Vermont Yankee 2007 NRC Scenario #1

The plant is initially operating at 90% power. The crew will perform weekly remote testing of the turbine oil pumps IAW OP 4160. Immediately after testing of the turbine oil pumps, the crew will restore power to 100% IAW OP 0105 via recirculation flow.

As the power ascension continues, the crew will be evaluated responding to a loss of a Circ Water pump. ACRO must start spare pump before vacuum degrades to a critical value requiring a power reduction.

As the power ascension continues, the crew will be evaluated responding to a fault on Bus 89B. After reviewing TS, a 7 day LCO will be entered.

After the Tech Spec have been addressed, the operating CRD pump will trip requiring the CRS to enter and direct actions IAW ON 3145. The B CRD pump will be started.

Once the standby CRD pump is started, control rod 18-31 will drift outward. The crew will respond IAW OT 3167 (Control Rod Drift) and OT 3110 (Positive Reactivity Addition). The crew will manually scram and electrically disarm the drifting control rod.

After the control rod has been scrammed and electrically disarmed, the crew will respond to an inadvertent HPCI initiation. HPCI will be inhibited, and a Tech Spec LCO will be entered. Also, an AP-0156 NRC 50.72 notification will be evaluated.

After HPCI is declared inoperable, the crew will respond to a loss of offsite power and the resulting loss of high pressure feed. This will require entry into OT 3122, LNP and OT 3100, Reactor Scram. Following the scram and loss of offsite power, an attempt will be made to feed with RCIC. At this point a leak will result in the inability to restore level with RCIC alone and HPCI will be started (must be taken out of inhibit). HPCI will fail to inject automatically due to a failure of the HPCI flow controller. The HPCI flow controller must be placed in manual to establish HPCI injection. EOP-1 will be entered.

After level is being restored in manual, , HPCI will trip. Actions will continue to be directed per EOP-1, and EOP-3 will be entered to combat the Recirc leak in the containment. Level will continue to lower, and before RPV level lowers to minus 19 inches, emergency depressurization will be required **(Critical Task)**. As depressurization progresses, the available ECCS injection valves will fail to open automatically when the low pressure permissive is reached. Operator action will be required to manually open the valves and establish ECCS injection **(Critical Task)**.

Critical tasks are to emergency depressurize before RPV level lowers to minus 19 inches and to manually open the low pressure ECCS injection valves within 1 minute of reaching valve open permissive pressure.

SIMULATOR EVALUATION GUIDE

Evaluators:

_____

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_____

_____

_____
Senior Management Observer

Crew: _____

SM _____

CRS _____

CRO _____

BOP _____

STA _____

Critical Task Performance: SAT UNSAT
(Circle One)

Lead Evaluator: _____
Signature

Date Administered: _____

Activity Code: _____

Prepared by: _____ Date: _____

Reviewed by: _____ Date: _____

Approved by: _____ Date: _____

CREW BRIEF:

-Power level: 90

-Rod Sequence: Rapid Shutdown Sequence Latched (MOC) **-Rod Group:** 23

-Equipment out of service and/or tagged or abnormalities:

1. Annunciator 4-J-6 RWCU DRAIN LINE PRESS HI/LO due to leakage past PCV-55.

-Reason For Equipment out of Service or tagged:

1.

-Applicable Tech Spec LCOs:

ORAM Sentinel Color:

Green

-Plant evolutions in progress/Scheduled Shift Evolutions:

1. Perform weekly remote testing of turbine oil pumps per OP-4160.
2. Power Ascension to 100% with recirculation flow (RE guidance).

SCENARIO SUMMARY:

The plant is initially operating at 90% power. The crew will perform weekly remote testing of the turbine oil pumps IAW OP 4160. Immediately after testing of the turbine oil pumps, the crew will restore power to 100% IAW OP 0105 via recirculation flow.

As the power ascension continues, the crew will be evaluated responding to a loss of a Circ Water pump. ACRO must start spare pump before vacuum degrades to a critical value requiring a power reduction.

As the power ascension continues, the crew will be evaluated responding to a fault on Bus 89B. After reviewing TS, a 7 day LCO will be entered.

After the Tech Spec have been addressed, the operating CRD pump will trip requiring the CRS to enter and direct actions IAW ON 3145. The B CRD pump will be started.

Once the standby CRD pump is started, control rod 18-31 will drift outward. The crew will respond IAW OT 3167 (Control Rod Drift) and OT 3110 (Positive Reactivity Addition). The crew will manually scram and electrically disarm the drifting control rod.

After the control rod has been scrammed and electrically disarmed, the crew will respond to an inadvertent HPCI initiation. HPCI will be inhibited, and a Tech Spec LCO will be entered. Also, an AP-0156 NRC 50.72 notification will be evaluated.

After HPCI is declared inoperable, the crew will respond to a loss of offsite power and the resulting loss of high pressure feed. This will require entry into OT 3122, LNP and OT 3100, Reactor Scram. Following the scram and loss of offsite power, an attempt will be made to feed with RCIC. At this point a leak will result in the inability to restore level with RCIC alone and HPCI will be started (must be taken out of inhibit). HPCI will fail to inject automatically due to a failure of the HPCI flow controller. The HPCI flow controller must be placed in manual to establish HPCI injection. EOP-1 will be entered.

After level is being restored in manual, , HPCI will trip. Actions will continue to be directed per EOP-1, and EOP-3 will be entered to combat the Recirc leak in the containment. Level will continue to lower, and before RPV level lowers to minus 19 inches, emergency depressurization will be required **(Critical Task)**. As depressurization progresses, the available ECCS injection valves will fail to open automatically when the low pressure permissive is reached. Operator action will be required to manually open the valves and establish ECCS injection **(Critical Task)**.

Critical tasks are to emergency depressurize before RPV level lowers to minus 19 inches and to manually open the low pressure ECCS injection valves within 1 minute of reaching valve open permissive pressure.

TERMINATING CONDITION(S):

1. Once the SRV's are opened and the crew has demonstrated that they can monitor and control level during an RPV-ED, the scenario may be terminated at the discretion of the Lead Evaluator.

REFERENCES:

1.
2.
3.
4.
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10.
11.

SIMULATOR OPERATOR INSTRUCTIONS

Simulator Set Up:

1. IC-801

Discretionary Distracter Malfunctions/RFs/IOs:

1. rfNM_72 APRM "B" Gain Adjust @ 1.19 (clears the high APRM GAF that was high at 1.006)

No.	MF/RF/IO #	Severity	Ramp	REM #	Act. Time	Description
1.	mfED_19B			1		Loss of Bus 89B
2.	mfMC_01B			2		Circ Water "B" Pump Trip
3.	mfRD_01A			3		CRD "A" Pump Trip
4.	mfRD_051831	100%		4		CRD 18-31 drift out
5.	mfHP_03			5		HPCI Inadvertent Initiation
6.	mfED_17			6		Loss of Offsite Power
7.	mfHP_04	0%		7		HPCI Flow Controller Failure
8.	mfRR_01A	.7%	300sec	8		Recirc Loop A Discharge Rupture
9.	mfHP_01			9		HPCI Turbine Trip
10.	mfCS_03A			Pre-insert		CS-12A Fail to Auto Open
11.	mfCS_03B			Pre-insert		CS-12B Fail to Auto Open
12.	mfRH_07A			Pre-insert		RHR-27A Fail to Auto Open
13.						
14.						
15.						

SIMULATOR OPERATOR INSTRUCTIONS
(Continued)

Additional Instructions:

1. When/if contacted to investigate the loss of MCC-89B, acknowledge then report there is an electrical fault on the bus and no other sources of power (maintenance tie) should be brought on. Additional troubleshooting is required to determine the cause and extent.

2. When/if contacted to investigate the loss of "B" CW Pump, acknowledge then give a follow-up report that there is no apparent cause and Electrical Maintenance will continue to troubleshoot.

3. When/if contacted to investigate the loss of the "A" CRD Pump, acknowledge then give a report that there was an overcurrent device activation (50) on phase "C". The cause is unknown and Electrical Maintenance is continuing to troubleshoot.

4. When asked to place secure seal purge following the pump trip, insert: rfRD_11 and rfRD_12 to 0 gpm.

5. When asked to place seal purge back in service following the pump start, insert: rfRD_11 and rfRD_12 to 3 gpm.

6. When/if contacted to investigate the inadvertent initiation of HPCI, acknowledge then give a follow-up report that there was an electrical short in the Rx Low-Low Level sensing circuit (K1&K2 relays) energized. If asked, these relays affect HPCI only, but that you follow-up on this to make sure.

7. The sequence of events post scram will be at the discretion of the Lead Evaluator based on the crew level mitigation strategy. If the crew elects to start RCIC, the most likely sequence of events will be key 8, then key 7, and lastly key 9.

OPERATOR ACTIONS
EVENT NUMBER 1

Crew Task Description:

Weekly Remote Testing of Turbine Oil Pumps per OP-4160.

STEP	POS.	CANDIDATE ACTIONS/BEHAVIOR	S	U	N/O	COMMENTS
	CRS	Direct Turbine Pump Performance IAW OP 4160 Section B.				
	BOP	Performs OP 4160 Section III. Steps 1.a thru 1.f				
EXAMINER'S NOTE: SEE ATTACHED COPY OF PROCEDURE FOR SPECIFIC STEP DETAIL.						

NOTES:

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

2) * = Critical Task/Step

OPERATOR ACTIONS
EVENT NUMBER 2

Crew Task Description:

Power Ascension IAW OP 0105

STEP	POS.	CANDIDATE ACTIONS/BEHAVIOR	S	U	N/O	COMMENTS
	CRS	Directs Power Increase IAW OP-0105 With recirc flow				
	CRO	Increase recirc flow with "master recirc flow controller" @ 1% per 3 minutes				
	CRO	Monitors power, pressure, level.				
NOTE:						

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2) * = Critical Task/Step

OPERATOR ACTIONS
EVENT NUMBER 3 & 4

Crew Task Description:

Respond to a Loss of Bus 89B; Loss of Circ Water

STEP	POS.	CANDIDATE ACTIONS/BEHAVIOR	S	U	N/O	COMMENTS
	CREW	Recognize a loss of Bus 89B power.				
	CRS	Enter and direct actions IAW OP 2143 and ARS.				
	CRS	Direct maintenance to investigate the loss of MCC 89B.				
	SM/CRS	Review Tech Specs and determine per 3.10.B.4 and 3.5.A.4 enter a 7-day LCO for "B" LPCI.				
	CRS	Direct AO to document indicating lights at RUPS 1B and MCC 89B per OP 2143.				
	CRS	Conduct a shift brief				
	CREW	Recognize a loss of Circ Water Pump 'B'.				
	BOP	Enter ARS 6-B-2 for loss of the pump.				
	CRS	Directs contacting maintenance due to pump trip and auxiliary operator to investigate locally.				
	CRS	Conduct a shift brief.				

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2) * = Critical Task/Step

OPERATOR ACTIONS
EVENT NUMBER 5

Crew Task Description:

CRD Pump A Trips (ON)

STEP	POS.	CANDIDATE ACTIONS/BEHAVIOR	S	U	N/O	COMMENTS
	CREW	Recognizes Trip of 'A' CRD pump.				
	CRS	Directs actions ON 3145 -Step 2 immediately stop 'B' RWCU -Step 4 – start Alternate CRD pump -seal purge must be secured when >2 minutes Directs AO and maintenance to investigate.				
NOTE:		**SEE Attached copy of ON 3145 for specific steps.**				
	CRO	References ON 3145 -Takes action to stop RWCU pump 'B'. - Starts 'B' CRD pump per ON 3145 - Takes action to isolate seal purge				
	CREW	Recognizes the following alarms are in due to excessive drywell cooling due to loss of RWCU heat loads: 5-G-1 – DW Pressure HI/LO 5-G-3 – DW Pressure Low				
NOTE:		**Operator will open 156-3 IAW ARS to clear alarms.**				

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2) * = Critical Task/Step

OPERATOR ACTIONS
EVENT NUMBER 6

Crew Task Description:

Control Rod 18-31 Drifts Outward (OT)

STEP	POS.	CANDIDATE ACTIONS/BEHAVIOR	S	U	N/O	COMMENTS
	CREW	Acknowledge/respond to Rod Drift annunciator (5-D-5); inform CRS.				
	CRO	Identify rod 18-31 as drifting rod; inform CRS.				
	CRS	• Enter and direct actions IAW OT 3167 (Control Rod Drift): • Observe drive water flow indication FI-3-305 • Select rod 18-31 and attempt to insert ONCE to original position.				

		When directed:
		• Observe drive water flow indication FI-3-305
		  • Select rod 18-31 and attempt to insert ONCE to original position
		  • Identify that rod continues to drift outward when insert signal removed; inform CRS				

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2) * = Critical Task/Step

STEP	POS.	CANDIDATE ACTIONS/BEHAVIOR	S	U	N/O	COMMENTS
		Direct the following IAW OT 3167 and OT 3110 (Positive Reactivity Insertion): • Manually scram rod 18-31. • Reduce Recirc flow to 27.5 – 29 Mlb/hr at a rate not to exceed 10% / minute. • Notify Reactor Engineering. • Attempt to determine if cause of control rod drift is a stuck collet. • Consult OT 3166 (Mispositioned Control Rod).				
	BOP	When directed, manually scram rod 18-31.				
	CRO	When directed, reduce Recirc flow to 27.5 – 29 Mlb/hr at a rate not to exceed 10% / minute.				
	CREW	When directed, notify Reactor Engineering of Rod 18-31 drift.				
	CRS	Conduct a crew brief.				

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2) * = Critical Task/Step

OPERATOR ACTIONS
EVENT NUMBER 7

Crew Task Description:

Inadvertent HPCI Initiation (TS)

STEP	POS.	CANDIDATE ACTIONS/BEHAVIOR	S	U	N/O	COMMENTS
	CREW	Recognize and inform the CRS of a HPCI initiation.				
	CRS	Enters OT 3110 – Positive Reactivity Insertion, Step 2.F.				
NOTE:		**See Attached OT 3110.**				
	BOP	Confirm no initiation signals present. (Two indications at least).				
	CRS	Directs that HPCI be secured (trip or inhibit) per Step 4. May direct opening SGT 1A & 1B due to auto start of SBGT per OP 2117.				
	BOP	Places Auto/Inhibit switch to Inhibit. May open SGT 1A & 1B per CRS direction.				
	CRS	Consult Tech Specs and determine that a 14-day LCO condition has been met per 3.5.E.2. OT 3110 - Step 9.Contacts RE Consult AP-0156 and determine that an 8 hour notification is required for spurious activation of an ECCS System [50.72 (b)(3)(iv)(4)].				
	CRS	Brief the crew.				

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2) * = Critical Task/Step

OPERATOR ACTIONS

EVENT NUMBER 8

Crew Task Description:

Loss of Offsite Power

STEP	POS.	CANDIDATE ACTIONS/BEHAVIOR	S	U	N/O	COMMENTS
	CRO	Report reactor scram.				
	CREW	Recognize and inform CRS of Loss of Off Site Power.				
		• Report power on buses 3, 4, 8, 9 from the Diesels.				
	CRO	Report feed and condensate are unavailable.				
	CRS	Enter and direct actions IAW OT 3122, LNP				
	CREW	Respond to LNP IAW OT 3122.				
		• Verify both DGs start and power buses.				
		• Verify SW pumps start.				
		• Restart station AC A & B.				
	CRS	Enter and direct crew actions IAW OT 3100, Rx Scram and EOP-1, RPV Control.				
	CRO	• Verify all rods fully inserted.				
		• When steam flow < 0.5 Mlbm/hr per steamline, place the mode switch in S/D.				
NOTE:		**THIS STEP IS AN Immediate Action, and may be performed without direction.**				
	CRO	Insert IRMs and SRMs.				
	CRS	Direct reactor water level maintained 127" - 177" using RCIC initially/ then HPCI as needed (must take out of INHIBIT).				
		Direct pressure maintained 800 – 1000 psig using SRVs/HPCI.				

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All Unsatisfactory ratings require comments; a comment sheet is attached.

2) * = Critical Task/Step

STEP	POS.	CANDIDATE ACTIONS/BEHAVIOR	S	U	N/O	COMMENTS
	BOP	Maintain RPV level as directed with RCIC initially. HPCI (must be taken out of inhibit). NOTE: HPCI cannot be used for pressure control until/unless lo lo level signal is bypassed.				
	CREW	Verify Table A: ECCS/PCIS actuations.				

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2) * = Critical Task/Step

OPERATOR ACTIONS
EVENT NUMBER 9, 10, & 11

Crew Task Description:

HPCI Flow Controller Failure; Recirc Loop Rupture (0.6% Over 600 Sec.); HPCI Trip; RPV-ED on Low Level; CS-12A and CS-12B Failure to Auto Open, RHR 27A Failure to Auto Open

STEP	POS.	CANDIDATE ACTIONS/BEHAVIOR	S	U	N/O	COMMENTS
	BOP	Report HPCI is not working in automatic and swaps controller to manual. (Controller has failed low in auto).				
	BOP	Reports HPCI trips. (the trip will be inserted after level control is established in manual).				
	CREW	Direct AO/ maintenance to investigate HPCI trip				
	CRS	Direct RPV level maintained between 6 inches (TAF) and 177 inches by maximizing CRD flow				
	CRO	Maximize available CRD flow				
	CREW	Report increasing drywell pressure.				
	CRS	Enter EOP-3 on High Drywell Pressure.				
	CRS	Direct BOP to restart drywell RRU's.				
	BOP	Restart drywell RRU's.				
	CRS	Before torus pressure reaches 10 psig, direct torus spray				
	BOP	Sprays the torus, as directed.				
	CRS	When torus pressure exceeds 10 psig:				
		• Verify drywell pressure and temperature in the safe region of the DWSIL graph.				
		• Verify drywell RRUs secured.				
		• Direct drywell sprays.				
	BOP	Secure drywell RRUs.				

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All Unsatisfactory ratings require comments; a comment sheet is attached.

2) * = Critical Task/Step

STEP	POS.	CANDIDATE ACTIONS/BEHAVIOR	S	U	N/O	COMMENTS
	BOP	Spray the drywell as directed. NOTE: May throttle open full flow test valve to control flow as DW pressure degrades.				
	CRS	When ADS timer initiated, direct ADS inhibited.				
	BOP	Inhibit ADS as directed.				
	CRS	Direct SLC for reactor water level control.				
	CRS	Direct RPV level maintained between 6 inches (TAF) and 177 inches				
	CRO	Inject SLC, as directed.				
	CREW	Report level approaching 6".				
	CRS	When RPV level cannot be maintained above 6", direct/verify at least 2 injection subsystems lined up for injection.				
	BOP/CRO	Lineup ECCS systems as directed.				
	***CREW** **EOP-1** **CT-1**	**With the reactor shutdown and reactor pressure greater than the shutoff head of the low pressure systems, initiate RPV-ED BEFORE RPV level reaches –19 inches.**				
		Standard:				
		Initiate RPV-ED (begin opening valves) BEFORE RPV level reaches – 48 inches				
	CREW	Inform CRS when level reaches 6".				
	CRS	Before level reaches – 19 inches, enter and direct crew actions IAW EOP-5 RPV-ED.				
	CRS	Direct all SRVs opened.				
	CRO/BOP	When directed, place all SRV control switches to open. Inform CRS that all SRVs are open.				

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All Unsatisfactory ratings require comments; a comment sheet is attached.

2) * = Critical Task/Step

STEP	POS.	CANDIDATE ACTIONS/BEHAVIOR	S	U	N/O	COMMENTS
	***CREW** **EOP-1** **CT-2**	**Action is taken to restore RPV water level above –19 inches by operating available low pressure ECCS system(s) when RPV pressure decreases below the shutoff head of the low pressure systems.** **Standard:** • At least 2 ECCS pumps are lined up for injection and running prior to RPV pressure reaching the injection valve open permissive pressure. • No pumps are secured until adequate core cooling is assured.				
		• Initiate manual opening of injection valves once valve open permissive pressure is reached.				
	CREW	Continue to monitor and report RPV Level and Pressure decrease.				
	CREW	Report failure of RHR-27A, CS-12A and CS-12B to AUTO open.				
	CRS	Direct RHR and CS injection valves opened. At 350 psig directs crew to monitor RPV level on the shroud level instruments.				
	BOP	Manually open RHR-27A, CS-12A and CS-12B as directed.				
	CRS	Direct CRO/BOP to ensure adequate core cooling and restore water level to 127-177 (shrouds at 350 psig).				
	CREW	Verify adequate core cooling and level rising.				
EXAMINER'S NOTE:		**Adequate core cooling is reactor level > -19" or reactor level > -48" with CS 'A' or CS 'B' flow > 3250 gpm**				
	CRS	As necessary, prevent injection from Core Spray and RHR Pumps not required to assure adequate core cooling.				

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All Unsatisfactory ratings require comments; a comment sheet is attached.

2) * = Critical Task/Step

STEP	POS.	CANDIDATE ACTIONS/BEHAVIOR	S	U	N/O	COMMENTS
	BOP/CRO	When directed, prevent injection from Core Spray and RHR Pumps not required to assure adequate core cooling.				
EXAMINER'S NOTE:		**AT THIS POINT SCENARIO MAY BE TERMINATED AT EXAMINER'S DISCRETION.**				

NOTES:

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All Unsatisfactory ratings require comments; a comment sheet is attached.

2) * = Critical Task/Step

OPERATOR ACTIONS

ADDITIONAL COMMENTS:

NOTES:

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

2) * = Critical Task/Step

Vermont Yankee 2007 NRC Scenario #2

After the crew places Circ Water in Closed Cycle for chlorination, a reactor power reduction will commence in preparation for a control rod pattern adjustment.

As the power reduction continues, a feedwater regulating valve lockup will occur, requiring the crew to enter OT-3114 and initially take manual control of feedwater in order to recover and stabilize RPV level. A loose airline fitting will be repaired and the FRV can be returned to automatic.

After RPV water has been stabilized in manual, APRM A will fail downscale. The crew will take actions in accordance with the ARS, and with APRM C previously inoperable and bypassed, a Tech Spec LCO will be entered.

After Techs Specs have been addressed for the APRM failure, the crew will respond to a loss of Bus 8. SBGT will fail to auto-initiate upon receipt of the Group III isolation signal. The crew will backup the Group III isolation and initiate SBGT. Review of Tech Specs will reveal an LCO due to inadequate RHR Torus cooling/spray capability.

Following the Loss of bus 8, a faulty EPR will cause pressure oscillations. The crew will respond IAW OT 3115 (Reactor Pressure Transients) to take control of pressure with the MPR and place the EPR in cutout.

Once pressure control has been transferred to the MPR and restored to its pre-transient value, a leaking SRV will begin adding heat and inventory to the Torus. The crew will respond in accordance with OT 3121 (Inadvertent Opening of a Relief Valve), and EOP-3 (due to rising Torus volume, drywell pressure, and Torus temperature). The fault with the RHR-39A valve, combined with the loss of Bus 8, will result in an inability to initiate Torus cooling. The crew will attempt manual manipulation of the required valves. As Torus volume, pressure, and temperature rise, conditions will deteriorate to the point where a reactor scram is required. The manual scram will fail, requiring initiation of ARI/RPT to insert the control rods **(Critical Task)**.

When ARI is initiated, some rod movement will occur; however, ATWS conditions will remain due to hydraulic lock on the scram discharge volume. The crew will be evaluated controlling and shutting down the plant in accordance with EOP-1 and EOP-2. After SLC has been initiated (**Critical Task**) and has been running for several minutes, the A SLC pump will trip. Alternate means to insert control rods are required to shutdown the reactor The crew will inhibit auto ADS initiation **(Critical Task)** and terminate and prevent injection as required by EOP-2 **(Critical Task)**. Additional EOP-2 actions to reduce reactor power via control rod insertion and lowering RPV level will also be required. EOP -3 actions to control Drywell and Torus parameters will continue throughout the ATWS event.

Critical tasks are to actuate the ARI/RPT logic and ensure that the Recirc drive motor breakers are tripped within 2 minutes of the scram failure, to inhibit ADS prior to automatic initiation, to terminate and prevent injection as required by EOP-2, and to initiate SLC injection.

SIMULATOR EVALUATION GUIDE

Evaluators:

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_____
Senior Management Observer

Crew: _____

SM _____

CRS _____

CRO _____

BOP _____

STA _____

Critical Task Performance: SAT UNSAT
(Circle One)

Lead Evaluator: _____
Signature

Date Administered: _____

Activity Code: _____

Prepared by: _____ Date: _____

Reviewed by: _____ Date: _____

Approved by: _____ Date: _____

CREW BRIEF:

-Power level: 100

-Rod Sequence: Rapid Shutdown Sequence Latched (EOC) **-Rod Group:** 54

-Equipment out of service and/or tagged or abnormalities:

1. APRM C
2. RHR-39A motor actuator repair
3. Annunciator 4-J-6 RWCU DRAIN LINE PRESS HI/LO due to leakage past PCV-55.

-Reason For Equipment out of Service or tagged:

1. Inability to adjust gain-I&C troubleshooting in progress.

-Applicable Tech Spec LCOs:

1. TS 3.5.B.1 (RHR Subsystem "A" for containment pressure control)
2. TS Table 3.1.1, TRM Table 3.2.5 (Tracking LCO on "C" APRM)

ORAM Sentinel Color:

Orange

-Plant evolutions in progress/Scheduled Shift Evolutions:

1. Place CW in closed cycle for chlorination.
2. Reduce power in preparation for control rod pattern adjustment. Per RE Guidance, the Rapid Shutdown Sequence will be used to reduce power to 80-85%.

SCENARIO SUMMARY:

After the crew places Circ Water in Closed Cycle for chlorination, a reactor power reduction will commence in preparation for a control rod pattern adjustment.

As the power reduction continues, a feedwater regulating valve lockup will occur, requiring the crew to enter OT-3114 and initially take manual control of feedwater in order to recover and stabilize RPV level. A loose airline fitting will be repaired and the FRV can be returned to automatic.

After RPV water has been stabilized in manual, APRM A will fail downscale. The crew will take actions in accordance with the ARS, and with APRM C previously inoperable and bypassed, a Tech Spec LCO will be entered.

After Techs Specs have been addressed for the APRM failure, the crew will respond to a loss of Bus 8. SBGT will fail to auto-initiate upon receipt of the Group III isolation signal. The crew will backup the Group III isolation and initiate SBGT. Review of Tech Specs will reveal an LCO due to inadequate RHR Torus cooling/spray capability.

Following the Loss of bus 8, a faulty EPR will cause pressure oscillations. The crew will respond IAW OT 3115 (Reactor Pressure Transients) to take control of pressure with the MPR and place the EPR in cutout.

Once pressure control has been transferred to the MPR and restored to its pre-transient value, a leaking SRV will begin adding heat and inventory to the Torus. The crew will respond in accordance with OT 3121 (Inadvertent Opening of a Relief Valve), and EOP-3 (due to rising Torus volume, drywell pressure, and Torus temperature). The fault with the RHR-39A valve, combined with the loss of Bus 8, will result in an inability to initiate Torus cooling. The crew will attempt manual manipulation of the required valves. As Torus volume, pressure, and temperature rise, conditions will deteriorate to the point where a reactor scram is required. The manual scram will fail, requiring initiation of ARI/RPT to insert the control rods **(Critical Task)**.

When ARI is initiated, some rod movement will occur; however, ATWS conditions will remain due to hydraulic lock on the scram discharge volume. The crew will be evaluated controlling and shutting down the plant in accordance with EOP-1 and EOP-2. After SLC has been initiated (**Critical Task)** and has been running for several minutes, the A SLC pump will trip. Alternate means to insert control rods are required to shutdown the reactor The crew will inhibit auto ADS initiation **(Critical Task)** and terminate and prevent injection as required by EOP-2 **(Critical Task)**. Additional EOP-2 actions to reduce reactor power via control rod insertion and lowering RPV level will also be required. EOP -3 actions to control Drywell and Torus parameters will continue throughout the ATWS event.

Critical tasks are to actuate the ARI/RPT logic and ensure that the Recirc drive motor breakers are tripped within 2 minutes of the scram failure, to inhibit ADS prior to automatic initiation, to terminate and prevent injection as required by EOP-2, and to initiate SLC injection.

TERMINATING CONDITION(S):

1. Once all control rods are inserted and EOP-2 is exited to EOP-1, the scenario may be terminated at the discretion of the Lead Evaluator.

REFERENCES:

1.
2.
3.
4.
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REFERENCES CONTINUED:

12.
13.
14.
15.
16.

SIMULATOR OPERATOR INSTRUCTIONS

Simulator Set Up: 100% Power

1. IC-802

Discretionary Distracter Malfunctions/RFs/IOs:

1. rfNM_71-76 All APRM Gain adjusts made to get APRM GAF's in spec (modeled to the plant at 100%): 71 (1.385), 72 (1.448), 73 (1.378), 74 (1.383), 75 (1.287), 76 (1.375)

No.	MF/RF/IO #	Severity	Ramp	REM #	Act. Time	Description
1.	mfFW_09A			1		Air Loss to FW Reg Vlv "A"
2.	mfNM_05A			2		APRM "A" Failure Downscale
3.	mfED_05C			3		Loss of 480V Bus #8
4.	mfPC_11A			3		SBGT "A" Fan Failure to Auto Start
5.	mfTC_04A	100%		4		Pressure Reg Oscillations (EPR)
6.	mfAD_01B	100%	600sec	5		Relief Valve RV2-71B Leak
7.	mfSL_01A			6		SLC "A" Pump Trip
8.	mfRD_12A	45%		Pre-insert		Partial Scram A
9.	mfRD_12B	55%		Pre-insert		Partial Scram B
10.	mfRP_01B			Pre-insert		Failure to manual scram
11.						
12.						
13.						
14.						
15.						
16.						

SIMULATOR OPERATOR INSTRUCTIONS
(Continued)

Additional Instructions:

1. When/if contacted to investigate the "A" FRV Lockup, acknowledge, and then give report that an instrument air line connection was found leaking and the connection has been tightened. I&C recommends resetting the FRV Lockup. At the time **delete mfFW_09A.**

2. When/if contacted to investigate the "A" APRM downscale failure, acknowledge, and then give report that that there is an electronic failure of the Averaging Amplifier circuit. Time of repair will be unknown and you will follow-up with the control room.

   After the crew discusses Tech Specs and the possibility of inserting a half scram on RPS-A, at the discretion of the Lead Evaluator, **insert Key 3 (Loss of Bus 8)**. This will give a half scram on RPS-A.

3. When/if contacted to investigate the loss of Bus 8, acknowledge, and then give report that there is an electrical fault on Bus 8. **DO NOT** report that you do not recommend cross tying Bus 8 and 9 unless the crew ascertains this and asks.

4. When/if asked to investigate the status of RHR-39A (to be able to spray the torus), report that RHR-39A is still disassembled and that it will not be ready for operation for another 2-3 hours.

5. When/if asked to operate CRD-56 and/or CRD-40/40A, insert the following remote functions as directed: rfRD_02 and rfRD_04 respectfully.

6. Once power is <2%, **insert key 6 ("A" SLC Pump Trip)** at the discretion of the Lead Evaluator.

OPERATOR ACTIONS
EVENT NUMBER 1

Crew Task Description:

Place CW in Closed Cycle for Chlorination

STEP	POS.	CANDIDATE ACTIONS/BEHAVIOR	S	U	N/O	COMMENTS
	CRS	Directs Placing CW in closed Cycle for chlorination.				
	BOP	Procedure OP 2180 Section F. Reviews procedure and checks prereqs.				
	BOP	Ensures all Circ Water & Circ Water Booster Pumps running.				
	BOP	Contacts Chemistry – Are we treating service water at the same time.				
EVALUATOR'S CUE: Report back - not treating SW simultaneously.						
	BOP	Opens Circ Water Recirc Gate >85% by taking "Circ Water Recirc Gate" switch to open, Observes indicator POI-104-3 >85% Observes weir level indicator LI-104-10-1 is < 225'				
	BOP	Calls field operator to throttle valve CW-7.				
EVALUATOR'S CUE: Already throttled.						
	BOP	Closes all intake gates by taking hand switches "Circ Water Intake Gate 1A (1B, 1C)" to close.				
	BOP	Monitors intake level and condenser backpressure.				

NOTES:

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All Unsatisfactory ratings require comments; a comment sheet is attached.

2) * = Critical Task/Step

OPERATOR ACTIONS
EVENT NUMBER 2

Crew Task Description:

Power Reduction IAW OP 0105

STEP	POS.	CANDIDATE ACTIONS/BEHAVIOR	S	U	N/O	COMMENTS
	CRS	Directs power reduction IAW OP-0105 Directs maintaining Rx Pressure 100 to 1006 psig with ER during downpower				
	CUE	Per RE Guidance, the Rapid Shutdown Sequence will be used to reduce power to 80-85%.				
	CRO	Selects Rod 22-19 first Using "Rod Movement Control" switch, insert rod to "00" Monitors four-rod and full core display, monitors power indications , CRD parameters Continues with subsequent control rods. Uses Recirc Flow to further decrease power.				
EVALUATOR'S NOTE:		**May receive alarm 5-E-6 "FW Control System trouble". Due to mismatch of level and setpoint during power reduction. The alarm is expected and will clear.**				
	BOP	Maintains RX Press 100 psig to 1006 psig with EPR as directed by CRS				
EVALUATOR's NOTE:		**GO TO NEXT EVENT AT EXAMINER DISCRETION. DO NOT INSERT NEXT EVENT UNTIL LEVEL STABILIZES.**				

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2) * = Critical Task/Step

OPERATOR ACTIONS
EVENT NUMBER 3

Crew Task Description:

Feedwater Regulating Valve Lockup (OT)

STEP	POS.	CANDIDATE ACTIONS/BEHAVIOR	S	U	N/O	COMMENTS
	CREW	Recognizes "A" FRV Lockup.				
	CRO	Enters ARS 5-E-2				
	CRS	Directs field operator to check problem with "A" FRV. Contacts I&C.				
	CRS CRO	Directs FRV lockup reset per ARS. Attempts to reset FRV lockup by Performing steps 1.b. thru 1.f., Step 1.a.g and h. do not apply. Goes to step 2.				
	CRS	Upon receiving call from the field that an airline connection to the A FRV was found loose and subsequently tightened, CRS directs FRV to be reset per ARS.				
	BOP	Resets FRV lockup				
	CRS	CREW Brief on FRV operation and level control per guidance in OTs and ARS				

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All Unsatisfactory ratings require comments; a comment sheet is attached.

2) * = Critical Task/Step

OPERATOR ACTIONS
EVENT NUMBER 4

Crew Task Description:

APRM A Fails Downscale (TS)

STEP	POS.	CANDIDATE ACTIONS/BEHAVIOR	S	U	N/O	COMMENTS
	CREW	Recognizes Alarm 5-M-4 annunciates APRM Downscale. Also, 5-D-3 for Rod Withdraw Block				
	CRS	Enters TS and Directs contacting I&C. TS Table 3.1.1 , Notes 2 and 3, - 12 hours to put in trip on "A" side.				
	CRO	Review ARS 5-D-3 and 5-M-4 direction: • increased board monitoring • contacts I&C.				
	CRS	Crew Brief.				
Evaluator Note: Sim Booth operator will insert next event prior to the crew inserting a half scram if it is directed by the CRS						

NOTES:

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2) * = Critical Task/Step

OPERATOR ACTIONS
EVENT NUMBER 5

Crew Task Description:

Loss of 480 Volt Bus 8, Failure of SBGT A to Auto Start

STEP	POS.	CANDIDATE ACTIONS/BEHAVIOR	S	U	N/O	COMMENTS
	CREW	Recognize and inform CRS of a loss of 480 volt Bus 8.				
	CRO	Inform CRS of half scram. Report power, pressure, level				
	CREW	Recognize/respond to a Group III isolation and bus loss. Board walkdown to recognize equipment affected • B CS valves • B RHR valves • Drywell RRUs • alarm for seismic panel (in due to power loss, not an actual event)				
	CRS	Direct the following actions: • Backup Group III isolation • Direct call to chemistry for sampling per T.S. 4.6.B.3.b • Direct crew to initiate an investigation into bus loss.				
	BOP	When directed, backup Group III isolation • Recognize failure of the SBGT trains to auto start • Start/align SBGT "A" Inform CRS of failure to auto start.				
EVALUATOR'S NOTE: SBGT "B" powered from Bus 8.						

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All Unsatisfactory ratings require comments; a comment sheet is attached.

2) • = Critical Task/Step

STEP	POS.	CANDIDATE ACTIONS/BEHAVIOR	S	U	N/O	COMMENTS
	CRS	Consult Tech Specs and identify the following: • 24-hour S/D LCOs 3.10.A.3. (Bus Loss) AND • Core Spray and RHR due to loss of valve power 3.5.A.6. • 7 days - -3.7.B.3 (SBGT)				
	CRS	Monitor and control DW pressure rise due to loss of Drywell RRUs and isolation. Direct start of all available Drywell RRUs per OT3111, "High Drywell Pressure". Enter EOP-3 as required due to High Drywell temperature.				
	BOP	Isolates RWCU				
	BOP	Starts available Drywell RRUs.				
	CRS	Direct the CRO to begin preparations for a normal plant S/D per OP 0105.				
	CRS	Provide a crew brief on conditions and shutdown.				
	CRO	When directed, commence preparations to shutdown IAW OP-0105.				

NOTES:

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All Unsatisfactory ratings require comments; a comment sheet is attached.

2) * = Critical Task/Step

OPERATOR ACTIONS
EVENT NUMBER 6

Crew Task Description:

EPR Oscillations (OT)

STEP	POS.	CANDIDATE ACTIONS/BEHAVIOR	S	U	N/O	COMMENTS
	CREW	Recognize oscillating reactor pressure Enters OT 3115.				
	CRO/BOP	Coordinate determination of EPR at fault; inform CRS.				
	CRS	Enter and direct actions IAW OT 3115 (Reactor Pressure Transients): • Place the EPR in CUTOUT • Verify that the MPR has control • Lower MPR setpoint as necessary				
	BOP	When directed: Place the EPR in CUTOUT at peak pressure • Verify that the MPR has control • Lower MPR setpoint as necessary.				
	CRS	Direct BOP to restore pressure to the pre-transient pressure.				
	BOP	When directed, adjust MPR to adjust pressure to pre-transient level.				
	CRS	Direct crew member to contact I&C to check and repair EPR.				
	CREW	When directed, contract I&C, inform them of EPR problem and request repair efforts begin.				
	CRS	Brief the Crew.				
	SM	Direct STA/Crew to begin work on a CR to ensure an Operability Determination is made.				

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All Unsatisfactory ratings require comments; a comment sheet is attached.

2) * = Critical Task/Step

OPERATOR ACTIONS
EVENT NUMBER 7

Crew Task Description:

SRV-71B Leak (OT) Leads to Rx Scram (100% over 600sec)

STEP	POS.	CANDIDATE ACTIONS/BEHAVIOR	S	U	N/O	COMMENTS
	CREW	Recognize the "B" SRV leaking. Enter OT 3121, Inadvertent Opening of SRV.				
	BOP	Using available indications, determine that SRV 71-B is leaking: inform CRS				
	CRS	Enter and direct actions IAW OT 3121 (Inadvertent Opening of a Relief Valve)				
EVALUATOR'S NOTE:		**SRV is part-way open and may be assessed as either OPEN or leaking.**				
EVALUATOR'S NOTE:		**No actions to stop leak will be successful.**				
		• Confirm that an SRV is leaking • Place torus cooling in service				
EVALUATOR'S NOTE:		**Recognize can't place torus cooling in service.**				
		• Inform Operations Manager • Inform System Engineering • Commence plant shutdown IAW OP-0105 • Determine that SRV has no known pilot valve leakage. • Attempt to close valve by cycling control switch from AUTO to OPEN to AUTO (if valve is open enough to indicate it is open and not leaking).				
EVALUATOR'S NOTE:		**(Only if assessed as OPEN.)**				

NOTES:

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All Unsatisfactory ratings require comments; a comment sheet is attached.

2) * = Critical Task/Step

STEP	POS.	CANDIDATE ACTIONS/BEHAVIOR	S	U	N/O	COMMENTS
	BOP	Attempt to cycle "B" SRV; report valve failure to close.				
EVALUATOR'S NOTE: (Only if assessed as OPEN.)						
	CRS	IF the SRV remains OPEN, Place the ADS Appendix R Bypass Switch on CRP 9-3 to BYPASS.				
EVALUATOR'S NOTE: (Only if assessed as OPEN.)						
	BOP	When directed, place the ADS Appendix R Bypass Switch on CRP 9-3 to BYPASS.				
EVALUATOR'S NOTE: (Only if assessed as OPEN.)						
	CRS	If core flow is greater than 29 Mlbm/Hr then reduce reactor power ≤ 10% RTP/min using recirc flow until core flow is 27.5 to 29 Mlbm/Hr.				
EVALUATOR'S NOTE: (Only if assessed as OPEN.)						
	CRO	When directed, reduce reactor power ≤ 10% RTP/min using recirc flow until core flow is 27.5 to 29 Mlbm/Hr.				
EVALUATOR'S NOTE: (Only if assessed as OPEN.)						
	CRS	Direct the following actions: • Transfer station loads to the Startup Transformers (as time permits). • Reactor shutdown/cooldown as required by OT-3121.				
Evaluator Note: CRS may direct a manual scram if it is determined that torus temp will not remain below 100 degrees F.						
	CRO/BOP	When directed, commence plant shutdown IAW OP 0105.				
	CREW	Recognize torus volume > 70,000 cu ft; inform CRS of EOP-3 entry condition				

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All Unsatisfactory ratings require comments; a comment sheet is attached.

2) * = Critical Task/Step

STEP	POS.	CANDIDATE ACTIONS/BEHAVIOR	S	U	N/O	COMMENTS
	CRS	When torus volume exceeds 70,000 cu ft, enter and direct actions IAW EOP- 3 • Direct torus cooling.				
EVALUATOR'S NOTE: Recognize can't place torus cooling in service.						
	CREW	Report Drywell pressure approaching 2.5 psig.				
		Enter/direct actions IAW OT-3111 (as time permits): • Reduce Recirc flow to 27.5 – 29 Mlbs/hr at a rate not to exceed 10 percent per minute • Above the MELLLA boundary, stop lowering core flow and reduce power using the rapid shutdown sequence in reverse order				
EVALUATOR'S NOTE: May go above MELLLA for a short period of time during a transient.						
		• May transfer house loads to the Startup Transformers. • Start all available drywell RRUs.				
	CRS	Direct manual scram/turbine trip prior to drywell pressure exceeding 2.3 psig.				
	CRO	When directed, insert a manual reactor scram.				

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All Unsatisfactory ratings require comments; a comment sheet is attached.

2) * = Critical Task/Step

OPERATOR ACTIONS
EVENT NUMBER 8 & 9

Crew Task Description:

Failure of Manual Scram; ARI Required; ATWS (45%/55%)

STEP	POS.	CANDIDATE ACTIONS/BEHAVIOR	S	U	N/O	COMMENTS
	CREW	Recognize failure of pushbuttons to manually scram the reactor				
	***CREW** **EOP-2** **CCT-1**	**With reactor scram required and the reactor not shutdown, take action to reduce power by tripping the recirc pumps.** **Standard:** Actuate the ARI/RPT logic AND ensure that the recirc drive motor breakers are tripped within 2 minutes of the scram failure (or within 1 minute of RPV pressure exceeding 1200 psig)				
	CRO	Initiate ARI/RPT and Trip the Drive Motor Breakers. Report Partial Rod Insertion.				
	CRO	When steam flow < 0.5 Mlbm/hr per steamline, place mode switch in SHUTDOWN. • Verify all rods inserted; inform CRS. • Insert IRMs and SRMs.				
	CRS	Direct CRO to maintain level from 127" - 177".				
	CRO/BOP	Maintain reactor level as directed. • Determine HPCI not required for level control • HPCI tripped and inhibited				

NOTES:

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All Unsatisfactory ratings require comments; a comment sheet is attached.

2) * = Critical Task/Step

STEP	POS.	CANDIDATE ACTIONS/BEHAVIOR	S	U	N/O	COMMENTS
	CRS	Direct CRO/BOP to maintain reactor pressure 800 - 1000 psig using BPVs. With the leaking SRV, the pressure band may have to be adjusted based on plant pressure continuing to lower.				
	CRO / BOP	Maintain reactor pressure as directed.				
	CRS	Direct crew to monitor the plant cooldown.				
	BOP	When directed monitor cooldown.				

EVALUATOR'S NOTE:		**With ARI/RPT failure, trip of drive motor breakers required to satisfy critical task.**				
	CRS	When informed of the scram failure enter and direct crew actions IAW EOP-1 and EOP-2				
	STA	When directed, verify EOP-1 Table A automatic actions				
	CREW	Recognize/respond to high Drywell pressure and entry into EOP-3; inform CRS				
	CRS	Enter/direct actions per EOP-3 • Restart Drywell RRUs.				
	BOP	When directed: • Restart Drywell RRUs.				
	***CREW** **EOP-2** **CCT-2**	**With a reactor scram required and the reactor not shutdown, INHIBIT ADS to prevent an uncontrolled RPV depressurization to prevent causing a significant power excursion.** **Standard:** Inhibit ADS prior to automatic initiation.				
	CRS	Direct per EOP-2: • Inhibit ADS				

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2) * = Critical Task/Step

		• Implement App P to keep the MSIVs Open • When steam flow <0.5lbm/hr per steamline, place Mode Switch in SHUTDOWN				
EVALUATOR'S NOTE:		**This step is an Immediate Action, and may be performed without direction.**				
		• Verify ARI/RPT initiated • Insert control rods with one or more appropriate appendices				
EVALUATOR'S NOTE:		**Implement appendix F, BB or H of OE 3107.**				
		• Stabilize pressure RPV pressure 800-1,000 psig with BPVs.				
	BOP	When directed: • Inhibit ADS. • Implement App P to keep the MSIVs Open. • Stabilize pressure 800-1000 psig with BPVs.				
	***CREW** **EOP-2** **CCT-3**	**During an ATWS with conditions met to perform power/level control TERMINATE AND PREVENT INJECTION into the RPV using appendix GG, until conditions are met to re-establish injection.** **Standard:** Completion of Terminate and prevent injection IAW OE 3107 Appendix GG within 5 minutes of loss of forced circulation.				
	CRS	Inject SLC with A SLC pump				
	CRS	Terminate/prevent injection per Appendix GG.				

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2) * = Critical Task/Step

	***CREW** **EOP-2** **CCT-4**	**With a reactor scram required and the reactor not shutdown, TAKE ACTION TO REDUCE POWER by injecting boron and/or inserting control rods, to prevent exceeding the primary containment design limits.** **Standard:** Actions taken within 10 minutes of the scram failure to implement appropriate appendices and/or inject SLC. Initially SLC will be available, then one method must result in successful control rod insertion.				
	CRO	When steam flow <0.5lbm/hr per steamline, place Mode Switch in SHUTDOWN.				
EVALUATOR'S NOTE:		**This step is an Immediate Action, and may be performed without direction.** **SLC will run initially then trip when power is < 2%.**				
	CRO	Insert control rods using directed appendices.				
EVALUATOR'S NOTE:		**After trip of SLC, control rod insertion becomes only means available to satisfy the critical task.**				
	BOP	When directed, terminate/prevent injection per Appendix GG.				
	***CREW** **EOP-2** **CCT-5**	**When conditions are met to re-establish injection, use available injection systems to RESTORE & MAINTAIN RPV water level above -19".** **Standard:** Restore and maintain RPV level to between -19" and the level to which it was lowered AND no significant power excursion occurs.				
EVALUATOR NOTE: Depending on crews pace, Torus temperature may reach 110 degrees before power drops to < 2%. This along with an SRV open and level > TAF will satisfy override to terminate and prevent / enter -19" to 90" level control leg.						
	CRO	Recognize when power drops below 2 %; inform CRS				
	CREW	Recognizes A SLC pump trip				
	CRS	Direct RPV level maintained between –19 and 90 inches				

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2) * = Critical Task/Step

	CRO	Maintain RPV level between –19 and 90 inches				
	CRO/STA	Recognize all rods inserted; inform CRS				
	CRS	When all control rods inserted, exit EOP-2 and enter/direct actions IAW EOP-1: • Verify Table A automatic actions • Restore/ maintain RPV level 127 – 177 inches. • Commence cooldown at less than 100 degrees F per hour.				
	BOP	When directed, commence cooldown at less than 100 degrees F per hour.				
	CRS	When all rods inserted, exit EOP-2, enter EOP-1, and direct RPV level restored and maintained 127 –177 inches.				
Scenario may be terminated once EOP-2 has been exited at the discretion of the lead evaluator.						

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2) * = Critical Task/Step

OPERATOR ACTIONS

ADDITIONAL COMMENTS:

NOTES:

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2) * = Critical Task/Step

Vermont Yankee 2007 NRC Scenario #3

The crew will initiate Turbine Chest Warming and continue with the reactor startup, pulling control rods to continue with the power ascension. As the startup progresses, IRM A will fail upscale resulting in a rod withdrawal block and a half scram, requiring the crew to evaluate Tech Specs, and bypass the failed IRM.

While addressing the IRM failure, the in-service CRD Flow Control Valve will fail closed. When startup is recommenced, the crew must identify the CRD Flow Control Valve failure and respond using ON 3145 to swap to the other CRD Flow Control Valve.

When the startup continues control rod 18-19 will not move at normal drive pressures, requiring actions IAW ON 3143 Appendix A to correct the condition and continue with the startup.

After the control rod is fully inserted and disarmed, the crew will respond to an earthquake using OP 3127, Natural Phenomena. This will cause a trip of the "A" TBCCW pump and the "B" TBCCW pump must be manually started when it fails to auto start. Also, the Gland Seal Regulator will fail closed requiring the crew to open the bypass valve to maintain condenser backpressure.

After the seismic and TBCCW issues have been addressed, a RCIC leak will develop requiring operator action to isolate the leak. The CRS will evaluate Tech specs after RCIC is manually isolated.

When the crew has isolated the RCIC leak and Tech Specs have been evaluated, a subsequent earthquake will cause a Group-1 isolation and a break in the Torus. The auto scram will fail requiring the crew to manually scram **(Critical Task)**. OT 3100 will be entered for the scram, EOP-3 will be entered due to the Torus leak. During the scram, Scram Discharge Volume valves will fail to auto close and operator action is required to attempt to close the valves. EOP-4 entry required.

The crew will be evaluated responding to low Torus level IAW EOP-3. The break will be in excess of makeup system capacity, and the crew will be required to emergency depressurize before going below 7 ft in the Torus due to the rupture **(Critical Task)**.

Critical tasks are to actuate a manual reactor scram and to emergency depressurize when Torus level cannot be maintained above 7 feet.

SIMULATOR EVALUATION GUIDE

Evaluators:

_____

_____

_____

_____

_____
Senior Management Observer

Crew: _____

SM _____

CRS _____

CRO _____

BOP _____

STA _____

Critical Task Performance: SAT UNSAT
(Circle One)

Lead Evaluator: _____
Signature

Date Administered: _____

Activity Code: _____

Prepared by: _____ Date: _____

Reviewed by: _____ Date: _____

Approved by: _____ Date: _____

CREW BRIEF:

-Power level: 2%

-Rod Sequence: A2 Rod Sequence **-Rod Group:** 30

-Equipment out of service and/or tagged:

1.

-Reason For Equipment out of Service or tagged:

1.

-Applicable Tech Spec LCOs:

1.

ORAM Sentinel Color:

Yellow Transient Evolution >50%

-Plant evolutions in progress/Scheduled Shift Evolutions:

1. Place Turbine Chest Warming in service and continue reactor startup.

SCENARIO SUMMARY:

The crew will initiate Turbine Chest Warming and continue with the reactor startup, pulling control rods to continue with the power ascension. As the startup progresses, IRM A will fail upscale resulting in a rod withdrawal block and a half scram, requiring the crew to evaluate Tech Specs, and bypass the failed IRM.

While addressing the IRM failure, the in-service CRD Flow Control Valve will fail closed. When startup is recommenced, the crew must identify the CRD Flow Control Valve failure and respond using ON 3145 to swap to the other CRD Flow Control Valve.

When the startup continues control rod 18-19 will not move at normal drive pressures, requiring actions IAW ON 3143 Appendix A to correct the condition and continue with the startup.

After the control rod is fully inserted and disarmed, the crew will respond to an earthquake using OP 3127, Natural Phenomena. This will cause a trip of the "A" TBCCW pump and the "B" TBCCW pump must be manually started when it fails to auto start. Also, the Gland Seal Regulator will fail closed requiring the crew to open the bypass valve to maintain condenser backpressure.

After the seismic and TBCCW issues have been addressed, a RCIC leak will develop requiring operator action to isolate the leak. The CRS will evaluate Tech specs after RCIC is manually isolated.

When the crew has isolated the RCIC leak and Tech Specs have been evaluated, a subsequent earthquake will cause a Group-1 isolation and a break in the Torus. The auto scram will fail requiring the crew to manually scram **(Critical Task)**. OT 3100 will be entered for the scram, EOP-3 will be entered due to the Torus leak. During the scram, Scram Discharge Volume valves will fail to auto close and operator action is required to attempt to close the valves. EOP-4 entry required.

The crew will be evaluated responding to low Torus level IAW EOP-3. The break will be in excess of makeup system capacity, and the crew will be required to emergency depressurize before going below 7 ft in the Torus due to the rupture **(Critical Task)**.

Critical tasks are to actuate a manual reactor scram and to emergency depressurize when Torus level cannot be maintained above 7 feet.

TERMINATING CONDITION(S):

1. Once the crew has opened the SRV's to commence an RPV-ED on Torus Level and had demonstrated the ability to monitor and control RPV Level during the RPV-ED, the scenario can be terminated at the discretion of the Lead Evaluator.

REFERENCES:

1.

SIMULATOR OPERATOR INSTRUCTIONS

Simulator Set Up: ~2% Power

1. IC-805
2.

Discretionary Distracter Malfunctions/RFs/IOs:

1. rfNM_71-76 APRM Gain adjustments due to APRM GAF's being out of spec; 71 (1.22), 72 (1.33), 73 (1.14), 74 (1.22), 75 (1.11), 76 (1.14)

No.	MF/RF/IO #	Severity	Ramp	REM #	Act. Time	Description
1.	mfNM_03A	100%		1		IRM "A" Failure Upscale
2.	mfRD_11A			2		CRD "A" FCV Failure Closed
3.	mfRD_021819			3		Stuck Control Rod 18-19
4.	rfPP_06			4		Seismic Event
5.	mfSW_21B			4		TBCCW "B" Pump Failure to Auto Start
6.	mfSW_14A			4		TBCCW "A" Pump Trip
7.	mfMS_09			4		Gland Seal Regulator fails closed
8.	mfRC_14			5		RCIC Group 6 Isolation Failure
9.	mfRC_10	100%	30sec	5		RCIC Steam Leak before 131
10.	rfPP_06			6		Seismic Event (aftershock)
11.	mfRP_03			6		Spurious Group 1 Isolation
12.	mfRP_01A			6		Failure to Auto Scram
13.	mfPC_10	50%	900sec	7		Suppression Pool Leak
14.	mfRD_09A			Pre-Insert		SDV Drain Valve 1A Fails Open
15.	mfRD_09B			Pre-Insert		SDV Drain Valve 2A Fails Open
16.						

SIMULATOR OPERATOR INSTRUCTIONS (Continued)

Additional Instructions:

1. When/if contacted to investigate the "A" IRM failure, acknowledge, and then report that there was an electronic failure of the output amplifier. If asked, recommend that the CR bypass the failed IRM.

2. When/if asked to monitor FCV-19A parameters, report you have normal filter suction & discharge pressures and no other abnormalities exist. You'll continue to monitor.

   When asked to place FCV-19B in service, insert the following: rfRD_08 (OUT) followed by rfRD_09 (IN).

3. Following initial drive flow pressure increase (ON-3143), Simulator Booth Operator **DELETE stuck rod malfunction (mfRD_021819).**

   NOTE: Based on the pace of the crew, they may not be on the intended malfunctioning rod (18-19), if this is the case, coordinate with the Lead Evaluator to provide a Stuck Rod malfunction for the rod selected. Ensure the alternate rod selected is at something other than 00 for evaluation purposes.

4. **PRIOR** to inserting key 4, call the CR as the RBAO to talk to the CRO to follow-up on CRD FCV operation. **Insert key 4 during dialog *(ensure you have a peer check or another simulator operator available to perform this function to prevent inserting the wrong malfunction during this evolution- STAR).*** This will ensure the ACRO gets credit for either the TBCCW pump trip and auto start failure or Gland Seal Regulator malfunction.

   Report to the Control room from the Security Shift Supervisor that tremors were felt from officers in the field.

   When/if asked to investigate the TBCCW pump trip and failure to auto start, acknowledge, and then report that it's believed to be due to the seismic event and that you'll report back to the Control Room with a confirmation as soon as possible.

5. Report to the Control Room from the Security Shift Supervisor that aftershocks were felt by security officers in the field.

6. When/if asked to investigate a leak in the torus, acknowledge, and then report that the leak is about 4 feet up from the torus azimuth near the "A" RHR Loop Suction and that repairs to fix the leak are ongoing.

7. At the discretion of the Lead Examiner, the Torus Leak size/rate may be modified to get the crew to the point where they need to RPV-ED on torus level.

   When/if asked to open CS-8A or CS-8B for torus makeup, insert the following as needed: rfCS_01 or rfCS_02 respectfully.

OPERATOR ACTIONS
EVENT NUMBER 1

Crew Task Description:

Perform Turbine Chest Warmup

STEP	POS.	CANDIDATE ACTIONS/BEHAVIOR	S	U	N/O	COMMENTS
	CRS	Directs Performing Turbine Chest Warmup IAW OP 0105 Phase 2.D. Step 1. Direct CRO to monitor Reactor Power, Pressure and Level during Turbine Chest Warm-up.				
	BOP	Enters OP 0105 Phase 2.D. Step 1. for Turbine Chest Warm-up and reviews Takes actions IAW OP 0105 for Turbine Chest Warmup				
	CRO	Maintains Reactor Power, Pressure and Level as Turbine Chest Warm-up is placed in service.				
EVALUATOR'S NOTE:		**OP 0105 Phase 2.D. Step 1. specific steps attached.**				

NOTES:

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

2) * = Critical Task/Step

OPERATOR ACTIONS
EVENT NUMBER 2

Crew Task Description:

Pull Rods to Continue Power Ascension

STEP	POS.	CANDIDATE ACTIONS/BEHAVIOR	S	U	N/O	COMMENTS
	CRS	Directs power ascension per OP 0105 until 1 ½ bypass valves open				
	CRO	Withdraws control rods to increase power.				
	CREW	Monitors reactor parameters				
EVALUATOR'S NOTE:		**Specific guidance for rod pulls in OP 0105.**				

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OPERATOR ACTIONS
EVENT NUMBER 3

Crew Task Description:

IRM A Fails Upscale (TS)

STEP	POS.	CANDIDATE ACTIONS/BEHAVIOR	S	U	N/O	COMMENTS
	CREW	Recognizes IRM 'A" failed upscale Recognizes ½ scram ALARMS				
	CRS	Recognizes IRM'A' upscale, references OP2131 section C. Directs confirmation of upscale . Directs I & C to investigate. Directs bypassing IRM 'A'. Directs reset of ½ scram. Consults Tech Specs – Table 3.1.1. – no restriction with one IRM inop.				
	CRO	Bypasses IRM Resets ½ scram per OP 2134 "RPS".				
	CRS	Crew Brief				

NOTES:

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OPERATOR ACTIONS
EVENT NUMBER 4

Crew Task Description:

CRD Flow Control Valve Fails Closed (ON)

STEP	POS.	CANDIDATE ACTIONS/BEHAVIOR	S	U	N/O	COMMENTS
	CREW	Recognizes abnormal CRD conditions. Control Rod won't move.				
	CRS	Enters ON 3145 – Loss of CRD Reg Function. Directs actions per ON 3145, Step 9 for placing flow controller in manual, and swapping controllers.				
	CRO	Takes steps described in Step 9. • places in-service flow controller in manual • determines problem still exists • swaps to alternate controller				
EVALUATOR'S NOTE:		**See attached copy of ON 3145, Step 9. for specific steps.**				
	CRS	Crew Brief.				

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OPERATOR ACTIONS
EVENT NUMBER 5

Crew Task Description:

Stuck Control Rod 18-19 (ON)

STEP	POS.	CANDIDATE ACTIONS/BEHAVIOR	S	U	N/O	COMMENTS
	CRO	Determines control rod 18-19 (or XX-XX) is stuck and notifies CRS				
EXAMINER NOTE: The stuck rod will be dependent on how far along the reactor startup/heatup has progressed. Rod 18-19 is the first control rod that may become stuck. If another rod needs to have the malfunction, the steps below will be performed unless the rod is initially at 00. In this case, wait to insert the malfunction on the alternate rod until it's at a position other than 00.						
	CRS	Enters ON 3143 – Stuck Control Rod and directs actions contained on ON 3143 flow chart.				
	CRO	Takes actions as directed to unstick control rod per ON 3143 flowchart • attempt one notch insert • attempt a single notch withdraw • determines drive water pressure • raises drive water pressure 10-50 psig • attempt to insert control rod one notch (successful) • attempt to withdraw one notch (successful) • insert rod 18-19 one notch • withdraw rod 18-19 one notch • return drive water press. to 250-275 • insert then withdraw rod 18-19 one notch (done twice)				
EVALUATOR'S NOTE:		**See attached ON 3143 Flow Chart for specific actions.**				
	CRO	• insert then withdraw rod 18-19 one notch (done twice).				

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2) * = Critical Task/Step

	CRS	Crew Brief.				

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OPERATOR ACTIONS
EVENT NUMBERS 6 and 7

Crew Task Description:

Seismic Event; Trip of "A" TBCCW Pump with "B" TBCCW Pump Failing to Auto Start; Gland Seal Regulator Failure

STEP	POS.	CANDIDATE ACTIONS/BEHAVIOR	S	U	N/O	COMMENTS
	CREW	Recognize and inform the CRS of indication of a seismic event				
	CRS	Enter and direct crew actions IAW OP 3127				
	CRS	Direct CRO/BOP to dispatch AO to check for damage to structures or equipment IAW OP 3127				
	CRO/BOP	When directed, dispatch AOs to check for damage to structures or equipment IAW OP 3127				
	CRS	Direct CRO/BOP to verify the seismic event by checking indications on the seismic monitor				
	CRO/BOP	When directed, check seismic monitor report valid indication of a seismic event				
	CRS	Direct CRO to check control rod display for rod drift				
	CRO	When directed, check control rod display. Report no drifts				
	CREW	Direct STA to check the seismic monitor to determine if OBE was exceeded				
	CREW	Report loss of "A" TBCCW Declares ALERT for seismic event A-5-c.				
	BOP	Starts "B" TBCCW pump manually.				
	CREW	Call Electrical Maintenance to investigate the loss of valve indication, and failed level transmitter				

NOTES:

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2) * = Critical Task/Step

STEP	POS.	CANDIDATE ACTIONS/BEHAVIOR	S	U	N/O	COMMENTS
	CREW	Responds to Annunciator 7-K-9 STM SEAL HDR PRESS LO				
	CRS	Directs the Gland Seal Regulator Bypass valve be opened to restore gland seal pressure and condenser backpressure. Enters OT-3120 for Rising Main Condenser Backpressure if conditions warrant, to ensure actions taken in the ARS will resolve the condenser backpressure issue.				
	BOP	Refers to Alarm Response Procedure for Low seal steam pressure and opens the gland seal regulator bypass valve (MS-10).				
	CREW	Monitors Main Condenser Backpressure.				
	CRS	Conduct a crew brief on plant conditions and priorities.				

NOTES:

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2) * = Critical Task/Step

OPERATOR ACTIONS
EVENT NUMBER 8

Crew Task Description:

RCIC Steam Leak (TS); RCIC Fails to Auto Isolate

STEP	POS.	CANDIDATE ACTIONS/BEHAVIOR	S	U	N/O	COMMENTS
	CREW	Responds to Annunciator 9-4-U-2 "RCIC Steam Line DP High"				
	CRS	May Enter ON 3158 "RX BLDG High Area Temp/Water Level" Directs/Verifies Isolating RCIC when it fails to auto isolate. Tech Specs 3.5.G.2. – 14 day LCO				
	BOP	Refers to Alarm Response Procedure for 9-4-U-2. Manually Isolates RCIC valves 15 & 16 due to failure to auto isolate. (Successful)				

NOTES:

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2) * = Critical Task/Step

OPERATOR ACTIONS
EVENT NUMBER 9, 10 & 11

Crew Task Description:

Seismic Aftershock; Group 1 Isolation; Auto Scram Failure; Manual Scram Required; PCIS Group III Failure

STEP	POS.	CANDIDATE ACTIONS/BEHAVIOR	S	U	N/O	COMMENTS
	CRO	Spurious Group 1 Isolation due to seismic event and the reactor should have scrammed				
	CREW	Recognize auto scram failure				
	***CREW** **EOP-2** **CCT-1**	**With the reactor at power and a full auto scram signal, manually scram the reactor** **Standard:** Actuate the manual scram pushbuttons, place the mode switch in SHUTDOWN within approximately 30 seconds of reaching the RPS auto scram actuation setpoint (9-5-K-3, Reactor Pressure High)				
	CRO	Insert manual scram.				
	CRS	Enter and direct actions per OT 3100 and EOP-1 • Verify applicable Table A automatic actions				
	CRO	When steam flow < 0.5 Mlbm/hr per steamline, place mode switch in SHUTDOWN • Verify all rods inserted; inform CRS • Insert IRMs and SRMs				
EVALUATOR'S NOTE:		**The next step is an Immediate Action, and may be performed without direction.**				
	CREW	Recognizes SDV Drain valves CRD -33A & 33B fail to isolate on scram.				

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STEP	POS.	CANDIDATE ACTIONS/BEHAVIOR	S	U	N/O	COMMENTS
	CRO	Attempts to Isolate SDV valves (unsuccessful) Reports to CRS failure to isolate. Recommends calling operators in the field to manually isolate SDV.				
	CRS	Enters OP 3127 "Natural Phenomena" due to alarm 7-M-7 – Seismic Monitor Alarm from aftershock.				
	CRS	Enters EOP-4 on Alarms 4-L-4 –Equip.drain N/S sump hi 4-M-4 – Floor drain N/S sump hi Due to increasing sump levels caused by SDV failure to isolate.				
	CREW	Maintains pressure/level as directed				
	BOP	Controls Pressure 800-1000 psig				
	CRO	Control RPV water level 127-177 with feedwater				

NOTES:

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2) * = Critical Task/Step

OPERATOR ACTIONS
EVENT NUMBER 12

Crew Task Description:

Torus Leak at "A" RHR Suction (50% Over 900 Secs); PRV-ED on Low Torus Level

STEP	POS.	CANDIDATE ACTIONS/BEHAVIOR	S	U	N/O	COMMENTS
	CREW	Report high sump levels in reactor building.				
	CRS	Direct an AO to investigate.				
	CRS	When AO reports RHR suction line break, enter and direct actions per ON 3108, Loss of Containment Integrity Emergency Procedure and ON 3158, Hi Rx Building Temperature or Water Level.				
	CRS	Direct maintenance to attempt to restore primary containment integrity.				
	CREW	Respond to reactor building sump level alarm.				
	CRS	Re-enter EOP-4, Secondary Containment Control, due to high floor drain sump levels.				
	CRS	Verify all available sump pumps are running.				
	CRS	Enter EOP-3 on low torus volume				
	CRS	Direct CREW to initiate makeup to the torus IAW Table N (multiple systems should be used).				
	BOP	Initiates torus makeup, as directed.				
	***CREW CCT-2**	**When torus level cannot be <u>maintained</u> above 7 ft, perform RPV emergency depressurization.** **Standard:** Initiate RPV-ED such that RPV pressure is < 50 psig when Torus level reaches 5.5 ft.				

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2) * = Critical Task/Step

STEP	POS.	CANDIDATE ACTIONS/BEHAVIOR	S	U	N/O	COMMENTS
EVALUATOR'S NOTE:		**Once the CRS determines Torus Level can't be maintained > 7 feet then RPV-ED is warranted.**				
	CRS	When torus level cannot be maintained above 7 ft, enter EOP-5 Inhibit HPCI and and direct all 4 SRVs opened.				
	BOP	HPCI injection is terminated before Torus level falls below 6 ft. if HPCI is running.				
	BOP	Open SRVs as directed.				
	CRS	Direct CRO to restore and maintain level 6" - 177" using condensate and feed. EOP-1, Step RC/L-2				
	CRO	Maintain RPV level as directed.				
Scenario may be terminated once level is restored and maintained.						

NOTES:

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2) • = Critical Task/Step

OPERATOR ACTIONS

ADDITIONAL COMMENTS:

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