Plant Response
- ☐ Suppression pool temperature rises >110°F
- ☐ Reactor power remains above APRM downscale

Simulator Operator Activities
- ☐ None

EVENT 10 TABLE 3 CONDITIONS MET

Required Operator Actions

SCO

☐ Determine level must be lowered until Table 3 conditions no longer met.

☐ Direct injection be or remain terminated.

☐ If LOCA signal received, direct drywell cooling be restored per SEP-10.

☐ Evaluate TAF and LL4 using Caution 1 graphs.

RO/BOP

☐ Continue to drive control rods using RMCS

☐ Monitor APRMs for downscales.

☐ If necessary terminate and prevent HPCI.

- If injecting trip then place AOP in PTL at 0 RPM.
- Not injecting, PLACE AOP in PTL.

☐ Override Core Spray pumps if LOCA signal received.

- Take CS pump CS to STOP
- Verify WHITE O/R light ON and pump STOPPED

☐ Return RHR to Suppression Pool cooling if LOCA signal received.

- Use THINK switch and RHRSW Pump LOCA O/R switch

☐ Continue to control pressure using SRVs.

☐ Monitor Reactor level for TAF.

☐ Re-open SW-V103/V106 when directed by SCO

APPLICANT'S ACTIONS OR BEHAVIOR:

EVENT 11 APRMs DOWNSCALE OR RPV LEVEL AT TAF

The crew lowers level to mitigate ATWS per EOP-01-LPC.

Malfunctions required – N/A

Objectives:

RO/BOP – Commence controlled injection to maintain RPV level within established band.

SRO – Establish RPV level band and direct injection to maintain per EOP-01-LPC.

Success Path –Commence injection and control RPV level and pressure as required per EOP-01-LPC.

Plant Response

- ☐ APRMs reading APRM downscale, or RPV level at TAF
- ☐ Based on power level if at TAF, HPCI may be required to maintain level above LL4.

Simulator Operator Activities

- ☐ If requested to defeat HPCI hi torus level transfer, wait 3 minutes and insert RF EP_IAEOPJP4, and report HPCI hi torus level transfer defeated.

EVENT 11 APRMs DOWNSCALE OR RPV LEVEL AT TAF

Required Operator Actions

SCO

- ☐ Direct injection be established to maintain RPV level LL4 to the level where APRMs downscale or TAF.
- ☐ Determine level must remain in this band until SLC tank level @32% (or reactor shutdown under all conditions by control rod insertion).

RO/BOP

- ☐ Report APRM downscales when in.
- ☐ Continue rod insertion per LEP-02.
- ☐ Monitor SLC tank level and SLC operation.
- ☐ Report level at TAF (if APRM downscales not in).
- ☐ Operate HPCI and/or RCIC as required to maintain level between LL4 and the level to which it was lowered.
- ☐ Restart RCIC following turbine trip with initiation present (if not already done)
- ☐ Continue to operate SRVs to control pressure.

APPLICANT'S ACTIONS OR BEHAVIOR:

EVENT 12 REACTOR LEVEL STABILIZED/CONTROL ROD INSERTION

The crew stabilizes RPV level and insert all control rods.

Malfunctions required – N/A

Objectives:

RO/BOP – Maintain Level and Pressure within band.

RO/BOP – Insert all control rods.

SRO – Transition out of EOP-01-LPC and into RVCP.

Success Path –Insert all control rods and transition to RVCP.

Plant Response

- ☐ Rod motion on manual scram.

Simulator Operator Activities

- ☐ After level has been stabilized and suppression pool cooling placed in service, if I&C has been requested to investigate ARI, delete switch override K2624A (ARI Reset) and report problem has been fixed (if asked a loose wire re-landed).
- ☐ When ARI & RPS is reset, and scram discharge volume level is lowering, insert MF_RP009F (ATWS #2), and then delete MF_RP011F (ATWS #4).
- ☐ When RPS and ARI are reset for the 2nd time, and scram discharge volume level is lowering, insert MF_RP008F (ATWS #1), then delete MF_RP009F (ATWS #2).
- ☐ When all rods are inserted and level is being restored to +170-200", the scenario may be terminated.
- ☐ SCO classify the event per the Emergency Plan. (SAE)

EVENT 12 REACTOR LEVEL STABILIZED/CONTROL ROD INSERTION

Required Operator Actions

SCO

- ☐ When rods are inserted, direct termination of SLC
- ☐ Exit LPC and enter RVCP and RSP
- ☐ Direct level to be restored +170-200 inches.
- ☐ Direct cooldown be maintained ≤100°F/Hr during level restoration.

RO/BOP

- ☐ Continue rod insertion.
- ☐ Reset ARI and RPS.
- ☐ After 2 minutes insert manual scram.
- ☐ Recognize rod motion and repeat actions for manual scram.
- ☐ Report when all rods in (or all rods in but one).
- ☐ Restore level +170-200 inches while maintaining cooldown ≤100°F/Hr.
- ☐ Terminate SLC operation.

APPLICANT'S ACTIONS OR BEHAVIOR: