

INITIAL SUBMITTAL OF SCENARIOS AND NRC COMMENTS

FOR THE BRAIDWOOD INITIAL EXAMINATION - OCTOBER 2000

Braidwood Scenario Review 8/9/00

NRC Overall Comments:

- 1) The individual scenario cover sheet outlines do not indicate a time line for the actuation of the pre-loaded failures. Some pre-loaded failures appear to be part of events, but are not so indicated.
- 2) Credit for auto rod movement component failures will not be given if rods are placed in MANUAL for other reasons prior to the failure.
- 4) Eight events are repeated once in different scenario sets, one event is repeated in three scenarios. There are a lot of component failures for AFW pumps failing to start (scenarios 00-1, 00-7, 00-8, 00-9, and 00-6).
- 5) Scenario 00-5, Event #6 and Scenario 00-7, Event #5 overlap with a JPM for a loss of 4 KV bus. Scenario 00-6, Event #2 overlaps a JPM for diagnosis of plugging of the boric acid filter, but required actions are significantly different.

Operating Test # 1 - Scenarios 00-1, 00-2, 00-5

Scenario 00-1

NRC Comments:

Event # 4 - Replace/rewrite: 1) This is not a component failure, but rather an initiator for the major transient. A MFW pump cannot be recovered which leads to loss of FW reactor trip (ATWS).

Licensee Response: Deleted credit for "C" failure.

Scenario 00-2

NRC Comments:

Event # 4 - Show the significant, verifiable actions for evaluation of the BOP, RO, and SRO to get credit.

Event #6 -1) Credit would not be given if rods were in MANUAL (due to power ramp) because it eliminates the single immediate action that the RO takes. If this "C" lost, need to make sure there are adequate "C" failures without it.

Licensee Response: Event 4, based on location of RO and BOP relative to the affected systems, each will be performing significant, verifiable actions (RO near charging and letdown system, BOP near RM-11 and component cooling water systems).

Event 6, doesn't matter if rods are initially in MANUAL or AUTO, if identified, credit should be given.

NRC Resolution: Regardless of Rod Control mode, credit will be given for Event 6 if identified.

Scenario 00-5

NRC Comments:

Preloads RP15B and RP15R - Clarify Show the significant, verifiable actions for both the BOP and RO get credit (ref.ES-301, D.4.d and Appendix D, Attachment 1 examples). Show where this event occurs on the scenario cover page.

Event #3 - This is N and R.

Event #6 - Clarify Show the significant, verifiable actions for the SRO to get credit.

Licensee Response: Agree

NRC Resolution: Comments accepted.

Operating Test # 2 - The first group of scenarios 00-3, 00-4, 00-6

Scenario 00-3

NRC Comments:

Preload MRF FW160STOP - Show where this preload occurs in the scenario cover page. The BOP does not perform verifiable actions that provide insight to the applicant's competence (ref.ES-301, D.4.d and Appendix D, Section B.3). Applicant only verifies low AF flow and dispatches local operator to start the pump.

Event #4 - Was the inadvertent dilution event intended to be a component vice reactivity event?

Licensee Response: The BOP needs to identify failure of AF pump and no AF, needs to realize other ways to start AF pump.

Make Event 4 a component failure for RO.

NRC Resolution: Comments accepted.

Scenario 00-4

NRC Comments:

Event #3 - This is repeat of Event #2, Scenario 00-2.

Event #4 - This is a repeat of Event #2, Scenario 00-1 and Event #3, Scenario 00-9.

Scenario 00-6

NRC Comments:

There are a lot of faults with AFW pumps failing to start.

Event #2 - Reevaluate The event provides good evaluation of applicant diagnosis, but does not require the RO to perform verifiable actions that provide insight to the applicant's competence (ref.ES-301, D.4.d and Appendix D, Section B.3). To get credit for the component failure, the applicant needs to do more than diagnose and direct local opening of the bypass valve.

Event #8 - AFW events occur in the Scenarios (00-1, 00-7, 00-8, 00-9, and 00-6).

Licensee Response: Agree.

NRC Resolution: Comments accepted. Credit for Event #2 deleted

Operating Test # 3 - The third group of scenarios 00-7, 00-8, 00-9

Scenario 00-8

NRC Comments:

Preload RD09 - The applicant may place the rods in MANUAL without recognizing the speed failure based on an unrelated procedural requirement (ie, Event #3), or personal preference. If this happens, this event will not count as component failure. Note: The required action(s) aren't written up in the scenario.

Event #3 - This is repeat of Scenario 00-1 Event #3.

Event #4 - This is repeat of Scenario 00-6 Event #4.

Licensee Response: Auto is normal rod control during operation.

Scenario 00-9

NRC Comments:

Event #2 - Clarify the significant, verifiable actions of the BOP. To get credit for an instrument failure, the applicant needs to do more than acknowledge alarm, monitor parameters and notify Rad Protection.

Event #3 - Repeat of Event #2, Scenario 00-1, and Event #4, Scenario 00-4.

Event #5 - Clarify the significant, verifiable BOP and RO actions.

Event #7 - 1) Clarify the significant, verifiable actions of the BOP and RO.

Licensee Response: No credit for Event #2.

Facility: Braidwood Unit 1 & 2 Date of Exam: 10/23/00 Scenario Numbers: 00-1/ 00-2/ 00-5 Operating Test No.:1					
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.	✓	JOS	MGB	
2.	The scenarios consist mostly of related events.	✓	JOS	MGB	
3.	Each event description consists of <ul style="list-style-type: none"> 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) 	✓	JOS	MGB	
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.	✓	JOS	MGB	
5.	The events are valid with regard to physics and thermodynamics.	✓	JOS	MGB	
6.	Sequencing and timing of events is reasonable, and allows the examination team to obtain complete evaluation results commensurate with the scenario objectives.	✓	JOS	MGB	
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.	✓	JOS	MGB	
8.	The simulator modeling is not altered.	✓	JOS	MGB	
9.	The scenarios have been validated.	✓	JOS	MGB	
10.	Every operator will be evaluated using at least one new scenario. All other scenarios have been modified in accordance with Section D.4 of ES-301.	✓	JOS	MGB	
11.	All individual operator competencies can be evaluated, as verified using Form ES-301-6 (submit the form along with the simulator scenarios).	✓	JOS	MGB	
12.	Each applicant will be significantly involved in the minimum number of transients and events specified on Form ES-301-5 (submit the form along with the simulator scenarios).	✓	JOS	MGB	
13.	The level of difficulty is appropriate to support licensing decisions for each crew position.	✓	JOS	MGB	
TARGET QUANTITATIVE ATTRIBUTES (PER SCENARIO)		Actual Attributes	---	---	
1.	Total malfunctions (5-8)	5 / 7 / 8	✓	JOS	MGB
2.	Malfunctions after EOP entry (1-2)	2 / 2 / 2	✓	JOS	MGB
3.	Abnormal events (2-4)	3 / 5 / 4	✓	JOS	MGB
4.	Major transients (1-2)	2 / 1 / 2	✓	JOS	MGB
5.	EOPs entered/requiring substantive actions (1-2)	2 / 3 / 1	✓	JOS	MGB
6.	EOP contingencies requiring substantive actions (0-2)	2 / 0 / 0	✓	JOS	MGB
7.	Critical tasks (2-3)	3 / 2 / 2	✓	JOS	MGB

OPERATING TEST NO.: 1

Applicant Type	Evolution Type	Minimum Number	Scenario Number			
			00-1	00-2	00-5	Spare
			1	2	3	4
RO	Reactivity	1	1/	1/	1,3/	1/
	Normal	1	/1	/1	/1,3	/1
	Instrument	2	3/2	2/3	5/4	2/3
	Component	2	4/4	4,6,8/4,5	2,6/6	4,7/8
	Major	1	5,6/5,6	7/7	7,8/7,8	5,6/5,6
As RO	Reactivity	1	1	1	1,3	1
	Normal	0				
	Instrument	1	3	2	5	2
	Component	1	4	4,6,8	2,6	4,7
	Major	1	5,6	7	7,8	5,6
SRO-I	Reactivity	0				
	Normal	1	1	1	1,3	1
	Instrument	1	2,3	2,3	4,5	2,3
	Component	1	4	4,5,6,8	2,6	4,7,8
	Major	1	5,6	7	7,8	5,6
As SRO	Reactivity	0	N/A	N/A	N/A	N/A
	Normal	1	N/A	N/A	N/A	N/A
	Instrument	1	N/A	N/A	N/A	N/A
	Component	1	N/A	N/A	N/A	N/A
	Major	1	N/A	N/A	N/A	N/A
SRO-U	Reactivity	0	N/A	N/A	N/A	N/A
	Normal	1	N/A	N/A	N/A	N/A
	Instrument	1	N/A	N/A	N/A	N/A
	Component	1	N/A	N/A	N/A	N/A
	Major	1	N/A	N/A	N/A	N/A

- Instructions: (1) Enter the operating test number and Form ES-D-1 event numbers for each evolution type.
- (2) Reactivity manipulations must be significant as defined in Appendix D.

NOTE: Scenario Number 4 is a "spare" scenario and is represented for comparison purposes only in Examination Outline submittal.

The "/" in the cells for the "RO" applicant type represents the position the applicant is expected to fill during the scenario. The events are listed for the identified position: RO / BOP.

Author: _____

Chief Examiner: _____

Operating Test: 1

Competencies	Applicant #1 RO/SRO-I/SRO-U				Applicant #2 RO/SRO-I/SRO-U				Applicant #3 RO(BOP)/SRO-I/SRO-U			
	SCENARIO				SCENARIO				SCENARIO			
	01	02	05	S	01	02	05	S	01	02	05	S
Understand and Interpret Annunciators and Alarms	2-6	2-8	2-8	2-8	3-6	2,4,6 ,7,8	2,5,6 ,7,8	2,4,5 ,6,7	2,4,5 ,6	3,4,5 ,7,8	3,4,6 ,7,8	3,5,6 ,8
Diagnose Events and Conditions	2-6	2-8	2-8	2-8	3-6	2,4,6 ,7,8	2,5,6 ,7,8	2,4,5 ,6,7	2,4,5 ,6	3,4,5 ,7,8	3,4,6 ,7,8	3,5,6 ,8
Understand Plant and System Response	1-6	1-8	1-8	1-8	1,3-6	1,2,4 ,6,7, 8	1,2,3 ,5,6, 7,8	1,2,4 ,5,6, 7	1,2,4 ,5,6	1,3,4 ,5,7, 8	1,3,4 ,6-8	1, 3,5,6 ,8
Comply With and Use Procedures (1)	1-6	1-8	1-8	1-8	1,3-6	1,2,4 ,6,7, 8	1,2,3 ,5,6, 7,8	1,2,4 ,5,6, 7	1,2,4 ,5,6	1,3,4 ,5,7, 8	1,3,4 ,6-8	1, 3,5,6 ,8
Operate Control Boards (2)	1-6	1-8	1-8	1-8	1,3-6	1,2,4 ,6,7, 8	1,2,3 ,5,6, 7,8	1,2,4 ,5,6, 7	1,2,4 ,5,6	1,3,4 ,5,7, 8	1,3,4 ,6-8	1, 3,5,6 ,8
Communicate and Interact With the Crew	1-6	1-8	1-8	1-8	1-6	1-8	1-8	1-8	1-6	1-8	1-8	1-8
Demonstrate Supervisory Ability (3)	1-6	1-8	1-8	1-8	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Comply With and Use Tech. Specs. (3)	2,3	4	4,5	2,4	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Notes: (1) Includes Technical Specification compliance for an RO. (2) Optional for an SRO-U. (3) Only applicable to SROs.												

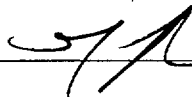
Instructions:

Circle the applicant's license type and enter the event numbers that test the competency for each scenario in the set.

NOTE: **OPERATING TEST NO.: 1.** Scenario Number 4 is a "spare" scenario and is represented for comparison purposes only in Examination Outline submittal. The order of listing for candidates is SRO, RO and BOP by position.

Author:

Chief Examiner:



Simulation Facility <u>Braidwood</u>	Scenario No.: <u>00-1</u>	Operating Test No.: <u>1</u>
Examiners: _____	Applicant: _____	<u>SRO</u>
_____	_____	<u>RO</u>
_____	_____	<u>BOP</u>

Objectives: To evaluate the applicants ability to use Normal, Abnormal, Emergency and alarm response procedures to respond to a 1A Steam Generator level transmitter failure, a 1D Thot RTD failure requiring rod control to be placed in manual, a Main Feedwater Pump trip coincident with a failure of the main turbine to runback, an ATWS event followed by a loss of heat sink requiring a bleed and feed.

Initial Conditions: IC-21; 100% power BOL, Equil. Xenon

Turnover: The Unit is at 100% power. The 1B AFW pump is OOS to repair a pump motor bearing oil leak. The pump is expected back in approximately 3 to 4 hours. Currently in LCO 3.7.5 Condition A. 60 hours into a 72 hour LCO.

Event No.	Malf. No.	Event Type*	Event Description
Preload (NOTE 1)	PTL & OOS		1B AFW Pump OOS for oil leak repair
Preload (NOTE 1)	RP01 RP02A RP02B		ATWS Event
Preload (NOTE 1)	FW43 FW01		1A AFW Pump fail to start 1A MFW Pump fail to start
Preload (NOTE 1)	TC04 TC03 IOR ZDIIHSRUNBK OFF IOR ZLO1HSRUNBK OFF IOR ZDIIHSMANUAL OFF IOR ZDIIHSTG010 NORM		Prevent Main Turbine from Runback Prevent Main Turbine Auto Trip
1		R RO N BOP SRO	Perform Load Decrease to 1080 MW at 5MW/min
2	RX06C, 100	I BOP SRO	1A SG Narrow Range Level Transmitter failure high (NOTE 2)
3	RX18H, 650	I RO SRO	RCS Loop 1D Thot RTD failure high. (NOTE 3)
4	IOR ZDIIHSDEHENTR OFF FW02A	C BOP RO SRO	1B MFW Pump Trip (complicated with failure of Main Turbine to runback)
5	Preloaded	M BOP RO SRO	ATWS
6	Preloaded	M BOP RO SRO	Loss of Heat Sink

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

NOTE 1: Run BATCH FILE for all Preload **BAT RUNBACK**

NOTE 2: RF RP21 (Open/Close) RF RX051 (Trip) RF RX052 (Trip)

NOTE 3: RF RP23 (Open/Close) RF RX026 (Trip) RF RX142 (Trip) RF RX025 (Trip) RF RX141 (Trip)
RF RX028 (Trip) RF RX027 (Trip)

SCENARIO 00-1 OVERVIEW

Unit 1 is at 100% power, BOL. The 1B Auxiliary Feedwater Pump is OOS to repair a pump motor bearing oil leak. The pump is expected back in 3 to 4 hours. Currently in LCO 3.7.5 Condition A with 12 hours left on the Completion Time.

Shortly after the crew takes the shift, the crew will commence the load decrease to 1080 MW at 5MW/min.

Following clearly observable plant response from the reactivity changes the 1A steam generator level transmitter LT-519 will fail high. The Feed Water Reg valve will be taken to manual. The crew will enter BwOA INST-2 Attachment E and trip the required bistables. Technical Specifications will be addressed for bistable tripping.

After the actions of BwOA INST-2 are complete, the 1D Thot RTD will fail high. This will require the crew to re-enter BwOA INST-2 to address the failure. Control rods will have to be placed in manual. The crew will again have to trip bistables and reference Technical Specifications. Control rods may be placed back into Auto after the failed channel is defeated.

Once the crew determines that the bistables can be tripped, the 1B MFW pump will trip. The crew should attempt to ramp down the main turbine by performing a turbine runback (unsuccessful) while attempting to fast start the 1A Main Feedwater pump. The crew will determine that the Main Turbine will not run back and that a reactor trip is required due to lowering SG water levels.

When the crew attempts to trip the reactor, an ATWS event will initiate. The crew will enter BwFR-S.1. The turbine will fail to trip and the crew will shut the MSIVs by initiating a Main Steamline Isolation signal. When the 1A Auxiliary Feedwater Pump receives a start signal, it will immediately trip. This is an entry condition into BwFR-H.1 but the crew will have to complete FR-S.1 first.

Once the crew is complete with BwFR-S.1, the crew will transition to BwFR-H.1 due to the loss of heat sink. The crew will secure RCPs and initiate an RCS bleed and feed. Once the bleed and feed is initiated, the 1A AFW pump will be returned to operation. The crew must remain in BwFR-H.1 due to bleed and feed initiated.

Comments: _____

Critical Tasks

1. FR-S.1--A: Isolate the main turbine from the SGs within 1 minute of the Reactor Trip signal.
2. FR-S.1--C: Insert negative reactivity into the core by at least one of the following methods before completing the immediate action steps of FR-S.1:
 - De-energize the control rod drive MG sets
 - Insert RCCAs
 - Establish emergency boration flow to the RCS
3. FR-H.1--B Establish RCS bleed and feed before PORVs open automatically.

Comments: _____

Scenario No: 00-1		Event No. 1
Event Description: Perform Load Decrease to 1080 MW at 5MW/min		
Time	Position	Applicant's Actions or Behavior
	US	Implement actions of 1BwGP 100-4, "Power Descension"
	US	Direct load reduction
	CREW	Review applicable Precautions, and Limitations and Actions.
	RO	<p>Verify rod position and boron concentration.</p> <p>Initiate boration, if required to maintain ΔI within target band. (BwOP CV-6)</p> <ul style="list-style-type: none"> • Determine boric acid flow rate • Set 1FK-110 BA Flow Cont to desired boration rate. • Set 1FY-0110 BA Blender Preset Counter to desired volume. • Place MU MODE CONT SWITCH to STOP position. • Set MU MODE SELECT to BOR position. • Place MAKE-UP CONTROL Switch to START • Verify proper operation of valves & BA transfer pump (CV110B open, BA pump is running, CV110A throttles open) • Verify BA flow on recorder
	BOP	<p>Initiate turbine load reduction:</p> <ul style="list-style-type: none"> • Depress LOAD RATE MW/MIN • Enter 5 MW/min • Depress REF • Enter power level • When ready to begin load reduction, depress GO • Verify load decreases.

Comments: _____

Scenario No: 00-1		Event No. 1
Event Description: Perform Load Decrease to 1080 MW at 5MW/min		
Time	Position	Applicant's Actions or Behavior
	RO	<p>Monitor power decrease:</p> <ul style="list-style-type: none"> • Monitor reactor power, Tave, ΔI • Verify rods more in AUTO to maintain Tave within $\pm 1.0^{\circ}\text{F}$ of Tref. <p>If borating:</p> <ul style="list-style-type: none"> • Monitor VCT level • Monitor BA Blender counter countdown. • Verify boration auto stops at preset value. • Return Reactor Makeup System to blended flow at current blended flow.
		Note: Following clearly observable plant response from the reactivity changes, Event 2 is entered.

Comments: _____

Scenario No: 00-1		Event No. 2
Event Description: 1A SG Narrow Range Level Transmitter failure high (LT-519)		
Time	Position	Applicant's Actions or Behavior
	CUE	Annunciator 1-15-A8 "SG 1A LVL Hi-2 TURB TRIP P-14 ALERT" 1LI-519 off scale high
	BOP	Identify/report Steam Generator Level channel LT-519 failure
	US	Implement BwOA INST-2 "OPERATION WITH A FAILED INSTRUMENT CHANNEL", Attachment E "NARROW RANGE SG LEVEL CHANNEL FAILURE" and direct operator action.
	BOP	Check affected SG levels normal <ul style="list-style-type: none"> • If NOT, <ul style="list-style-type: none"> • Place feed reg. valve in manual • Restore SG level to a stable condition Select operable SG level channel Establish AUTO level control
	US	Locally trip bistables for failed channel <ul style="list-style-type: none"> • P14 LB519A Lo-2 Rx Trip/AF Pump Start LB519B
	BOP	Check status of AMS <ul style="list-style-type: none"> • Not failed
	US	Refer to Tech Spec <ul style="list-style-type: none"> • 3.3.1 • 3.3.2 • 3.3.3
	US	Inform SM/Maint of failure of SG 1B Level Transmitter LT-519
Note: Following Tech Spec determination, initiate Event 3.		

Comments: _____

Scenario No: 00-1		Event No. 3
Event Description: RCS Loop 1D Thot RTD failure high		
Time	Position	Applicant's Actions or Behavior
	CUE	Numerous 1-14 annunciators Automatic rod motion in 1-10-A5 "OPAT High Rod Stop C-4" 1-10-C5 "OTAT High Rod Stop C-3"
	RO	Determine failed channel Place rod control in manual
	US	Implement BwOA INST-2 "OPERATION WITH A FAILED INSTRUMENT CHANNEL", Attachment A "RCS NARROW RANGE RTD CHANNEL FAILURE" and direct operator action.
	RO	Place Rod Bank Select Switch in MANUAL Manually defeat failed RTD <ul style="list-style-type: none"> • Select failed Tave channel with TAVE DEFEAT switch • Select failed ΔT channel with ΔT DEFEAT switch Select an operable RTD channel to the ΔT recorder Check if rod control can be placed in AUTO <ul style="list-style-type: none"> • TURBINE LOW POWER INTLK C5 – Not Lit • Tave-Tref deviation – Stable and within 1°F • Place Rod Bank Select switch in AUTO Check PZR Level PZR level – normal and stable
	US	Locally trip bistables for the failed channel <ul style="list-style-type: none"> • OPΔT Trip TB441G • OPΔT Runback TB441H • OTΔT Trip TB441C • OTΔT Runback TB441D • Low Tave TB442G • Lo-Lo Tave TB442D

Comments: _____

Scenario No: 00-1		Event No. 3
Event Description: RCS Loop 1D Thot RTD failure high		
Time	Position	Applicant's Actions or Behavior
	RO	Check P12 interlock <ul style="list-style-type: none"> • Tave greater than 550°F • LO-2 TAVE STM DUMP INTLK P12 – Not Lit
	US	Refer to Tech Specs <ul style="list-style-type: none"> • 3.3.1 • 3.3.2
		NOTE: Once the proper bistables have been determined, initiate EVENT 4.

Comments: _____

Scenario No: 00-1		Event No. 4
Event Description: 1B Main Feedwater Pump Trip		
Time	Position	Applicant's Actions or Behavior
	CUE	<p>Annunciator 1-16-B1 "FW PUMP 1B TRIP" 1-16-D2 "FW PMP DISCH FLOW HIGH"</p> <p>1B MFP Trip indicating light Lowering Steam Generator Water Levels Feed Reg Valves opening Lowering Feed flow indications</p>
	BOP	<p>Determine 1B MFP Trip</p> <p>Attempt to fast start 1A MFW pump (unsuccessful)</p> <p>Attempt to Runback the Main Turbine (unsuccessful)</p>
	US	Implement 1BwOA SEC-1 "SECONDARY PUMP TRIP" Attachment A "FW PUMP TRIP" and direct actions.
	BOP	<p>Close FW Pump Recirc Valve</p> <ul style="list-style-type: none"> Close recirc valve on tripped FW pump 1FW012B <p>Check Turbine Load</p> <ul style="list-style-type: none"> Turbine Load – Greater than 700 MW Check Main FW pumps – at least one running
	RO/BOP	<p>Restore Feed Flow</p> <ul style="list-style-type: none"> Check FW pump 1A – Available for fast start Start aux oil pump for FW pump 1A Check 1FW016 controller in manual and between 23% and 27% Start FW pump 1A (unsuccessful)

Comments: _____

Scenario No: 00-1		Event No. 4
Event Description: 1B Main Feedwater Pump Trip		
Time	Position	Applicant's Actions or Behavior
	BOP	Reduce Turbine Load <ul style="list-style-type: none"> • Depress TURBINE RUNBACK pushbutton • Check turbine load decreasing <ul style="list-style-type: none"> • Select OPER AUTO • Select MW OUT • Set REFERENCE DEMAND to 700 MW • Set turbine LOAD RATE to 250 MW/MIN • Depress GO pushbutton (unsuccessful)
	US	Determine Steam flow greater than feed flow and order a reactor trip
	RO	Attempt a reactor Trip at both the reactor panel and the Safeguards panel Determine ATWS condition Transition to 1BwFR-S.1
		NOTE: Do not trip the reactor trip breakers until after the crew has completed step 10 of FR-S.1

Comments: _____

Scenario No: 00-1		Event No. 5
Event Description: ATWS		
Time	Position	Applicant's Actions or Behavior
	CUE	Red First Out Failure of manual and automatic reactor trip
	US	Transition to 1BwFR-S.1 "Response to Nuclear Power Generation/ ATWS" Direct actions of 1BwFR-S.1
	RO [CT] FR-S.1--C	Verify Reactor Trip <ul style="list-style-type: none"> • Rod bottom lights lit • Reactor trip and bypass breakers open • Neutron flux decreasing <p>If the reactor will not trip, then allow control rods to insert automatically until rod speed is less than 48 steps/min, then manually insert control rods.</p>
	BOP [CT] FR-S.1--A	Verify Turbine Trip <ul style="list-style-type: none"> • All turbine throttle valves closed • All turbine governor valves closed <p>Determine Main Turbine will not trip</p> <ul style="list-style-type: none"> • Initiate Main Steam Isolation – Shut all MSIVs
	CREW	Check AF Pumps Running <ul style="list-style-type: none"> • Determines that no AFW pumps are available • Does not transition to 1BwFR-H.1

Comments: _____

Scenario No: 00-1		Event No. 5
Event Description: ATWS		
Time	Position	Applicant's Actions or Behavior
	RO [CT] FR-S.1--C	Initiate Emergency Boration of RCS <ul style="list-style-type: none"> • Check at least one Cent Chg pump running • Initiate emergency boration <ul style="list-style-type: none"> • Open 1CV8104 • Start boric acid transfer pump • Check emergency boration flow greater than 30 gpm • Verify charging flow greater than 30 gpm • Check PZR pressure less than 2335 psig
	BOP	Verify Containment Ventilation Isolation <ul style="list-style-type: none"> • Group 6 CNMT Vent Isol monitor lights – LIT
	RO	Verify Reactor Subcritical <ul style="list-style-type: none"> • PR channels less than 5% • IR channels negative startup rate
	BOP	Isolate Steam Dumps <ul style="list-style-type: none"> • Place steam dump BYPASS INTERLOCK switches to OFF RESET
	RO	Check if the Following Trips Have Occurred <ul style="list-style-type: none"> • Reactor Trip Dispatch local operator to open reactor trip breakers and secure rod drive MG sets. • Turbine Trip
	BOP	Check SG Levels <ul style="list-style-type: none"> • Narrow Range level in at least one SG Greater than 10% (31%) No AFW pumps are available <p>NOTE: Open Reactor Trip Breakers here.</p>

Comments: _____

Scenario No: 00-1		Event No. 5
Event Description: ATWS		
Time	Position	Applicant's Actions or Behavior
	BOP	Check SG blowdown isolation valves closed (1SD002A-H)
	RO	Verify all Dilution Paths Isolated <ul style="list-style-type: none"> • Reactor makeup dilution valves closed <ul style="list-style-type: none"> - 1CV111A - 1CV111B • Verify BTRS Mode Selector switch is OFF • Dispatch operators to verify dilution paths isolated <ul style="list-style-type: none"> - 1CV8441 - 1CV8435 - 1CV8453 - 1AB8629A
	RO/BOP	Check Main Steamline Isolation Identify Faulted SGs Check Core Exit Thermocouples less than 1200°F Verify Reactor Subcritical

Comments: _____

Scenario No: 00-1		Event No. 6
Event Description: Loss of Heat Sink		
Time	Position	Applicant's Actions or Behavior
	US	Transition to 1BwFR-H.1 "Response to Loss of Secondary Heat Sink" Direct actions of 1BwFR-H.1
	RO	Check if Secondary Heat Sink is Required <ul style="list-style-type: none"> • RCS pressure greater than any non-faulted SG pressure • RCS temperature greater than 335°F Check CHG pumps at least one running
		NOTE: May transition directly to step 13 off of the Operators Action Summary Page.
	CREW	Check if Bleed and Feed is Required <ul style="list-style-type: none"> • Wide Range level in any three SGs less than 27% (43%) OR • PZR pressure greater than 2335 psig due to loss of heat sink
	US	Transition to step 13 of 1BwFR-H.1

Comments: _____

Scenario No: 00-1		Event No. 6
Event Description: Loss of Heat Sink		
Time	Position	Applicant's Actions or Behavior
	RO	<p>Establish RCS Feed Path</p> <ul style="list-style-type: none"> • Stop all RCPs • Actuate SI <p>Verify RCS Feed Path</p> <ul style="list-style-type: none"> • Cent Chg pumps at least one running OR • SI Pumps at least one running • Check ECCS valve alignment – Group 2 Cold Leg Injection monitor lights required for operating ECCS pumps. <p>Establish RCS Bleed Path</p> <ul style="list-style-type: none"> • PZR PORV isolation valves energized and open IRY8000A IRY8000B • Open PZR PORVs IRY455A IRY456
	RO	<p>Verify Adequate RCS Bleed Path</p> <ul style="list-style-type: none"> • Both PORVs open • Both PORV isolation valves open

Comments: _____

Scenario No: 00-1		Event No. 6
Event Description: Loss of Heat Sink		
Time	Position	Applicant's Actions or Behavior
	BOP	<p>Verify ESF Equipment Actuations</p> <ul style="list-style-type: none"> Verify ESF actuations per the Operator Action Summary page as time permits <p>Reset SI if Necessary</p> <ul style="list-style-type: none"> Depress both SI reset pushbuttons Verify SI Actuated permissive light not lit Verify AUTO SI BLOCKED permissive light LIT <p>Reset Cnmt Isolation</p> <ul style="list-style-type: none"> Reset Cnmt Isolation Phase A Reset Cnmt Isolation Phase B Check SACs running Open IA to Cnmt
	CREW	<p>Maintain RCS Heat Removal</p> <ul style="list-style-type: none"> Maintain ECCS flow Maintain PZR PORVs – Both Open
	BOP	<p>Check if Containment Spray Should be Stopped</p> <ul style="list-style-type: none"> CS pumps running – none running <p>Verify Cold Leg Recirculation Capability</p> <ul style="list-style-type: none"> 1A RH pump running CNMT sump isolation valve position light lit 1SI8811A 1B RH pump running CNMT sump isolation valve position light lit 1SI8811B
	BOP	<p>Try to establish AF to at Least One SG</p> <ul style="list-style-type: none"> Check SG blowdown isolation valves closed (1SD002A-H) Check SG sample isolation valves closed (1SD005A-D)

Comments: _____

Scenario No: 00-1		Event No. 6
Event Description: Loss of Heat Sink		
Time	Position	Applicant's Actions or Behavior
	CREW	Prior to initiating feed flow, review ATTACHMENT B
		NOTE: If previously contacted, report as the local operator that you have racked in and out the 1A AF pump breaker and to try starting the 1A AF pump.
	US	Review Attachment B Feed Flow Limitations (Step 3 or 4) depending on core exit thermocouple temperatures.
	BOP	Check AF Pump SX Suct Vlvs ARMED alarm (1-3-E7) not lit. Check AF test valves open <ul style="list-style-type: none"> • 1AF004A • 1AF004B Check AF isol valves for selected SGs open <ul style="list-style-type: none"> • 1AF013 A-E Check AF flow control valves for selected SGs throttled open <ul style="list-style-type: none"> • 1AF005A-H Check AF pumps both running Check AF flow established
		Scenario is complete at this point

Comments: _____

Simulation Facility BraidwoodScenario 00-2

Operating Test No.: 1

Examiners: _____

No.:

Applicant: _____ SROROBOP

Objectives: To evaluate the applicants ability to use Normal, Abnormal, Emergency and alarm response procedures to respond to a VCT level channel failure, a failure of a radiation monitor, letdown system leak to the Component Cooling water system, loss of condenser vacuum, uncontrolled outward rod motion requiring a manual reactor trip, a steam break inside containment with a failure to auto isolate the faulted steam generator and a failed open PORV requiring manual isolation.

Initial Conditions: IC-16; 48% power MOL, Steady State, Equil. Xe

Turnover : The unit is at 48% power. Currently in BwGP 100-3 step 58. Electric Generation has requested an increase to 900 MW at 5MW/Min.

Event No.	Malf. No.	Event Type*	Event Description
1		N BOP SRO R RO	Ramp the unit up in power at 5MW/min
2	CV16, 0	I RO SRO	VCT Level Channel (LT-112) failure
3	RM01T, 5	I BOP SRO	Drumming Station Radiation Alarm failure high (Delete malfunction in 5 minutes)
4	CV23A, 50	C BOP RO SRO	Letdown Heat Exchanger leak to the Component Cooling Water System
5	FW36, 350	C BOP SRO	Loss of Condenser Vacuum
6	BAT rodsout	C RO SRO	Uncontrolled Rod Withdrawal requiring a Reactor Trip
7	BAT PORVFAIL	M BOP RO SRO	Steam line break inside containment on the 1D Main Steam Line with a failed open Feedwater Isolation valve
8	BAT PORVFAIL	C RO SRO	PORV 455C fail open

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

SCENARIO 00-2 OVERVIEW

Initially Unit 1 is at 48% power in 1BwGP 100-3 step 58 holding for turnover. Electric Generation has requested an increase in power to 900MW at 5Mw/min after the crew takes the shift.

Following clearly observable plant response from the reactivity changes, VCT level transmitter LT-112 will fail low. The crew should respond to the alarm, reference the annunciator response and secure auto makeup.

After the actions for the failed VCT transmitter are complete, the Drumming Station Radiation Alarm will fail high. The crew should reference BwAR 4-OAR059J to determine automatic and subsequent operator actions for the failed radiation monitor.

After the actions are complete for the failed radiation monitor, a letdown heat exchanger to Component Cooling Water System leak will occur. The crew should enter BwOA PRI-6 to isolate letdown, determine the location of the leak and place the standby letdown heat exchanger in service.

Once the crew has placed the standby letdown heat exchanger in service, a loss of condenser vacuum will occur. The crew should transition to BwOA-SEC-3 and take actions to restore condenser vacuum. Once local operators are dispatched, the cause of the leak will be found and vacuum will be restored.

After the actions for the loss of vacuum are complete, an uncontrolled rod motion casualty will occur. The crew will attempt to stop the rod motion by placing the rods in manual and taking the actions of BwOA ROD-1. When the crew notes that this does not stop the withdrawal, the crew will trip the reactor and enter BwEP E-0.

From E-0, the crew will transition to BwEP ES-0.1. While in ES-0.1 a steam break will occur inside containment on the 1D Main Steam Line. The crew will initiate a Safety Injection and transition back to BwEP E-0. From BwEP E-0, the crew will transition to BwEP E-2.

From BwEP E-2, the crew will transition to BwEP E-1 and then to BwEP ES-1.1 to terminate SI. After the 1D SG has completely blown down, RCS pressure will rapidly increase to the PORV setpoint. When PORV 455C opens it will fail open requiring the crew to manually isolate the PORV.

Critical Tasks

1. E-2 --A: Isolate the faulted SG before transition out of E-2.
2. E-0--M: Close the block MOV upstream of the stuck-open Pzr PORV by completion of the first step in the ERG network that directs the crew to close the block MOV.

Scenario No: 00-2		Event No. 1
Event Description: Ramp up turbine and reactor power		
Time	Position	Applicant's Actions or Behavior
	CUE:	Request from System Operator to increase power to 900 MW @ 5MW/min
	US	Implement actions of 1BwGP 100-3:
	US	Direct increase to 900 MW power at desired rate.
	CREW	Review applicable Precautions, and Limitations and Actions.
	RO	<p>Verify rod position and boron concentration.</p> <p>Initiate dilution, if required. (BwOP CV-5)</p> <ul style="list-style-type: none"> Place MU MODE CONT SWITCH to STOP position. Set MU MODE SELECT to DIL or ALT DIL position. Set 1FK-111 PW/Total Flow Cont. to desired dilution rate. Verify 1CV111A in AUTO Set 1FY-0111 Primary Water Control Preset Counter to desired volume. Verify 1CV11B & 1CV110B in AUTO Place MAKE-UP CONTROL Switch to START Verify proper operation of valves & PW pump (CV111A & 111B open, PW pump is running, CV110B opens [if ALT DIL]) Verify PW flow on recorder Verify B/U Heaters ON and spray valves 1RY455B/C modulates OPEN.
	BOP	<p>Initiate turbine load increase:</p> <ul style="list-style-type: none"> Depress LOAD RATE MW/MIN Enter desired value for rate Depress REF Enter power level 1050 MW (or 1175MW) When ready to begin load increase, depress GO Verify load increases.

Comments: _____

Scenario No: 00-2		Event No. 1
Event Description: Ramp up turbine and reactor power		
Time	Position	Applicant's Actions or Behavior
	RO	<p>Monitor power increase:</p> <ul style="list-style-type: none"> • Monitor reactor power, Tave, ΔI • Verify rods more in AUTO to maintain Tave within $\pm 1.0^{\circ}\text{F}$ of Tref. <p>If diluting:</p> <ul style="list-style-type: none"> • Monitor VCT level • Verify RCS concentration decreasing • Monitor Primary Water Control counter countdown. • Verify dilution auto stops at preset value. • Return Reactor Makeup System to blended flow at current blended flow.
		Note: Following clearly observable plant response from the reactivity changes, Initiate Event 2.

Comments: _____

Scenario No: 00-2		Event No. 2
Event Description: VCT Level Channel (LT-112) failure		
Time	Position	Applicant's Actions or Behavior
	CUE	Annunciator: 1-9-A2 "VCT LEVEL HIGH LOW Auto Makeup initiation LI-112 indicating low
	RO	Identify /Report failed VCT level transmitter
	US	Direct actions and ensure BwAR is referenced for annunciators
	RO	Secure automatic makeup • May take M/U Control Switch or Mode Select switch to off to stop the makeup. Restore VCT level to normal Determine LT-185 must be observed Discuss functions lost due to failure of LT-112
	US	Inform SM/Maintenance of LT-112 failure
		NOTE: After the actions for LT-112 are complete, initiate Event 3

Comments: _____

Scenario No: 00-2		Event No. 3
Event Description: Drumming Station Radiation Monitor Alarm failure		
Time	Position	Applicant's Actions or Behavior
	CUE	Alarm on RM-11 Red indicator for alarming radiation monitor
	BOP	Acknowledge RM-11 Determine alarming radiation monitor is for the drumming station Inform crew of Drumming Station alarm Reference Annunciator response guidelines Review 1BwOP VA-5 Aux Building Charcoal Booster Fan Operation
		NOTE: The crew may enter BwOA PRI-1 immediately or may wait for RP confirmation of alarm.
	US	Dispatch Rad Protection to verify alarming condition Evacuate affected area of personnel Consider placing the Aux Building Charcoal Booster Fans in operation per 1BwOP VA-5 Upon receipt of failed Rad Monitor from RP, Notify System Engineer.
		NOTE: After determination of failed radiation monitor, initiate EVENT 4.

Comments: _____

Scenario No: 00-2		Event No. 4
Event Description: Letdown HX leak to the Component Cooling Water System		
Time	Position	Applicant's Actions or Behavior
	CUE	Annunciator: 1-2-A5 "CC SURGE TANK LEVEL HIGH LOW" CCW surge Tank level increases CCW Surge Tank Rad Monitor alarms, 1RE-PR009 & 0RE-PR009 Letdown flow decreases VCT level decreases
	RO/BOP	Identify report alarming conditions in CCW system Begin troubleshooting using Alarm Response procedures
	US	Enter 1BwOA PRI-6 Attachment A to diagnose location of the leak.
	RO	Identify/report changing letdown flow and pressure
	BOP	Check CC Surge Tank Level <ul style="list-style-type: none"> • Greater than 13% and increasing
	US	Transitions to Attachment A of 1BwOA PRI-6
	BOP	Check Leakage from RCP Thermal Barrier <ul style="list-style-type: none"> • RCP Thermal Barrier CC Water Flow High/Low alarm – NOT LIT
	CREW	Try to isolate CC System In-leakage <ul style="list-style-type: none"> • CC HX Radiation monitor alarms 1PR09J 0PR09J • Notify chemistry to sample
	CREW	Troubleshooting leads to conclusion that Letdown Heat Exchanger is source of flow to the CCW system.

Comments: _____

Scenario No: 00-2		Event No. 4
Event Description: Letdown HX leak to the Component Cooling Water System		
Time	Position	Applicant's Actions or Behavior
	US	Direct RO to place 1B Letdown HX in service and isolate the 1A HX
		NOTE: If the crew attempts to place excess letdown in service; act as the Shift Manager and state that System Engineering is investigating a Water Hammer event that previously occurred to the Excess Letdown HX. Do not place excess letdown in service.
	RO	<p>Remove 1A Letdown Heat Exchanger from service and place 1B Letdown Heat Exchanger in Service per 1BwOP CV-22 step 4.</p> <ul style="list-style-type: none"> • Establish CC flow through the 1B Letdown Hx by directing local operators as follows: • Verify/Open 1CC9452D, HX CC outlet valve • Verify open 1VF015, 1B Ltn HX Filtered Vent Hdr Isol to Floor Drain. • Crack open 1CV011B HX CC vent until a steady stream issues • Slowly open 1CC9452C HX CC inlet valve MRF CC39, 100 • Swap in service HX • Place 1TCVCC130A, Letdown Hx Temp Control valves, in MANUAL and maintain desired temperature • Verify/Open 1CV8467B HX outlet valve • Open 1CV8401B HX Inlet valve • Close 1CV8401A 1A Letdown HX Inlet valve • Slowly close 1CC9452A 1A Letdown HX CC Inlet isol valve to isolate leak MRF CC37, 0 ○ Close 1CC9452B 1A Letdown HX CC outlet valve MRF CC40, 0 ○ Close 1CV 8467A HX outlet valve MRF CV63, 0
		NOTE: After the 1B Ltn HX is in service (letdown restored) initiate Event 5.

Comments: _____

Scenario No: 00-2		Event No. 5
Event Description: Lowering Main Condenser Vacuum		
Time	Position	Applicant's Actions or Behavior
	CUE	Annunciators: 1-18-D4 "CONDSR VACUUM LOW" Chart recorder showing an increase in exhaust pressure MCB meters showing an increase in exhaust pressure Reactor power increasing Control rods moving out
	SRO	Implement 1BwOA SEC-3 "Loss of Condenser Vacuum"
	BOP SRO	Check CW System <ul style="list-style-type: none"> • CW pumps- three running • CW pump discharge valves – three open • Circ water box isol valves – all open Monitor Condenser Pressure <ul style="list-style-type: none"> • Condenser pressure acceptable per figure • Condenser pressure greater than 5.5." HG ABS Notify System Engineering to track condenser pressure Check DEHC MW OUT SELECTED - Select MW OUT
	BOP	Bypass CP Demins <ul style="list-style-type: none"> • Open condensate polisher bypass valves <ul style="list-style-type: none"> - 1CD210A - 1CD210B Restore Condenser Vacuum <ul style="list-style-type: none"> • Place U-1 hogging vacuum pump online • Place U-0 hogging vacuum pump online Place additional sets of air ejectors in service Start available CW pumps (all are already running) Check condenser pressure acceptable

Comments: _____

Scenario No: 00-2		Event No. 5
Event Description:		Lowering Main Condenser Vacuum
Time	Position	Applicant's Actions or Behavior
	BOP SRO	Identify and isolate leak <ul style="list-style-type: none"> • Check GS System • Check SJAE operating properly • Check condenser vacuum breaker • Locally check FW pump seal water collection tank water level • Locally check MS flash tank LCV operating normally.
		NOTE: When the C-9 alarm comes in notify the crew that the sightglass for the vacuum breaker was empty. I have opened 1WG043 and level has been restored. DMF FW36
	SRO	Request Chemistry department check dissolved oxygen level.
	BOP	Determine Condenser Status <ul style="list-style-type: none"> • Check air inleakage source identified • Check condenser pressure less than 5.5"HG ABS and stable or decreasing
		After the actions are complete for the lowering main condenser vacuum, initiate Event 6

Comments: _____

Scenario No: 00-2		Event No. 6,7,8
Event Description:		Uncontrolled Rod Withdraw requiring a reactor trip (6) Steam Break (7) PORV 455C Failure (8)
Time	Position	Applicant's Actions or Behavior
	CUE	Bank D Control rods withdrawing
	RO	Determine no conditions requiring rods to move out Place rods in Manual to stop rod motion
		NOTE: The crew may take all actions including tripping the reactor without entering 1BwOA ROD-1
	US	Transition to 1BwOA ROD-1 "Uncontrolled Rod Motion" and direct actions
	BOP	Check Secondary Plant Status – Turbine power stable
	RO	Check Rod Control Status <ul style="list-style-type: none"> • Place rods in manual • Determine rods still moving • Cycle the ROD CONTROL IN-OUT switch in both directions • Check if rods still moving • Evaluate if rod control previously in Auto • Place the ROD BANK SELECT switch to SHUTDOWN BANK D • Check if rods are still moving or ratchetting at top of core • Manually trip the reactor
	US	Implement 1BwEP-0 "Reactor Trip or Safety Injection" Direct actions of 1BwEP E-0
	RO	Verify reactor trip <ul style="list-style-type: none"> • Rod bottom lights LIT • Reactor trip & Bypass breakers open • Neutron flux lowering

Comments: _____

Scenario No: 00-2		Event No. 6,7,8
Event Description: Uncontrolled Rod Withdraw requiring a reactor trip (6) Steam Break (7) PORV 455C Failure (8)		
Time	Position	Applicant's Actions or Behavior
	BOP	Verify Turbine Trip <ul style="list-style-type: none"> • Turbine throttle valves closed • Turbine governor valves closed Verify power to 4KV busses <ul style="list-style-type: none"> • Bus 141 alive light lit • Bus 142 alive light lit
	CREW	Determine SI needed/actuated <ul style="list-style-type: none"> • Not actuated Check if SI is required <ul style="list-style-type: none"> • Pzr pressure >1829 psig • Steamline pressure >640 psig • Cnmt pressure >3.4 psig • Pzr level can not be maintained >4% Determine SI not required
	US	Transition to 1BwEP ES-0.1 "Reactor Trip Response" Direct operator actions of EP ES-0.1.
	BOP	Verify generator tripped Output breakers open <ul style="list-style-type: none"> • OCB 1-8 • OCB 7-8 PMG output breaker open - 41 breaker

Comments: _____

Scenario No: 00-2		Event No. 6,7,8
Event Description: Uncontrolled Rod Withdraw requiring a reactor trip (6) Steam Break (7) PORV 455C Failure (8)		
Time	Position	Applicant's Actions or Behavior
	RO	Check RCS average temperature stable or trending to 557°F.
	BOP	Check FW isolation <ul style="list-style-type: none"> • monitor lights lit Check feed flow to SGs Check SG blowdown isolated (SD002 A-H)
	RO	Verify ALL control rods inserted Check PZR level greater than 17% <ul style="list-style-type: none"> • Check Charging and letdown in service • Level trending to program level Check PZR pressure greater than 1829 psig <ul style="list-style-type: none"> • Pressure stable at or trending to 2235 psig
	BOP	Check SG levels maintained between 10% and 50% Verify ALL AC bus powered from offsite power (SATs)
		NOTE: Insert the Steam Break at this point.
	CUE	1D SG Level alarm Steam flow on the 1D Steam Line Increasing Containment pressure Lowering Pzr level and pressure
	US	Direct a Manual Safety Injection
	RO/BOP	Manually initiate a Safety Injection

Comments: _____

Scenario No: 00-2		Event No. 6,7,8
Event Description: Uncontrolled Rod Withdraw requiring a reactor trip (6) Steam Break (7) PORV 455C Failure (8)		
Time	Position	Applicant's Actions or Behavior
	US	Transition to 1BwEP E-0 "Reactor Trip or Safety Injection"
	RO	Verify reactor trip <ul style="list-style-type: none"> Rod bottom lights LIT Reactor trip & Bypass breakers open Neutron flux lowering
	BOP	Verify Turbine Trip <ul style="list-style-type: none"> Turbine throttle valves closed Turbine governor valves closed Verify power to 4KV busses <ul style="list-style-type: none"> Bus 141 alive light lit Bus 142 alive light lit
	CREW	Determine SI needed/actuated <ul style="list-style-type: none"> If actuated <ul style="list-style-type: none"> SI First OUT annunciator lit (1-11-B1, 1-11-C1, 1-11-D1, 1-11-E1) SI ACTUATED lit (1-BP-4.1) SI Equipment actuated (SI pumps running, CV Cold leg injection SI8801A/B open) Manually actuate SI

Comments: _____

Scenario No: 00-2		Event No. 6,7,8
Event Description: Uncontrolled Rod Withdraw requiring a reactor trip (6) Steam Break (7) PORV 455C Failure (8)		
Time	Position	Applicant's Actions or Behavior
	CREW	Recognize ADVERSE CNMT conditions when <ul style="list-style-type: none"> • CNMT pressure > 5psig • CNMT rad level > 10⁵ R/hr (Grid 4 4AS120 or 4AS121)
	RO	Trip RCPs per Operator Action Summary <ul style="list-style-type: none"> • CC Water lost to RCP • • CNMT Phase B actuated • • ALL of the following exist • Controlled RCS cooldown NOT in progress • RCS pressure < 1425 psig • HHSI flow > 100 gpm OR SI pump discharge flow > 200 gpm
	BOP	Verify FW isolated <ul style="list-style-type: none"> •FW pumps tripped •Isolation monitor lights lit •FW pumps disch valves closed (FW002A-C)
	RO	Verify ECCS pumps running <ul style="list-style-type: none"> • CENT Chg pumps • RH pumps • SI pumps

Comments: _____

Scenario No: 00-2		Event No. 6,7,8
Event Description: Uncontrolled Rod Withdraw requiring a reactor trip (6) Steam Break (7) PORV 455C Failure (8)		
Time	Position	Applicant's Actions or Behavior
	BOP	Verify Group 2 RCFC Accident Mode Lights Lit Verify Phase A isolation - Group 3 Monitor lights lit Verify CNMT Ventilation isolation - Group 6 Monitor lights lit
	BOP	Verify AF system: <ul style="list-style-type: none"> • AF pumps running • AF isolation valves open (1AF13A-H) • AF flow control valves throttled (AF005A-H) Verify CC Pumps running Verify SX Pumps running Check Main Steamline Isolation <ul style="list-style-type: none"> • Check SG pressure > 640 psig • Check CNMT pressure on IPR-937 OR IPI-CS934 thru 937 is >8.2 psig Verify MSIV and MSIV Bypass valves closed
	BOP	Check if CNMT Spray is required CNMT pressure > 20 psig <ul style="list-style-type: none"> • Stop all RCPs • Check Group 6 CS monitor lights lit • Check Group 6 monitor Phase B Isolation lights lit Check CS eductor suction flow >15 gpm on 1FI-CS013 & 14 Check CS eductor additive flow > 5 gpm on 1FI-CS015 & 16

Comments: _____

Scenario No: 00-2		Event No. 6,7,8
Event Description: Uncontrolled Rod Withdraw requiring a reactor trip (6) Steam Break (7) PORV 455C Failure (8)		
Time	Position	Applicant's Actions or Behavior
	BOP	Verify AF flows <ul style="list-style-type: none"> • AF flow > 500 gpm • SG levels maintained between 10% (31%) and 50% • NR levels NOT increasing in an uncontrolled manner
	RO	Verify ECCS valve alignment & flows <ul style="list-style-type: none"> • Group 2 Cold Leg Injection Monitor lights lit (except 1A RH pump). • High Head SI flow >100 gpm • RCS pressure <1700 psig • SI Pump discharge flow > 200gpm • Check RCS pressure < 325 psig <ul style="list-style-type: none"> • Check RH pump discharge flow > 1000 gpm <p>Check at least ONE PZR PORV relief path available:</p> <ul style="list-style-type: none"> • At least ONE PORV Isol valve energized. • PORV in AUTO • Associated Isol valve open

Comments: _____

Scenario No: 00-2		Event No. 6,7,8
Event Description: Uncontrolled Rod Withdraw requiring a reactor trip (6) Steam Break (7) PORV 455C Failure (8)		
Time	Position	Applicant's Actions or Behavior
	BOP	Verify generator trip <ul style="list-style-type: none"> • OCB 1-8 and 7-8 open • PMG output breaker open
	BOP	Verify DG 1A running <ul style="list-style-type: none"> • DG SX valves 1SX169A open • Dispatch operator to locally check 1A DG Ventilation systems aligned for emergency <ul style="list-style-type: none"> • Control Room • Aux Bldg. • Fuel Handling Bldg.
	RO [CT] E-0--M	Check PZR sprays & PORVs closed <ul style="list-style-type: none"> • Identifies PORV 455C is failed open • Attempts to manually close PORV • Manually close PORV Block valve RCS temperature control <ul style="list-style-type: none"> • Check RCP status • Check RCS Cold Leg temps trending to or stable at 557°F • Throttle AF flow if required Report RCS cold leg temperatures low due to ECCS injection flow
	RO	Check RCP status: <ul style="list-style-type: none"> • None running
	BOP	Check SG secondary boundary <ul style="list-style-type: none"> • 1D SG pressure decreasing in an uncontrolled manner • 1D SG completely depressurized

Comments: _____

Scenario No: 00-2		Event No. 6,7,8
Event Description: Uncontrolled Rod Withdraw requiring a reactor trip (6) Steam Break (7) PORV 455C Failure (8)		
Time	Position	Applicant's Actions or Behavior
	US	Transition to 1BwEP-2 "Faulted Steam Generator" Direct actions of 1BwEP-2
	BOP	Check Main Steam Line Isolation <ul style="list-style-type: none"> All MSIVs and bypass valves closed Check if any SG Secondary Pressure Boundary is Intact <ul style="list-style-type: none"> Any SG pressure stable or increasing
	BOP	Identify Faulted SG(s) <ul style="list-style-type: none"> Any SG pressure decreasing in an uncontrolled manner OR <ul style="list-style-type: none"> Any SG completely depressurized
	BOP [CT] E-2--A	Isolate Faulted SG <ul style="list-style-type: none"> 1AF013D closed 1AF013H closed Check FW to faulted SG isolated <ul style="list-style-type: none"> Associated row of FW ISOLATION MONITOR LIGHTS panel lit for faulted SG. 1FW009D open <ul style="list-style-type: none"> 1FW034D closed 1FW035D closed 1FW039D closed 1FW540 closed Verify SG PORV on faulted SG closed 1MS018D <ul style="list-style-type: none"> Verify SG blowdown isolation valves on faulted SG – closed <ul style="list-style-type: none"> 1SD002C 1SD002D <ul style="list-style-type: none"> Verify SG blowdown sample isolation valve on faulted SG – closed <ul style="list-style-type: none"> 1SD05B

Comments: _____

Scenario No: 00-2		Event No. 6,7,8
Event Description: Uncontrolled Rod Withdraw requiring a reactor trip (6) Steam Break (7) PORV 455C Failure (8)		
Time	Position	Applicant's Actions or Behavior
	BOP	Monitor AF Pump Suction Pressure <ul style="list-style-type: none"> AF PUMP SX SUCT VLVS ARMED alarm - NOT LIT Check secondary radiation <ul style="list-style-type: none"> No radiation monitors in alarm indicating steam generator tube rupture
	US	Transition to 1BwEP-1 "Loss of Reactor or Secondary Coolant" Direct actions of 1BwEP-1
	RO	Check status of RCPs <ul style="list-style-type: none"> High Head SI flow greater than 100 GPM OR <ul style="list-style-type: none"> SI Pump discharge flow greater than 200 GPM RCS pressure less than 1425 psig Controlled RCS cooldown not in progress or previously initiated
	BOP	Check if SG Secondary Pressure Boundaries are Intact <ul style="list-style-type: none"> No SG pressure decreasing in an uncontrolled manner No SG completely depressurized Check Intact SG Levels <ul style="list-style-type: none"> Narrow range level >10% (31%) Maintain total FW flow greater than 500 GPM until narrow range level is greater than 10% (31%) in at least 1 intact SG. Narrow range levels not increasing in an uncontrolled manner. Check Secondary Radiation Normal
	RO	Check Pzr PORVs and Isolation Valves <ul style="list-style-type: none"> PORVs energized and closed PORV isolation valves – at least one open

Comments: _____

Scenario No: 00-2		Event No. 6,7,8
Event Description: Uncontrolled Rod Withdraw requiring a reactor trip (6) Steam Break (7) PORV 455C Failure (8)		
Time	Position	Applicant's Actions or Behavior
	RO	Check if ECCS flow should be reduced <ul style="list-style-type: none"> • Subcooling acceptable • Secondary heat sink • Stable or increasing RCS pressure • Pzr level greater than 12% (28%)
	US	Transition to 1BwEP ES-1.1 "SI Termination" Direct actions of 1BwEP ES-1.1
		NOTE: At this point the crew may stay in 1BwEP -1 based on SI termination criteria. Ensure critical task E-0—M is complete prior to terminating scenario.
		NOTE: Scenario may be terminated at this point

Comments: _____

Simulation Facility	<u>Braidwood</u>	Scenario No.: 00-5	Operating Test No.:	1
Examiners:	_____	Operators:	_____	<u>SRO</u>
	_____		_____	<u>RO</u>
	_____		_____	<u>BOP</u>
Objectives:	To evaluate the applicants ability to use Normal, Abnormal, Emergency and alarm response procedures to respond to a power maneuver, RCP seal failure, 1C Steam Generator feed flow transmitter failure, Pzr pressure channel failure, loss of an ESF bus, reactor trip with component failures.			
Initial Conditions:	IC-31 90% power. All systems are in automatic and operating properly.			
Turnover:	Unit 1 is currently at 90% power. All systems are in automatic and operating properly. Electrical Generation has requested a load increase to full power as soon as possible.			

Event No.	Malf. No.	Event Type*	Event Description
Preload	RP01	M RO BOP SRO	Failure of automatic reactor trip
Preload	RP15B	C RO BOP SRO	Failure of the 1B Charging pump to Auto Start
Preload	RP15R	C RO BOP SRO	Failure of the 1B SX pump to Auto Start
1		N BOP SRO	Ramp up turbine power to 100% at 5 MW/min
		R RO	Raise reactor power using rods and/or dilution
2	CV27A, 3.1	C RO SRO	1A RCP #1 seal failure. (3.1 gpm at 240 sec.)
3		N BOP SRO	Ramp down turbine power at directed MW/min due to shutdown requirements
		R RO	Lower reactor power using rods and/or boration
4	RX04E, 0	I BOP SRO	SG C feed flow (controlling) fails low. 180 sec ramp.
5	RX21B, 2500	I RO SRO	Pressurizer Pressure channel PT-456 fails high. (NOTE 1)
6	ED07A	C RO BOP SRO	Loss of 4KV ESF Bus 141
7	MRF RP61 IN	M RO BOP SRO	Closure of all MSIVs with failure of reactor to auto trip
8	TH06A, 2500	M RO BOP SRO	LOCA 2500 gpm. 5 minute ramp

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

NOTE 1: MRF RP21 (OPEN/CLOSE) MRF RX036 (TRIP) MRF RX038 (TRIP) MRF RX039 (TRIP)
 MRF RX037 (TRIP) MRF RX017 (TRIP) MRF RX137 (TRIP)

SCENARIO 00-5 OVERVIEW

Unit 1 is at 90% power. Electric Generation has requested load increase to full power as soon as possible due to expected electrical loads.

Following clearly observable plant response from the reactivity changes, a 1A RCP #1 seal will fail and leak at the rate of 3.1 gpm over a 240-sec. period. The seal should be isolated. The procedure will direct the removal of the RCP from service. A ramp down in power should be started.

[NOTE to Simulator Operator: When asked, report 1A RCP # 2 seal leakoff flow reads 0.3 gpm]

Following the decision to ramp down power, a SG feed flow channel will fail low. The operator should place the associated FWRV in manual and restore SG level. Entry is made into BwOA INST-2 (Attachment G) and the feedwater flow control is transferred to an operable channel and the FRV control returned to auto. Tech Specs will be referenced.

After actions are complete for the feed flow channel failure, a pressurizer pressure channel will fail high. A PORV will go open. The operator must diagnose the failed channel, close the PORV. Entry is made into BwOA INST-2 (Attachment B) and an operable pressurizer pressure channel selected. Pressurizer pressure is verified restoring to normal. The SRO will review Tech Specs for applicability and actions. The SRO will notify I&C of the failure, request assistance in repair and the tripping of bistables.

When the bistables have been tripped, power will be lost to the 4KV ESF Bus 141. Just following the loss of power to the bus, all MSIVs will close resulting in a primary transient that will generate a reactor trip (OTAT). The reactor will fail to trip requiring the crew to recognize failure and initiate a manual trip. Following entry into E-0, a LOCA will occur on the 1A Cold Leg requiring a SI. The crew should manually initiate a SI. The crew will recognize the DG 1A started but does NOT tie to bus due to the fault. Repairs are required for Bus 141. Transition will be made to E-1. The crew will be required to manually start the 1B SX Pump to provide cooling to various plant components. Manual start of the 1B CV Pump is also required.

Critical Tasks

E-0--A: Manually trip the reactor from the control room when safety limits are exceeded (failure of auto trip)

E-0--L: Manually start at least one ESW pump in an operating safeguards train (1B) before cooled components overheat.

Scenario No: 00-5		Event No. 1
Event Description: Ramp up turbine and reactor power		
Time	Position	Applicant's Actions or Behavior
	CUE:	Request from System Operator to increase power to 100%
	US	Implement actions of IBwGP 100-3, "Power Ascension"
	US	Direct increase to 100% power at desired rate.
	CREW	Review applicable Precautions, and Limitations and Actions.
	RO	<p>Verify rod position and boron concentration.</p> <p>Initiate dilution, if required. (BwOP CV-5)</p> <ul style="list-style-type: none"> • Determine desired PW flow rate. • Set 1FK-111 PW/Total Flow Cont. to desired dilution rate. • Set 1FY-0111 Primary Water Control Preset Counter to desired volume. • Place MU MODE CONT SWITCH to STOP position. • Set MU MODE SELECT to DIL or ALT DIL position. • Place MAKE-UP CONTROL Switch to START • Verify proper operation of valves & PW pump (CV111A & 111B open, PW pump is running, CV110B opens [if ALT DIL]) • Verify PW flow on recorder

Comments: _____

Scenario No: 00-5		Event No. 1
Event Description: Ramp up turbine and reactor power		
Time	Position	Applicant's Actions or Behavior
	BOP	<p>Initiate turbine load increase:</p> <ul style="list-style-type: none"> Depress LOAD RATE MW/MIN Enter desired load rate <ul style="list-style-type: none"> Depress REF <ul style="list-style-type: none"> Calculate desired power level Enter power level When ready to begin load increase, depress GO <ul style="list-style-type: none"> Verify load increases.
	RO	<p>Monitor power increase:</p> <ul style="list-style-type: none"> Monitor reactor power, Tave, ΔI Verify rods more in AUTO to maintain Tave within $\pm 1.0^{\circ}\text{F}$ of Tref. <p>If diluting:</p> <ul style="list-style-type: none"> Monitor VCT level Verify RCS concentration decreasing Monitor Primary Water Control counter countdown. Verify dilution auto stops at preset value. Return Reactor Makeup System to blended flow at current blended flow.
		Note: Following clearly observable plant response from the reactivity changes, Event 2 is entered.

Comments: _____

Scenario No: 00-5		Event No. 2
Event Description: 1A RCP #1 seal failure		
Time	Position	Applicant's Actions or Behavior
	CUE	Annunciator: (1-7-B3) – RCP SEAL LEAKOFF FLOW HIGH RCP Bearing temperature increase (may decrease) RCP Seal outlet temperature increasing (may decrease) Containment environment alarms
	RO/US	Identify /Report plant alarms.
	RO	Diagnose RCP seal failure from indications.
	US	Enter 1BwOA RCP-1 “Reactor Coolant Pump Seal Failure” Direct operator actions (May place the ramp on hold)
	RO/US	Check #1 Seal ΔP <ul style="list-style-type: none"> • Seal $\Delta P > 200$ psid Check #1 Seal leakoff flow <ul style="list-style-type: none"> • #1 seal leakoff flow rate – HIGH Check for Failed Instrument Determine if affected RCP should be stopped <ul style="list-style-type: none"> • Maintain at least 9 GPM Seal Injection • No. 1 seal leakoff flow < 8 GPM • RCP temperatures • Seal leakoff flow < 6 GPM.
		NOTE: If contacted as local operator; #2 Seal Leakoff flow is 0.3 gpm
	US	Determine need for Unit Shutdown Inform SM of status of RCP 1A Seal condition and the need for unit shutdown.
		NOTE: Following the decision to ramp down power, Events 3 and 4 may be started.

Comments: _____

Scenario No: 00-5		Event No. 3 and 4
Event Description: Ramp down reactor and turbine power. (3) SG C feed flow (controlling) fails low. (4)		
Time	Position	Applicant's Actions or Behavior
		Note: Depending on when the feed flow failure occurs, the crew may not have time to begin the ramp down. Procedure actions for the feed flow failure follows the actions for the ramp down.
	US	Implement actions of 1BwGP 100-4, "Power Descension"
	US	Direct load reduction
	CREW	Review applicable Precautions, and Limitations and Actions.
	RO	<p>Verify rod position and boron concentration.</p> <p>Initiate boration, if required to maintain ΔI within target band. (BwOP CV-6)</p> <ul style="list-style-type: none"> • Determine boric acid flow rate • Set 1FK-110 BA Flow Cont to desired boration rate. • Set 1FY-0110 BA Blender Preset Counter to desired volume. • Place MU MODE CONT SWITCH to STOP position. • Set MU MODE SELECT to BOR position. • Place MAKE-UP CONTROL Switch to START • Verify proper operation of valves & BA transfer pump (CV110B open, BA pump is running, CV110A throttles open) • Verify BA flow on recorder
	BOP	<p>Initiate turbine load reduction:</p> <ul style="list-style-type: none"> • Depress LOAD RATE MW/MIN • Enter _ MW/min (Select based on Tech Spec time requirement) • Depress REF • Enter power level • When ready to begin load reduction, depress GO • Verify load decreases.

Comments: _____

Scenario No: 00-5		Event No. 3 and 4
Event Description: Ramp down reactor and turbine power. (3) SG C feed flow (controlling) fails low. (4)		
Time	Position	Applicant's Actions or Behavior
	RO	<p>Monitor power decrease:</p> <ul style="list-style-type: none"> Monitor reactor power, Tave, ΔI Verify rods more in AUTO to maintain Tave within $\pm 1.0^{\circ}\text{F}$ of Tref. <p>If borating:</p> <ul style="list-style-type: none"> Monitor VCT level Monitor BA Blender counter countdown. Verify boration auto stops at preset value. Return Reactor Makeup System to blended flow at current blended flow.
	CUE:	<p>Annunciators: 1-15-C4, "SG 1C FLOW MISMATCH FW FLOW LOW"</p> <p>1-15-C3 "SG 1C FLOW MISMATCH STEAM FLOW LOW"</p> <p>SG 1C Feed Water Regulating Valve opens</p> <p>SG 1C level increases</p>
	BOP/US	Identify/Report failure of Feed water flow channel
	BOP	Take manual control of 1C Feed Water Regulating Valve and regain control of 1C SG level.
	US	Enter 1BwOA INST-2, OPERATION WITH A FAILED INSTRUMENT CHANNEL, ATT. G, "FEEDWATER FLOW CHANNNEL FAILURE"
	US	Direct actions of ATT. G, "FEEDWATER FLOW CHANNNEL FAILURE"
	BOP	<p>Check affected SG levels</p> <p>SG levels - NORMAL</p> <ul style="list-style-type: none"> Place feed reg. valve in manual Restore level to a stable condition <p>Operable feed flow control channel – SELECTED</p> <ul style="list-style-type: none"> Select an operable channel <p>Automatic level control – ESTABLISHED</p> <ul style="list-style-type: none"> Return SG 1C level control to automatic when conditions are stable.

Comments: _____

Scenario No: 00-5		Event No. 3 and 4
Event Description: Ramp down reactor and turbine power. (3) SG C feed flow (controlling) fails low. (4)		
Time	Position	Applicant's Actions or Behavior
	RO/US	Check HD System operation HD pump discharge flow control valve position – NORMAL
	US	Inform SM/Maint of SG 1C feed flow channel failure.
		NOTE: After actions are complete for the feed flow channel failure, EVENT 5 may be entered.

Comments: _____

Scenario No: 00-5		Event No. 5
Event Description: Pressurizer Pressure channel PT-456 fails high		
Time	Position	Applicant's Actions or Behavior
	CUE:	Annunciators: 1-12-A2 "PZR PRESS HIGH RX TRIP STPT ALERT" 1-12-B2 "PZR PORV OR SAF VLV OPEN" 1-12-C1 "PZR PRESS CONT DEV LOW HTRS ON" PORV 456 opens RCS pressure decreases Heaters come on PORV 456 will close when pressure decreases to 2185 psig Pressure will cycle around 2185 psig
	RO/US	Identify/Report failure of PT 456 from indications
	RO	May take manual control of Master Pressurizer pressure controller Close PORV 456 manually
	US	Enter 1BwOA INST-2 ATT. B PRESSURIZER PRESSURE CHANNEL FAILURE
	RO	Check Pzr Pressure <ul style="list-style-type: none"> • RCS pressure normal – take manual control to restore. Operable Pzr pressure channel selected <ul style="list-style-type: none"> • Place Master Pzr Pressure Controller in Manual • Control Pzr pressure • Select operable channel Check PORVs, Spray Valves and Heaters <ul style="list-style-type: none"> • PORVs closed • Spray valves normal Place Pzr Pressure Control in Auto Select Operable Channels to recorders <ul style="list-style-type: none"> • Pzr pressure • Loop ΔT

Comments: _____

Scenario No: 00-5		Event No. 5
Event Description: Pressurizer Pressure channel PT-456 fails high		
Time	Position	Applicant's Actions or Behavior
	US	Trip bistables to remove failed channel from service. <ul style="list-style-type: none"> • Pzr Hi Press Rx Trip PB456A • Pzr Lo Press Rx Trip PB456C • Pzr Lo Press SI PB456D • P-11 PB456B • OTΔT Rx Trip TB421C • OTΔT Runback TB421D
	US	Review Technical Specifications and ITS for applicability and actions <ul style="list-style-type: none"> •3.4.1 •3.3.1 •3.3.2
	US	Notify SM/Maint. of status of PT 456.
		NOTE: After the bistables have been tripped for the failed channel, Proceed to Event 6

Comments: _____

Scenario No: 00-5		Event No. 6,7 and 8
Event Description: Loss of 4KV ESF Bus 141. (6) Closure of all MSIVs with failure of reactor to auto trip. (7) 2500 GPM LOCA (8)		
Time	Position	Applicant's Actions or Behavior
	CUE	Annunciator (1-21-A7) BUS 141 FD BRKR 1412 TRIP (1-21-C7) BUS 141 OVERLOAD OR VOLT LOW (1-21-E8) 125V DC BATT CHGR 111 TROUBLE (1-9-A3) CHG PUMP TRIP (1-9-D3) CHG LINE FLOW HIGH LOW 1A CV, CC, SX PUMP TRIPS All MSIVs close Pzr Level decreasing Pzr pressure decreasing
	CREW [CT] E-0--A	Identify that a reactor trip should have occurred Perform manual reactor trip
	US	Implement 1BwEP-0 "Reactor Trip or Safety Injection"
	RO	Verify reactor trip <ul style="list-style-type: none"> • Rod bottom lights LIT • Reactor trip & bypass breakers open • Neutron flux decreasing
	BOP	Verify Turbine Trip <ul style="list-style-type: none"> • Turbine throttle valves closed • Turbine governor valves closed Verify power to 4KV ESF Busses <ul style="list-style-type: none"> • Bus 141 alive light NOT lit • Bus 142 alive light lit Try to restore power per 1BWOA ELEC-3, LOSS OF 4KV ESF BUS while continuing with this procedure
		NOTE: Actions of 1BWOA ELEC-3 are stated here. E-0 actions are continued further in this document.

Comments: _____

Scenario No: 00-5		Event No. 6,7 and 8
Event Description: Loss of 4KV ESF Bus 141. (6) Closure of all MSIVs with failure of reactor to auto trip. (7) 2500 GPM LOCA (8)		
Time	Position	Applicant's Actions or Behavior NOTE: Crew should notice that DG 1A started but did NOT tie to the bus
	CREW [CT] E-0--L	Identify/report failure of ESF Bus 141 Verify required ESF Loads energized on Bus 142 Operators manually start: <ul style="list-style-type: none"> • 1B CV Pump • 1B SX Pump
	BOP/US	Check Bus 141 not faulted Place the following control switches in PTL: <ul style="list-style-type: none"> • ACB 1413 – DG 1A Feed Breaker • ACB 1411 – Non-ESF bus tie • ACB 1412 – SAT feed • ACB 1414 – Reserve feed
	BOP	Check Bus 141 lockout alarms – NOT Lit 1-21-A7 BUS 141 FD BRKR 1412 TRIP is LIT 1-21-B8 BKR 1414 CROSS-TIE OVERCURRENT 1-21-B9 DG 1A OVERLOAD
	US	No Fire has occurred, Go To Step 6.
	BOP/US	Check if DC Cross-Tie Required Battery charger 111 NOT energized Crosstie DC Bus 111 to Unit 2 within 1 hour per 1BwOP DC-7-111, "125 VDC ESF Bus 111 Cross-Tie/ Restoration"

Comments: _____

Scenario No: 00-5		Event No. 6,7 and 8
Event Description: Loss of 4KV ESF Bus 141. (6) Closure of all MSIVs with failure of reactor to auto trip. (7) 2500 GPM LOCA (8)		
Time	Position	Applicant's Actions or Behavior
	US	Perform following Tech Spec Surveillances within 1 hour: <ul style="list-style-type: none"> 1BwOSR 3.8.1.1, "Offsite AC Power Availability Weekly Surveillance" Contact UNIT 2 to perform 2BwOSR 3.8.1.1, "Unit Two Offsite AC Power Availability Weekly Surveillance"
	RO/US	Review Tech Specs: 3.8.1 3.8.2 3.8.9 3.8.10
	US	BUS 141 Alarms LIT <ul style="list-style-type: none"> Initiate repairs
NOTE: E-0 steps continue here		
	CREW	Check SI Status If actuated <ul style="list-style-type: none"> SI First OUT annunciator lit SI ACTUATED lit SI Equipment
	BOP	Verify FW isolated <ul style="list-style-type: none"> FW pumps tripped Isolation monitor lights lit FW pumps discharge valves closed (FW002A-C)

Comments: _____

Scenario No: 00-5		Event No. 6,7 and 8
Event Description: Loss of 4KV ESF Bus 141. (6) Closure of all MSIVs with failure of reactor to auto trip. (7) 2500 GPM LOCA (8)		
Time	Position	Applicant's Actions or Behavior
	RO	<ul style="list-style-type: none"> Verify ECCS pumps running <ul style="list-style-type: none"> CENT Chg pumps RH pumps SI pumps
	BOP	Verify RCFCs running in LOW SPEED Verify Phase A isolation – Group 3 Monitor lights lit Verify CNMT Ventilation isolation - Group 6 Monitor lights lit Verify AF system: <ul style="list-style-type: none"> AF pumps running. AF isolation valves open (AF13A-H) AF flow control valves throttled (AF005A-H) Verify CC Pumps running Verify SX Pumps running
	BOP	Check Main Steamline Isolation <ul style="list-style-type: none"> Check SG pressure > 640 psig Check CNMT pressure <8.2
	BOP	Check if CNMT Spray is required <ul style="list-style-type: none"> CNMT pressure > 20 psig NOTE: Containment spray may not be actuated at this time. When it does, do the following: <ul style="list-style-type: none"> Stop all RCPs Group 6 CS monitor lights – LIT Group 6 Phase B Isolation monitor lights – LIT Check CS eductor suction flow on running pumps – Greater than 15 GPM Check CS eductor additive flow on running pumps –Greater than 5 GPM.

Comments: _____

Scenario No: 00-5		Event No. 6,7 and 8
Event Description: Loss of 4KV ESF Bus 141. (6) Closure of all MSIVs with failure of reactor to auto trip. (7) 2500 GPM LOCA (8)		
Time	Position	Applicant's Actions or Behavior
	BOP	Verify AF flows <ul style="list-style-type: none"> • AF flow > 500 gpm available • SG levels maintained between 10% (31%) and 50% • Narrow range levels – Not increasing in an uncontrolled manner
	RO	Verify ECCS valve alignment & flows <ul style="list-style-type: none"> • Group 2 CL Inj monitor lights lit • High Head Injection flow >100 gpm • Safety Injection flow > 200gpm (if RCS pressure <1700 psig)
	RO	Check at least One PZR PORV Relief Path Available <ul style="list-style-type: none"> • PORV isol valves – ENERGIZED • PORV relief path – AVAILABLE
	BOP	Verify Generator Trip <ul style="list-style-type: none"> • OCB 1-8 open • OCB 7-8 open • PMG Breaker Open
	BOP	Verify DG running <ul style="list-style-type: none"> • SX valves open (SX169A/B) • Dispatch operator locally to check operation
	BOP	Ventilation systems aligned for emergency <ul style="list-style-type: none"> • Control Room • Aux Bldg. • Fuel Handling Bldg.

Comments: _____

Scenario No: 00-5		Event No. 6,7 and 8
Event Description: Loss of 4KV ESF Bus 141. (6) Closure of all MSIVs with failure of reactor to auto trip. (7) 2500 GPM LOCA (8)		
Time	Position	Applicant's Actions or Behavior
	RO	Check PZR sprays & PORVs closed Maintain RCS temperature control <ul style="list-style-type: none"> Throttle AFW. Maintain total AFW flow >500 GPM until Steam Generator narrow range level >10% (31%). Check RCP status <ul style="list-style-type: none"> High Head SI flow greater than 100 GPM OR SI Pump discharge flow greater than 200 GPM RCS pressure less than 1425 psig Controlled RCS cooldown not in progress or previously initiated
	BOP	Check SG secondary boundary <ul style="list-style-type: none"> No SG pressure decreasing in an uncontrolled manner No SG completely depressurized Check if SG Tubes are Intact <ul style="list-style-type: none"> Check radiation monitors Check if RCS is Intact <ul style="list-style-type: none"> Check Radiation monitors Containment pressure <3.4 psig Containment floor water level <5 inches
	US	Perform proper transition to 1BwEP-1, "Loss of Reactor or Secondary Coolant" Direct operator actions of 1BwEP-1

Comments: _____

Scenario No: 00-5		Event No. 6,7 and 8
Event Description: Loss of 4KV ESF Bus 141. (6) Closure of all MSIVs with failure of reactor to auto trip. (7) 2500 GPM LOCA (8)		
Time	Position	Applicant's Actions or Behavior
	RO	Check status of RCPs <ul style="list-style-type: none"> • High Head SI flow greater than 100 GPM OR <ul style="list-style-type: none"> • SI Pump discharge flow greater than 200 GPM • RCS pressure less than 1425 psig • Controlled RCS cooldown not in progress or previously initiated
	BOP	Check if SG Secondary Pressure Boundaries are Intact <ul style="list-style-type: none"> • No SG pressure decreasing in an uncontrolled manner • No SG completely depressurized Check Intact SG Levels <ul style="list-style-type: none"> • Narrow range level >10% (31%) • Maintain total FW flow greater than 500 GPM until narrow range level is greater than 10% (31%) in at least 1 intact SG. • Narrow range levels not increasing in an uncontrolled manner. Check Secondary Radiation Normal
	RO	Check Pzr PORVs and Isolation Valves <ul style="list-style-type: none"> • PORVs energized and closed • PORV isolation valves – at least one open
	RO	Check if ECCS flow should be reduced <ul style="list-style-type: none"> • Subcooling acceptable • Secondary heat sink • Stable or increasing RCS pressure • Pzr level greater than 12% (28%)
	BOP	Check if Containment Spray should be stopped (Continuous Action Step)

Comments: _____

Scenario No: 00-5		Event No. 6,7 and 8
Event Description: Loss of 4KV ESF Bus 141. (6) Closure of all MSIVs with failure of reactor to auto trip. (7) 2500 GPM LOCA (8)		
Time	Position	Applicant's Actions or Behavior
	RO	Check if RH Pumps should be stopped Check RCS and SG Pressures for Faulted SG Indications
	BOP	Check if DGs should be stopped <ul style="list-style-type: none"> • Determine Bus 141 not available • Secure running DGs
		NOTE: Scenario may be terminated at this point

Comments: _____

Simulation Facility Braidwood

Scenario No.: Spare

Examiners: _____

Operators: _____

SRO

RO

BOP

Objectives: To evaluate the applicants ability to use Normal, Abnormal, Emergency and alarm response procedures to respond to a normal power increase, a pressurizer level channel failure, HDT level controller failure, a leak in the letdown heat exchanger, a leak in the main turbine EHC system and a Large LOCA with failure of RH pumps to start and failure of automatic transfer to sump suction for operating train of RH.

Initial Conditions: IC-16. Unit at 49% power

Turnover: 1CC9437A OOS for solenoid replacement. Circuit breaker 1423 (DG-1B feeder to Bus 142) was declared OOS late last shift and is being replaced. DG-1B has been declared Out of Service. Breaker 1423 is expected to return to service in 3 to 4 hours. Currently in LCO 3.8.1 Condition B with 12 hours left on the completion time.

Event No.	Malf. No.	Event Type*	Event Description
Preload	RH01A	C RO SRO	1A RH Pump fails to start/trip
Preload	MFP EG09 MAINT_O 1B DG & Bkr 1423 in PTL and OOS		1B DG OOS
Preload	IOR ZDI1CC9437A CLS IOR ZLO1CC9437A[CLS] OFF IOR ZLO1CC9437A[OPEN] OFF		1CC9437A OOS
Preload	MRF RP85 open RP15F	C RO SRO	1B RH Pump fails to start on SI with manual start available **
Preload	RH04B	C BOP SRO	Failure of 1SI8811B (RH CNMT Sump) auto transfer
1		N BOP SRO	Ramp up turbine power to 750MW at 5 MW/min
		R RO	Raise reactor power using rods and/or dilution
2	RX13A, 0, 10	I RO SRO	Pressurizer level channel fails low (LT-459) (NOTE 1)
3	FW17, 0	I BOP SRO	Heater Drain Tank level controller fails low
4	CV23A, 100	C RO SRO	Letdown Heat Exchanger tube leak
5	TC15, 34	M BOP RO SRO	EHC System leak of 34 gpm results in turbine trip (NOTE 2)
6	TH06A, 450000	M BOP RO SRO	Large Break LOCA upon reactor trip
7	Preload	C RO SRO	1A and 1B RH Pump fail to start with 1B RH pump manual start capable.
8	Preload	C BOP SRO	Failure of Auto transfer to cold leg recirc for "B" Train

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

NOTE 1: MRF RP20 OPEN/CLOSE MRF RX029 TRIP

NOTE 2: If asked as local operator, the EH fluid leak is greater than makeup capacity and leak is located at combined discharge of EH pumps.

SCENARIO SPARE OVERVIEW

Unit 1 is at 50% power. Following turnover power increase is initiated to 750MW power.

Following clearly observable plant response from the reactivity changes, the controlling pressurizer level channel will fail low. Pressurizer level will be placed in manual, an operable channel selected, level returned to normal and letdown restored. Technical Specifications should be consulted for applicability.

After the bistables for pressurizer level have been tripped, Heater Drain Tank level controller will fail causing heater drain tank level to rise. The overflow valve will open and level alarms will actuate. The operator is expected to take manual control of the level controller and reopen the valve.

After HDT tank level is restored to normal band, a leak will develop in the letdown heat exchanger. The operator should notice VCT level changing, and radiation levels in the CCW system increasing. Operators should troubleshoot and identify the failed letdown HX. The crew should establish letdown using the 1B HX.

After the 1B HX is in service, an EHC leak will develop on the EHC reservoir. EHC level will drop bringing in several alarms. When level is sufficiently low to result in a trip of the EHC pumps, the main turbine also gets a trip signal. E-0 will be entered when the reactor trips.

At the time of the reactor trip, a large break LOCA occurs on the RCS. The crew will transition from 1BwEP-0 to 1BwEP-1. Both RH pumps fail to start. The 1A RH pump trips if a manual start is attempted, but the 1B RH pump will start on a manual start. When RWST level drops to the LO-2 level for automatic transfer to the CNMT sump suction, the "B" Train valve SI8811B will fail to automatically open. Operator action is required to stop the RH and CS pumps and manually open the sump suction valves. The crew will transition from 1BwEP-1 to 1BwES-1.3. The scenario is terminated following completion of the alignment of ECCS for cold leg recirculation.

Critical Tasks

1. E-0 -- H: Manually start at least one low-head ECCS pump before transition out of E-0.
2. ES-1.3 -- A: Transfer to cold leg recirculation and establish ECCS recirculation flow that at least meets the assumptions of the plant-specific LOCA analysis.

Scenario No: Spare		Event No. 1
Event Description: Ramp up turbine and reactor power.		
Time	Position	Applicant's Actions or Behavior
	CUE:	Request from System Operator to increase power to 75%
	US	Implement actions of 1BwGP 100-3, "Power Ascension"
	US	Direct increase to 75% power at desired rate.
	CREW	Review applicable Precautions, and Limitations and Actions.
	RO	<p>Verify rod position and boron concentration.</p> <p>Initiate dilution, if required. (BwOP CV-5)</p> <ul style="list-style-type: none"> • Determine desired PW flow rate. • Set 1FK-111 PW/Total Flow Cont. to desired dilution rate. • Set 1FY-0111 Primary Water Control Preset Counter to desired volume. • Place MU MODE CONT SWITCH to STOP position. • Set MU MODE SELECT to DIL or ALT DIL position. • Place MAKE-UP CONTROL Switch to START • Verify proper operation of valves & PW pump (CV111A & 111B open, PW pump is running, CV110B opens [if ALT DIL]) • Verify PW flow on recorder
	BOP	<p>Initiate turbine load increase:</p> <ul style="list-style-type: none"> • Depress LOAD RATE MW/MIN • Enter desired load rate • Depress REF • Calculate desired power level • Enter power level • When ready to begin load increase, depress GO • Verify load increases.

Comments: _____

Scenario No: Spare		Event No. 1
Event Description: Ramp up turbine and reactor power.		
Time	Position	Applicant's Actions or Behavior
	RO	<p>Monitor power increase:</p> <ul style="list-style-type: none"> • Monitor reactor power, Tave, ΔI • Verify rods more in AUTO to maintain Tave within $\pm 1.0^\circ\text{F}$ of Tref. <p>If diluting:</p> <ul style="list-style-type: none"> • Monitor VCT level • Monitor Primary Water Control counter countdown. • Verify dilution auto stops at preset value. • Return Reactor Makeup System to blended flow at current blended flow.
		NOTE: Following clearly observable plant response, Event 2 may be started.

Comments: _____

Scenario No: Spare		Event No. 2
Event Description: Controlling Pressurizer level channel fails low (LT-459)		
Time	Position	Applicant's Actions or Behavior
	CUES:	Annunciators (1-12-A4) PZR LVL LOW HTRS OFF LTDWN SECURED (1-12-B4) PZR LEVEL CONT DEV LOW <ul style="list-style-type: none"> • PZR heaters tripped OFF with associated alarms • Letdown Isolation Valve 1LCV-459 & Orifice Isolation valves 1CV8149A/B/C CLOSE • Charging flow control 1CV-121 throttles open to increase flow
	RO/US	Identify/Report failed PZR level channel - LT-459
	US	Implement 1BwOA INST-2 "OPERATION WITH A FAILED INSTRUMENT CHANNEL", Attachment C "PRESSURIZER LEVEL CHANNEL FAILURE" and direct operator action.
	RO/US	Check PZR Level: Verify level normal <ul style="list-style-type: none"> • Take manual control to restore PZR level • Select an operable channel • Select operable channel for PZR level recorder
	RO	Check letdown and PZR heaters PZR level >17% Establish letdown per 1BwOP CV-17 <ul style="list-style-type: none"> • Verifies closed 1CV8149A,B,C • Place letdown pressure controller 1PCV-CV131 in MAN and raise demand to 40% • Place Letdown Hx Out Temp Cont Vlv 1TCV-CC130A to MAN and raise demand to 60%. • Open Letdown Line Isolation valve 1LCV-CV459, verify open 1LCV-460 • Verify open inservice regen Hx isolation valves 1CV8324A/B & 1CV8389A/B • Verify open Letdown Line CNMT isolation valves 1CV8160 & 1CV8152 • Verify open Ltdn to Ltdn HX in service 1CV8401A/B • Verify close Pzr Aux Spray Vlv 1CV8145 • Verify Open 1CV8147/8105/8106 Charging Line Cnmt Isol Vlvs

Comments: _____

Scenario No: Spare		Event No. 2
Event Description: Controlling Pressurizer level channel fails low (LT-459)		
Time	Position	Applicant's Actions or Behavior
	RO (cont.)	<ul style="list-style-type: none"> Adjust in MAN Cent Chg Pump Flow controller 1FK-121 to establish \approx 100 gpm charging flow with 8-10 gpm seal injection flow. Open the selected letdown orifice isolation valve(s) 1CV8149 A/B/C to establish desired letdown flow Adjust 1PCV-CV131 to obtain 360-380 psig on 1PI-131 and place in AUTO Adjust 1TCV-CC130A to obtain 90-115°F on 1TI-130 and place in AUTO When plant conditions stabilize, place FCV-121 in AUTO. Verify Radiation Monitor 1RE-PR006 in service
	RO/US	Check PZR level control in Auto <ul style="list-style-type: none"> Master PZR Level Controller 1CV121 controller
	US/RO	Trip bistables for 1LT-459 by placing in TEST: <ul style="list-style-type: none"> PZR HI WTR LVL RX TRIP LB459A
	US	Refer to Technical Specifications: <ul style="list-style-type: none"> 3.3.1 3.3.3 3.3.4
	US	Inform SM/Maint of PZR level channel LT-459 status.
		NOTE: When Tech Specs have been referenced and bistables tripped power ascension may resume and Event 3 started.

Comments: _____

Scenario No: Spare		Event No. 3
Event Description: Heater Drain Tank level controller fails low.		
Time	Position	Applicant's Actions or Behavior
	CUE:	Annunciator: 1-17-D4 "HD TANK LEVEL HI-2" 1-17-E4 "HD TANK LEVEL HIGH LOW" 1-17-E5 "HD TANK OVERFLOW VALVE OPEN"
	BOP	Identify/report failure of Heater Drain Tank level controller
	BOP	Take manual control of Heater Drain Tank level controller. Regain control of Heater Drain Tank level May open MFP recirc valve to lower level.
	US	Inform SM/Maint of Heater Drain Tank level controller status.
		NOTE: After the HDT level has been restored, proceed to Event 4.

Comments: _____

Scenario No: Spare		Event No. 4
Event Description: Letdown Heat Exchanger tube leak.		
Time	Position	Applicant's Actions or Behavior
	CUE	Annunciator: 1-2-A5 "CC SURGE TANK LEVEL HIGH LOW" CCW surge Tank level increases CCW Surge Tank Rad Monitor alarms, 1RE-PR009 & 0RE-PR009 Letdown flow decreases VCT level decreases
	RO/BOP	Identify report alarming conditions in CCW system Begin troubleshooting using Alarm Response procedures
	US	Enter 1BwOA PRI-6 Attachment A to diagnose location of the leak.
	RO	Identify/report changing letdown flow and pressure
	BOP	Check CC Surge Tank Level <ul style="list-style-type: none"> • Greater than 13% and increasing
	US	Transitions to Attachment A of 1BwOA PRI-6
	BOP	Check Leakage from RCP Thermal Barrier <ul style="list-style-type: none"> • RCP Thermal Barrier CC Water Flow High/Low alarm – NOT LIT
	CREW	Try to isolate CC System In-leakage <ul style="list-style-type: none"> • CC HX Radiation monitor alarms 1PR09J 0PR09J • Notify chemistry to sample <p>NOTE: To drain the CC Surge Tank MRF CC16 100 and watch level!</p>
	CREW	Troubleshooting leads to conclusion that Letdown Heat Exchanger is source of flow to the CCW system.
	US	Direct RO to place 1B Letdown HX in service and isolate the 1A HX

Comments: _____

Scenario No: Spare		Event No. 4
Event Description: Letdown Heat Exchanger tube leak.		
Time	Position	Applicant's Actions or Behavior
	RO	<p>Remove 1A Letdown Heat Exchanger from service and place 1B Letdown Heat Exchanger in Service per 1BwOP CV-22 step 4.</p> <ul style="list-style-type: none"> Establish CC flow through the 1B Letdown Hx by directing local operators as follows: <ul style="list-style-type: none"> Verify/Open 1CC9452D, HX CC outlet valve Verify open 1VF015, 1B Ltn HX Filtered Vent Hdr Isol to Floor Drain. Crack open 1CV011B HX CC vent until a steady stream issues Slowly open 1CC9452C HX CC inlet valve MRF CC39 100 Swap in service HX <ul style="list-style-type: none"> Place 1TCVCC130A, Letdown Hx Temp Control valves, in MANUAL and maintain desired temperature Verify/Open 1CV8467B HX outlet valve Open 1CV8401B HX Inlet valve Close 1CV8401A 1A Letdown HX Inlet valve Slowly close 1CC9452A 1A Letdown HX CC Inlet isol valve MRF CC37 0 to isolate leak <ul style="list-style-type: none"> Close 1CC9452B 1A Letdown HX CC outlet valve MRF CC40 0 Close 1CV 8467A HX outlet valve MRF CV63 0
		NOTE: After the 1B Ltn HX is placed in service, proceed with Event 5.

Comments: _____

Scenario No: Spare		Event No. 5, 6, 7, and 8
Event Description: EHC System leak resulting in turbine trip and reactor trip (5). Upon reactor trip a large break LOCA will occur (6). 1A and 1B RH pumps fail to start w/1A pump failure to manually start (7). Upon LO-2 condition in RWST, SI8811B will fail to auto open (8).		
Time	Position	Applicant's Actions or Behavior
	CUE	Annunciator: 1-18-C15 "EH FLUID RSRVR LVL HIGH LOW" 1-16-C3 "FW PUMP TURB OIL PRESS LOW" Standby EH Pump auto starts When the Lo-2 alarm is reached on the reservoir, both EH pumps will trip. The low pressure will generate a turbine trip. Both Turbine driven feed pumps will also trip. The turbine trip will cause a reactor trip.
	BOP	Dispatch operator to locally check EH level When level reported, direct operator to attempt to add oil to EH reservoir When reported status of actions, report to US status of EH
		NOTE: Local operator will report that the leak is located at the combined discharge of the EH pumps and that the leak is greater than makeup capacity.
	US	When excessive leakage reported, direct load reduction (possible)
	RO/BOP	Initiate load reduction as directed. (possible)
	BOP	Monitor Main turbine & FW Pumps turbines Stop valve and Governor valve positions. (possible)
	US	The crew should elect to trip the reactor once the determination is made that EH makeup CANNOT maintain EH level <ul style="list-style-type: none"> • Direct manual trip of reactor
	RO	Manually trip the reactor

Comments: _____

Scenario No: Spare		Event No. 5, 6, 7, and 8
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Time	Position	Applicant's Actions or Behavior
	US	Implement 1BwEP-0 "Reactor Trip or Safety Injection" Direct actions of 1BwEP E-0
	RO	Verify reactor trip <ul style="list-style-type: none"> Rod bottom lights LIT Reactor trip & Bypass breakers open Neutron flux lowering
	BOP	Verify Turbine Trip <ul style="list-style-type: none"> Turbine throttle valves closed Turbine governor valves closed Verify power to 4KV busses <ul style="list-style-type: none"> Bus 141 alive light lit Bus 142 alive light lit
	CREW	Determine SI needed/actuated <ul style="list-style-type: none"> If actuated <ul style="list-style-type: none"> SI First OUT annunciator lit SI ACTUATED lit SI Equipment actuated Manually actuate SI
	CREW	Recognize ADVERSE CNMT conditions when <ul style="list-style-type: none"> CNMT pressure > 5psig CNMT rad level > 10⁵ R/hr (Grid 4 4AS120 or 4AS121)
	RO	Trip RCPs per Operator Action Summary

Comments: _____

Scenario No: Spare		Event No. 5, 6, 7, and 8
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Time	Position	Applicant's Actions or Behavior
		<ul style="list-style-type: none"> • CC Water lost to RCP • • CNMT Phase B actuated • • ALL of the following exist <ul style="list-style-type: none"> • Controlled RCS cooldown NOT in progress • RCS pressure < 1425 psig • HHSI flow > 50 gpm OR SI pump discharge flow > 100 gpm
	BOP	<p>Verify FW isolated</p> <ul style="list-style-type: none"> • FW pumps tripped • Isolation monitor lights lit • FW pumps disch valves closed (FW002A-C)
	RO	<p>Verify ECCS pumps running</p> <ul style="list-style-type: none"> • CENT'Chg pumps • RH pumps • SI pumps
	RO [CT] E-0--H	<p>Identify/Report 1A and 1B RH pumps did not start.</p> <ul style="list-style-type: none"> • Attempt to start both RH pumps • Identify/Report only the 1B RH pump was started.
	BOP	<ul style="list-style-type: none"> • Verify Group 2 RCFC Accident Mode Lights Lit • Verify Phase A isolation - Group 3 Monitor lights lit • Verify CNMT Ventilation isolation - Group 6 Monitor lights lit
	BOP	Verify AF system:

Comments: _____

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Time	Position	Applicant's Actions or Behavior
		<ul style="list-style-type: none"> • AF pumps running • AF isolation valves open (1AF13A-H) • AF flow control valves throttled (AF005A-H) <p>Verify CC Pumps running</p> <p>Verify SX Pumps running</p> <p>Check Main Steamline Isolation</p> <ul style="list-style-type: none"> • Check SG pressure > 640 psig • Check CNMT pressure on 1PR-937 OR 1PI-CS934 thru 937 is >8.2 psig <p>Verify MSIV and MSIV Bypass valves closed</p>
	BOP	<p>Check if CNMT Spray is required</p> <p>CNMT pressure > 20 psig</p> <ul style="list-style-type: none"> • Stop all RCPs • Check Group 6 CS monitor lights lit • Check Group 6 monitor Phase B Isolation lights lit <p>Check CS eductor suction flow >15 gpm on 1FI-CS013 & 14</p> <p>Check CS eductor additive flow > 5 gpm on 1FI-CS015 & 16</p>
	BOP	<p>Verify AF flows</p> <ul style="list-style-type: none"> • AF flow > 500 gpm • SG levels maintained between 10% (31%) and 50% • NR levels NOT increasing in an uncontrolled manner
	RO	Verify ECCS valve alignment & flows

Comments: _____

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Time	Position	Applicant's Actions or Behavior
		<ul style="list-style-type: none"> Group 2 Cold Leg Injection Monitor lights lit (except 1A RH pump). High Head SI flow >100 gpm RCS pressure <1700 psig SI Pump discharge flow > 200gpm Check RCS pressure < 325 psig <ul style="list-style-type: none"> Check RH pump discharge flow > 1000 gpm <p>Check at least ONE PZR PORV relief path available:</p> <ul style="list-style-type: none"> At least ONE PORV Isol valve energized. PORV in AUTO Associated Isol valve open
	BOP	Verify generator trip <ul style="list-style-type: none"> OCB 1-8 and 7-8 open PMG output breaker open
	BOP	Verify DG 1A running <ul style="list-style-type: none"> DG SX valves 1SX169A open Dispatch operator to locally check 1A DG <p>Ventilation systems aligned for emergency</p> <ul style="list-style-type: none"> Control Room Aux Bldg. Fuel Handling Bldg.
	RO	Check PZR sprays & PORVs closed

Comments: _____

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Time	Position	Applicant's Actions or Behavior
		RCS temperature control <ul style="list-style-type: none"> • Check RCP status – none running • Check RCS Cold Leg temps trending to or stable at 557°F • Throttle AF flow if required Report RCS cold leg temperatures low due to ECCS injection flow
	RO	Check RCP status: <ul style="list-style-type: none"> • None running
	BOP	Check SG secondary boundary <ul style="list-style-type: none"> • All SG pressure stable Check SG tubes intact <ul style="list-style-type: none"> • All secondary rad monitors < ALERT setpoint
	CREW	Check if RCS is Intact <ul style="list-style-type: none"> • Diagnose LOCA <ul style="list-style-type: none"> • CNMT are rad monitors levels increasing or in ALERT <ul style="list-style-type: none"> • Grid 4 AS101, 4AS202, 4AS303 (IRT-AR014) • Grid 4 AS111 (IRT-AR011) • Grid 4 AS112 (IRT-AR012) • Grid 4 AS120 (IRT-AR020) • Grid 4 AS121 (IRT-AR021) • CNMT pressure > 3.4 psig • CNMT floor water level > 5 inches
	US	Transition to 1BwEP-1 "Loss of Reactor or Secondary Coolant" Direct actions of 1BwEP-1
		NOTE: With cooldown an RED/ORANGE path may exist for the INTEGRITY CSFST. If so performance of FR-P.1 "Response To Imminent Pressurized Thermal Shock condition" is required.
		FR-P.1 ACTIONS
	US	Direct action of 1BwFR-P.1 "Response to imminent Pressurized Thermal Shock Condition".

Comments: _____

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Time	Position	Applicant's Actions or Behavior
	RO	Check RCS pressure > 325 psig (Will not be) Transition to procedure & step in effect
	US	Transition to 1BwEP-1 "Loss of Reactor or Secondary Coolant"
	US	Direct actions of 1BwEP-1
	CREW	Check Status of RCPs <ul style="list-style-type: none"> None running
	BOP	Check SG secondary boundaries intact <ul style="list-style-type: none"> Check pressure in all SGs <ul style="list-style-type: none"> No SG pressure decreasing in uncontrolled manner No SG completely depressurized Check intact SG levels <ul style="list-style-type: none"> Narrow range levels > 10% (31%). If not flow is maintain > 500 gpm Control feed flow to maintain intact SG levels between 10% (31%) and 50% Check narrow range levels NOT increasing in an uncontrolled manner.
	CREW	Check secondary radiation trends normal <ul style="list-style-type: none"> SJAE GS exhaust 1PR27J Grid 1 1PS027 SG Blowdown 1PR08J Grid 1 1PS108 Main Steam: 1RT-AR022 & 1RRT-AR023 for each SG, Grid 1 4AA122/123, 4AB222/223, 4AC322/323, 4AD422/423 Main Steam Penetration 1A/1D 1RT-AR024 Grid 4 4AA124 Main Steam Penetration 1B/1C 1RT-AR024 Grid 4 4AB124
	RO	Check PZR PORVs <ul style="list-style-type: none"> Power to PORV Isol valves 1RY8000A/B energized

Comments: _____

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Time	Position	Applicant's Actions or Behavior
		<ul style="list-style-type: none"> PORVs RY455A & RY456 CLOSED At least ONE PORV Block valve RY8000A OR RY8000B OPEN
	CREW	Check if ECCS flow should be reduced <ul style="list-style-type: none"> RCS Subcooling acceptable Iconic Display OR <ul style="list-style-type: none"> ATTACHMENT A, FIGURE 1BwEP 1-1 Secondary heat sink <ul style="list-style-type: none"> Total feed flow to SGs > 500 gpm OR <ul style="list-style-type: none"> NR level in at least ONE intact SG > 10% (31%) RCS Pressure stable or increasing PZR level >12% (28%) Determine ECCS reduction criteria NOT met (subcooling likely)
	CREW	Check if CNMT Spray should be stopped <ul style="list-style-type: none"> CS Pumps running Reset CS signal When Spray Additive tank LO-2 level lights LIT, close eductor spray additive valves 1CS019A/B When CNMT pressure is < 15 psig AND CS has operated for at least 2 hours, continue with steps to secure CS
	RO	Check if 1B RH Pump should be stopped <ul style="list-style-type: none"> Reset SI Depress BOTH SI RESET pushbuttons Verify SI ACTUATED permissive light NOT lit

Comments: _____

Scenario No: Spare		Event No. 5, 6, 7, and 8
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Time	Position	Applicant's Actions or Behavior
		<ul style="list-style-type: none"> Verify AUTO SI BLOCK permissive light LIT Determine 1B RH pump should NOT be stopped with RCS pressure < 325 psig
	CREW	Check RCS and SG Pressures for Faulted SG Indications <ul style="list-style-type: none"> Verify pressure in all SGs stable or increasing Pressure in RCS stable or decreasing
	BOP	Check if DG should be stopped <ul style="list-style-type: none"> ESF and Non-ESF Busses power by Offsite Stop 1A DG per 1BwOP DG-12
	CREW	Evaluate plant status <ul style="list-style-type: none"> Verify Cold Leg Recirc capability Check Aux Building Radiation monitors Reset Containment Isolation Phase A if necessary Place H2 monitors in service per 1BwOP PS-9 Obtain samples <ul style="list-style-type: none"> RCS activity and boron concentration Containment sump and atmosphere Evaluate plant equipment Trip all Heater Drain Pumps Shutdown Feedwater pumps, Condensate pumps and Circulating Water Pumps Shutdown chiller on non-operating VC train
	RO	<ul style="list-style-type: none"> Check if RCS cooldown and depressurization required <ul style="list-style-type: none"> RCS pressure > 325 psig If NOT check RHR flow > 1000 gpm <ul style="list-style-type: none"> When RWST level < 46% for transition to ES-1.3

Comments: _____

Scenario No: Spare		Event No. 5, 6, 7, and 8
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Time	Position	Applicant's Actions or Behavior
	US	Transition to 1BwEP ES-1.3 "TRANSFER TO COLD LEG RECIRCULATION"
	US	Direct actions of 1BwEP ES-1.3
	CREW	Establish CC flow to RH HX OPEN CC to RH HX isol valves <ul style="list-style-type: none"> • ICC9412A • ICC9412B Check CC to RH HX flows > 5000 gpm on 1FI0689/0688 Check adequate CNMT sump level <ul style="list-style-type: none"> • Check CNMT FLOOR LEVEL at least 8 (13) inches.
	CREW	Align RH pumps suction to CNMT sumps <ul style="list-style-type: none"> • Verify both RH pumps running – 1A Pump not running • Close 1SI8812A • Check CNMT sump isol valves 1SI8811A and 1SI 8811B open Determine SI8811B NOT open
	US	Direct actions of ATTACHMENT A
	CREW	Check if RH Pump 1A Need to be Aligned to Containment Sump <ul style="list-style-type: none"> • 1SI8811A open o Close 1SI8812A (RWST) Check if RH Pump 1B Need to be Aligned to Containment Sump

Comments: _____

Scenario No: Spare		Event No. 5, 6, 7, and 8
Event Description:		<p>EHC System leak resulting in turbine trip and reactor trip (5). Upon reactor trip a large break LOCA will occur (6). 1A and 1B RH pumps fail to start w/1A pump failure to manually start (7). Upon LO-2 condition in RWST, SI8811B will fail to auto open (8).</p>
Time	Position	Applicant's Actions or Behavior
		<ul style="list-style-type: none"> • 1SI8811B closed <p>Check Train B Recirc Flowpath From Cnmt Sump Available</p> <ul style="list-style-type: none"> • RH Pump 1B running • Train B valve 1SI8811B energized <p>Manually Align RH Pump 1B Suction to Cnmt Sump</p> <ul style="list-style-type: none"> • Place RH pump 1B in PULL OUT • Close RH pump 1B RWST suction valve 1SI8812B • Place CS pump 1B in PULL OUT • Close CS pump 1B RWST suction valve 1CS001B • Open RH pump 1B CNMT sump isol valve 1SI8811B • Restart RH Pump 1B • Reopen CS pump 1B RWST suction valve 1CS001B • Restart CS pump 1B <p>Check at least one CNMT sump recirc flowpath established</p> <ul style="list-style-type: none"> • RH Pump 1B running • CNMT sump isol 1SI8811B open
	US/ CREW	<p>Transition back to main body step 3.c</p> <ul style="list-style-type: none"> • Close 1SI8812A • Close 1SI8812B
	CREW	<p>Check SI & CENT CHG Pumps in ECCS Injection Mode</p> <ul style="list-style-type: none"> • Any SI pump running <p>OR</p> <ul style="list-style-type: none"> • Any CENT CHG pumps to cold legs injection isol valves 1SI8801A/B open

Comments: _____

Scenario No: Spare		Event No. 5, 6, 7, and 8
Event Description: EHC System leak resulting in turbine trip and reactor trip (5). Upon reactor trip a large break LOCA will occur (6). 1A and 1B RH pumps fail to start w/1A pump failure to manually start (7). Upon LO-2 condition in RWST, SI8811B will fail to auto open (8).		
Time	Position	Applicant's Actions or Behavior
	[CT] ES-1.3-A	Align SI & CENT CHG Pumps for Cold Leg Recirculation <ul style="list-style-type: none"> Dispatch operators to energize <ul style="list-style-type: none"> 1SI8813 (MCC 132X4A L3) MRF ED072B CLOSE 1SI8806 (MCC 131X1A P3) MRF ED055E CLOSE Verify CENT CHG Pump Miniflow Isol Valves closed <ul style="list-style-type: none"> 1CV8111, 1CV8114 1CV8110 and 1CV8116 Close SI Pump Miniflow Isol Valves <ul style="list-style-type: none"> 1SI8814 1SI8920 1SI8813 Close RH HX discharge crosstie valves 1RH8716A and 1RH8716B <ul style="list-style-type: none"> OPEN SI & CENT CHG pumps suction header crosstie valves 1SI8807A, 1SI8807B and 1SI8924 Check RH pump 1A running – NOT Running Check RH pump 1B running Open RH HX to SI pumps isol valve 1SI8804B Start SI and CENT CHG pumps as necessary
	CREW	Reset SI <ul style="list-style-type: none"> Depress both SI RESET pushbuttons Verify SI ACTUATED permissive light NOT lit Verify AUTO SI BLOCKED permissive light LIT

Comments: _____

Scenario No: Spare		Event No. 5, 6, 7, and 8
Event Description:		<p>EHC System leak resulting in turbine trip and reactor trip (5).</p> <p>Upon reactor trip a large break LOCA will occur (6).</p> <p>1A and 1B RH pumps fail to start w/1A pump failure to manually start (7).</p> <p>Upon LO-2 condition in RWST, SI8811B will fail to auto open (8).</p>
Time	Position	Applicant's Actions or Behavior
	CREW	<p>Isolate RWST from SI and CENT CHG pumps</p> <ul style="list-style-type: none"> • Check RH to SI and Cent Chg Pumps Isol Vlvs – at least one open 1CV8804A 1SI8804B • Close SI pump suction from RWST isol valve 1SI8806 when power is restored • Close RWST to CENT CHG pumps suction valves 1CV112D and 1CV112E • Dispatch operator to deenergize RWST to CENT CHG pumps valves <ul style="list-style-type: none"> • 1CV112D - MCC 131X1 K4 MRF ED053O OPEN • 1CV112E - MCC 132X4 C2 MRF ED071J OPEN
		NOTE: Following the alignment of ECCS for cold leg recirculation, the scenario can be terminated.

Comments: _____
