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SIMULATOR SCENARIOS

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MEVA 

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DOMINION  
NORTH ANNA POWER STATION

INITIAL LICENSED OPERATOR EXAMINATION  
SIMULATOR EXAMINATION GUIDE  
SCENARIO NRC 1

## SIMULATOR EXAMINATION GUIDE

<u>EVENT</u>	<u>DESCRIPTION</u>
1.	Start a second feed pump using OP
2.	Ramp unit up using normal ramping OP
3.	Trip of a running Condensate pump with no auto-start of standby pump w/ IRPI for control bank "A" rod K-2 dropping to 0
4.	Failure of 1-CH-FT-1122 high
5.	Failure of steam pressure channel low
6.	Tube leak in non-regenerative HX
7.	Steam leak outside containment
8.	MSLB outside containment

### Scenario Recapitulation:

Malfunctions after EOP entry	<b>2</b> (Reactor will not trip automatically or manually/rods will not insert in auto, motor-driven aux feed pumps do not auto-start)
Total Malfunctions	<b>9</b> (Running condensate pump trips/standby pump doesn't auto-start, IRPI failure, 1-CH-FT-1122 failure, SG steam pressure channel failure, tube leak in non-regen HX, steam leak outside containment, MSLB, reactor will not trip automatically or manually/rods will not insert in auto, motor-driven aux feed pumps do not auto-start)
Abnormal Events	<b>5</b> (Running condensate pump trips/standby pump doesn't auto-start, 1-CH-FT-1122 failure, SG steam pressure channel failure, tube leak in non-regen HX, steam leak outside containment)
Major Transients	<b>1</b> (MSLB outside containment)
EOPs Entered	<b>3</b> (FR-S.1, E-2, ES-1.1)
EOP Contingencies	<b>1</b> (FR-S.1)
Critical Tasks	<b>3</b>

### SCENARIO DURATION

130 Minutes

## **SIMULATOR EXAMINATION SCENARIO SUMMARY**

### **SCENARIO NRC 1**

The scenario starts with the unit at 45% power ready for a second Main Feed Water pump to be started. The unit was returned to power last shift following feed train work and cleared a 30% chemistry hold 1 hour ago. Rods are in manual due to a problem with auto rod control that I&C is currently investigating. The letdown radiation monitor is OOS. The turbine-driven auxiliary feedwater pump, 1-FW-P-2, was tagged out during the chemistry hold and has just been returned to service, PMT was SAT. 2-CC-P-1A is tagged out for seal work.

First, the crew will start a second Main Feed Pump in accordance with 1-OP-2.1, "Unit Startup from Mode 2 to Mode 1," and 1-OP-31.1, "Main Feedwater System."

Next, the crew will ramp the unit up in accordance with 1-OP-2.1, "Unit Startup from Mode 2 to Mode 1." Once the reactor power has increased approximately 5%, the first failure will occur.

During the ramp, 1-CN-P-1A will trip and 1-CN-P-1B will not auto-start. The crew will enter 1-AP-31, "Loss of Main Feedwater," and start the "B" Condensate pump. Several minutes into the event, an IRPI for rod K-2 in control bank "A" will drop to zero. The US will review technical specification 3.1.7 and notify the instrument shop. Once condensate flow has been re-established and tech specs reviewed, the next event can occur.

At this time, charging flow transmitter, 1-CH-FT-1122, will fail high. The crew will respond in accordance with the AR for C-C5 and take manual control of 1-CH-FCV-1122. Once charging flow has been restored to normal the next event can occur.

Next, the Channel III steam pressure transmitter for "A" SG (1-MS-PT-1475) fails low. The crew should enter 1-AP-3, "Loss of Vital Instrumentation," swap steam generator level control channels, and refer to technical specifications. At this time the next event can occur.

Due to the earlier oscillation on the charging system, a tube leak will develop in the non-regenerative heat exchanger. The crew will respond in accordance with 1-AP-16, "Increasing Primary Plant Leakage." The crew will isolate letdown and make preparations to place excess letdown in service. At this time the next event can occur.

A small steam leak will develop in the main steam valve house on the "A" steam line between the main steam trip valve and the containment wall. The crew will notice a decrease in megawatts and an increase in reactor power and enter 1-AP-38, "Excessive Load Increase," and begin to ramp the unit down. At this time the next event can occur.

The "A" main steam line will rupture and the crew will be expected to enter 1-E-0, "Reactor Trip and Safety Injection." The reactor will fail to trip, requiring the crew to transition to FR-S.1, "Response to Nuclear Power Generation/ATWS." Rods will not be able to be inserted in auto. Once the reactor has tripped the crew will return to 1-E-0 and then transition to 1-E-2, "Faulted Steam Generator Isolation." The crew will then transition to 1-ES-1.1, "SI Termination." The scenario may be ended once SI has been terminated, or at the discretion of the lead evaluator.

## SCENARIO TURNOVER SHEET

**Read the following to the crew:**

**Purpose:** This examination is intended to evaluate the crew's performance of various tasks associated with the Initial License Operator Training Program. All activities should be completed in accordance with approved operations standards.

1. You are on a day shift during the week.
2. When conditions allow, utilize the computer log systems as you would in the plant.

**Unit Status:**

Unit 1 is at 45% power. RCS boron is 1202 ppm and core age is 9000 MWD/MTU. Aux steam is on unit 2.

Unit 2 is at 100% power.

**Equipment Status:**

The unit was returned to power last shift following feed train work and cleared a 30% chemistry hold 1 hour ago. Control rods are in manual while the Instrument Department investigates a problem with auto rod control. 1-CH-RI-128 is out of service. The turbine-driven auxiliary feedwater pump, 1-FW-P-2, was tagged out during the chemistry hold and was just returned to service, PMT was SAT. 2-CC-P-1A is tagged out for seal work. Maintenance rule window is green.

**Shift Orders:**

Start "C" main feedwater pump and then commence a ramp to 100% power. The 2 non-running Main Feed Pumps have been vented per the OP. An operator is standing by at the feed pump. Control rods are to remain in Manual at this time due to the problem with auto rod control.

EVENT 1: Given that the unit is at 45% power, the crew will start a second Main Feedwater Pump in accordance with 1-OP-31.1, "Main Feedwater System."		
TIME	EXPECTED ACTION	INSTRUCTOR REMARKS
SPD Verified: _____ (Initials)		
<ul style="list-style-type: none"> <li>1-FW-P-1C starts and runs normally</li> </ul>		
	BOP places "B" Condensate pump in PTL.	
	BOP places both control switches for 1-FW-P-1C in PTL.	
	BOP closes 1-FW-MOV-150C.	
	BOP verifies/places switches for "B" MFP in PTL.	
	BOP verifies/aligns feed recirc.	
	BOP starts each "C" MFP motor.	
	BOP opens discharge MOV.	
	BOP instructs field operator to monitor local lube oil temperature.	
	BOP places the "B" MFP in AUTO and verifies its discharge MOV opens.	
	BOP places "B" Condensate pump in AUTO.	
	Crew directs initiation of 0-GOP-2.18.	
	<b>NOTE: The next event can occur once the crew has placed "C" MFP in service.</b>	

EVENT 2: Given that the unit is at 45% power and the crew has been instructed to increase power, the crew will ramp the unit up in accordance with 1-OP-2.1, "Unit Startup from Mode 2 to Mode 1."

TIME	EXPECTED ACTION	INSTRUCTOR REMARKS
	SPD Verified: _____ (Initials) <ul style="list-style-type: none"> <li>• Reactor power increases</li> <li>• Turbine power increases</li> <li>• Tavg/Tref increase</li> <li>• Generator megawatts increase</li> </ul>	
	<b>NOTE: The crew may raise primary temperature prior to ramping the turbine.</b>	
	BOP verifies/sets desired ramp rate.	
	BOP increases turbine setter to desired position.	
	BOP presses GO on turbine.	
	BOP monitors turbine ramp.	
	BOP adjusts limiter position, as required.	
	RO starts a dilution when required.	
	RO withdraws control rods to maintain primary temperature.	
	RO places AMSAC in "Normal" when procedure criteria met.	
	<b>NOTE: The next event can occur once the crew has ramped approximately 5% as determined by the lead evaluator.</b>	

EVENT 3: Given that the unit is at power and a Main Condensate pump has tripped with no auto-start of the standby pump, the crew will be expected to respond in accordance with 1-AP-31, "Loss of Main Feedwater."

TIME	EXPECTED ACTION	INSTRUCTOR REMARKS
	SPD Verified: _____ (Initials) <ul style="list-style-type: none"> <li>• Annunciators G-G6 and, later, G-F6 illuminate</li> <li>• 1-CN-P-1A has amber breaker disagreement light lit</li> <li>• 1-CN-P-1B does not auto-start</li> <li>• Feed pump suction pressure decreases</li> <li>• After several minutes: annunciators A-G2 and AF1 will illuminate</li> <li>• IRPI for rod K-2 in Control Bank A will drop to zero</li> <li>• Rod Bottom Light for K-2 will illuminate</li> </ul>	
	BOP identifies annunciator G-G6, CONDENSATE PP 1A-1B-1C AUTO TRIP, illuminated.	
	BOP identifies that 1-CN-P-1A has tripped and 1-CN-P-1B has not auto-started.	
	<b>NOTE: Crew may not stop the ramp until immediate actions of AP have been completed.</b>	
	US directs crew to stop ramp and secure any on-going dilution.	
	US directs entry into AP-31.	
	BOP checks power > 70%. (NO)	
	BOP verifies 2 main feed pump running.	
	BOP checks MFW pump suction pressure >300 psig. (NO)	
	BOP starts "B" Condensate pump.	
	BOP checks any MFW pumps tripped. (NO)	
	Crew evaluates reducing power < 55%.	
	*BOP stabilizes SG levels.	
	*Crew verifies MFP performance: <ul style="list-style-type: none"> <li>• Suction pressure adequate</li> <li>• &lt;550 amps on motors</li> <li>• Annunciator F-B5 NOT lit.</li> </ul>	

EVENT 3: Given that the unit is at power and a Main Condensate pump has tripped with no auto-start of the standby pump, the crew will be expected to respond in accordance with 1-AP-31, "Loss of Main Feedwater."

TIME	EXPECTED ACTION	INSTRUCTOR REMARKS
	<b>NOTE: Report from field will be that the "B" pump is running fine. Nothing to see locally on the "A" pump. If sent to breaker will report an overcurrent drop.</b>	
	Crew maintains stable plant conditions.	
	<b>NOTE: Several minutes after the Condensate pump trip, IRPI K-2 will drop to zero.</b>	
	RO identifies annunciators A-G2, RPI ROD BOT ROD DROP, and A-F1, CMPTR ALARM ROD DEV/SEQ.	
	<b>NOTE: If unsure of conditions, the crew may enter 1-AP-1.2 for a dropped rod. Steps in this procedure were not included.</b>	
	RO identifies IRPI K-2 in control bank "A" is reading zero.	
	RO checks for other indications of a dropped rod.	
	RO identifies that no rod has dropped, IRPI problem.	
	<b>NOTE: If I&amp;C is asked to investigate the K-2 rod, they will report that it is an IRPI problem.</b>	
	US refers to TS 3.1.7A and determines that a flux map must be done within 8 hours (if current power is >50%) or power reduced to <50%.	
	US makes notifications on Condensate pump trip/auto-start failure, and IRPI indication.	
	<b>NOTE: The next event may occur once the standby Condensate pump has been started and tech specs have been reviewed.</b>	

EVENT 4: Given that the charging flow transmitter has failed high, the crew will respond in accordance with AR for C-C5 annunciator.		
TIME	EXPECTED ACTION	INSTRUCTOR REMARKS
SPD Verified: _____ (Initials) <ul style="list-style-type: none"> <li>• Annunciator C-C5 will illuminate</li> <li>• 1-CH-FI-1122 will indicate full scale high</li> <li>• 1-CH-FCV-1122 will indicate minimum demand</li> <li>• Later, C-B3 may alarm if 1-CH-FCV-1122 not yet in manual and open.</li> </ul>		
	RO identifies annunciator C-C5, CH PP TO REGEN HX HI-LO FLOW.	
	RO identifies charging flow indicates high on 1-CH-FI-1122.	
	RO identifies actual charging flow indicates low.	
	<b>NOTE: RO will need to monitor pressurizer and VCT levels, and/or letdown temperature, to adjust charging flow.</b>	
	RO takes manual control of 1-CH-FCV-1122 and restores charging flow to normal.	
	Crew makes report of instrument failure and requests assistance.	
	<b>NOTE: The next event can occur once the crew has restored charging flow to normal.</b>	

EVENT 5: Given the plant is in mode one with indications of a failed steam pressure transmitter, the crew will respond in accordance with 1-AP-3, "Loss of Vital Instrumentation."

TIME	EXPECTED ACTION	INSTRUCTOR REMARKS
	SPD Verified: _____ (Initials) <ul style="list-style-type: none"> <li>• Annunciators F-H1 and F-E1 illuminate</li> <li>• Status lights N-C3 and N-D3 illuminate</li> <li>• 1-MS-PI-1475 fails low</li> <li>• 1-MS-FI-1474 fails low</li> <li>• "A" MFRV ramps closed</li> <li>• "A" SG level decreases</li> </ul>	
	BOP identifies annunciators F-H1, HI STM LINE ΔP SG 1A LO and F-E1, STM GEN1A FW > STM FLOW CH III-IV.	
	BOP identifies 1-MS-PI-1475 and 1-MS-FI-1474 failing low.	
	US directs the crew to enter 1-AP-3.	
	BOP verifies redundant channels normal.	
	BOP takes manual control of the "A" Main Feed Reg Valve to control SG level.	
	Crew verifies first stage pressure indications normal.	
	Crew verifies systems affected by PRZR level channels normal: <ul style="list-style-type: none"> <li>• RO verifies operable pressurizer level channel selected</li> <li>• RO verifies letdown in service</li> <li>• Crew leaves 1-CH-FCV-1122 in manual due to previous failure</li> <li>• RO verifies control group heaters are not tripped.</li> </ul>	
	Crew verifies both first stage pressure channels normal.	
	Crew verifies all SGWLC channels selected to an operable channel. (NO)	

EVENT 5: Given the plant is in mode one with indications of a failed steam pressure transmitter, the crew will respond in accordance with 1-AP-3, "Loss of Vital Instrumentation."

TIME	EXPECTED ACTION	INSTRUCTOR REMARKS
	Crew swaps to operable SGWLC channels. <ul style="list-style-type: none"> <li>• RO verifies control rods in manual</li> <li>• Crew places steam dumps in either OFF or steam pressure mode</li> <li>• BOP checks all bypass MRFVs in manual</li> <li>• BOP places all MFRVs in manual</li> <li>• Crew selects channel IV on SGWLCS</li> <li>• Crew verifies all SG level channels are operable</li> <li>• BOP verifies steam generator levels are on program</li> <li>• BOP places MFRVs in Auto</li> <li>• RO returns steam dumps to Tave mode</li> <li>• Crew leaves control rods in manual due to auto rod control problem.</li> </ul>	
	Crew verifies operation of instruments and enters applicable MOPs (1-MOP-55.77 for steam flow and 55.79 for steam pressure).	
	US refers to Technical Specification 3.3.1 (function 15 – 72 hours to place in trip), 3.3.2 (functions 1e, 1f, 4d, 4e – 72 hours to place in trip), 3.3.3 (function 17 – Info action), 3.3.4 (Table B 3.3.4-1, Instrument 3c – Info action).	
	US reports failure and requests assistance, WR, and CR.	
	<b>NOTE: The next event can occur once TS have been reviewed, or as directed by the lead evaluator.</b>	

EVENT 6: Given that there are indications of primary plant leakage due to a tube leak in the non-regenerative heat exchanger, the crew will take actions in accordance with 1-AP-16, "Increasing Primary Plant Leakage."

TIME	EXPECTED ACTION	INSTRUCTOR REMARKS
	SPD Verified: _____ (Initials) <ul style="list-style-type: none"> <li>• Letdown flow decreases</li> <li>• VCT level slowly decreases</li> <li>• CC surge tank level slowly increases</li> </ul>	
	RO identifies a decrease in letdown flow and/or a decrease in VCT level.	
	<b>NOTE: Crew may also check Aux Building and Containment sump levels at this time.</b>	
	US announces entry into AP-16.	
	Crew verifies unit in modes 1, 2, or 3.	
	*RO verifies parameters under his control: <ul style="list-style-type: none"> <li>• PRZR level</li> <li>• RCS subcooling</li> <li>• VCT level.</li> </ul>	
	RO checks 1-CH-LCV-1115A not diverted.	
	<b>NOTE: Crew may also notice increase in CC surge tank level at any time.</b>	
	Crew checks letdown parameters normal for plant conditions: <ul style="list-style-type: none"> <li>• Letdown flow. (NO)</li> </ul>	
	RO isolates letdown: <ul style="list-style-type: none"> <li>• Closes 1-CH-HCV-1200B</li> <li>• Closes 1-CH-LCV-1460A and 1460B.</li> </ul>	
	Crew checks excess letdown temperature and pressure.	
	Crew checks charging parameters normal: <ul style="list-style-type: none"> <li>• Pump discharge pressure</li> <li>• Flow</li> <li>• Regen HX outlet temperature</li> <li>• Seal Injection flow</li> <li>• AB sump level.</li> </ul>	

EVENT 6: Given that there are indications of primary plant leakage due to a tube leak in the non-regenerative heat exchanger, the crew will take actions in accordance with 1-AP-16, "Increasing Primary Plant Leakage."

TIME	EXPECTED ACTION	INSTRUCTOR REMARKS
	Crew checks containment parameters: <ul style="list-style-type: none"> <li>• Sump pumping rate</li> <li>• Temperature</li> <li>• Pressure</li> <li>• Radiation</li> <li>• Dispatches operator with AB attachment, as time permits.</li> </ul>	
	Crew checks safeguards parameters: <ul style="list-style-type: none"> <li>• Sump alarms</li> <li>• Radiation monitors</li> <li>• Temperatures</li> <li>• Locally check for leaks, as required.</li> </ul>	
	Crew verifies 1-CH-FCV-1122 in auto (and determines that it is not desired to place in AUTO due to previous failure).	
	Crew checks sample system.	
	Crew checks no CVCS manipulations in progress.	
	Crew checks RCP thermal barrier flow.	
	Crew checks for activities that could affect primary leakage.	
	Crew checks other parameters normal. (NO)	
	BOP identifies that CC surge tank level (and possibly CC RM) are increasing.	
	Crew verifies/isolates letdown and monitors head tank level.	
	Crew makes appropriate notifications.	
	Crew makes preparations to place excess letdown in service.	
	<b>NOTE: The next event can occur once letdown has been isolated and the crew is making preparations to place excess letdown in service.</b>	

EVENT 7: Given a steam leak between a MSTV and containment, the crew will respond in accordance with 1-AP-38, "Excessive Load Increase."		
TIME	EXPECTED ACTION	INSTRUCTOR REMARKS
SPD Verified: _____ (Initials)		
<ul style="list-style-type: none"> <li>• Main steam pressure decreasing.</li> <li>• Tave decreasing.</li> <li>• Power increasing.</li> </ul>		
	RO identifies Tave decreasing unexpectedly.	
	Crew identifies that power is increasing.	
	US directs crew to enter 1-AP-38.	
	RO verifies all steam dumps closed.	
	BOP verifies all SG PORVs closed.	
	Crew verifies main turbine load normal and reactor power $\leq 100\%$ and stable. (NO)	
	<b>NOTE: When operators have been dispatched, a call will be made stating that there is steam coming out the door of the Unit one main steam valve house.</b>	
	RO commences lowering Tave using boration/control rods.	
	BOP commences lowering main turbine load.	
	<b>NOTE: Once the crew is informed of the steam issuing from the MSVH they may choose to trip the reactor due to safety concerns and because a power reduction will cause SG pressures to increase.</b>	
	Crew checks reactor power reduced to the power level before the event started.	
	<b>NOTE: The next event will occur when ramp has been stopped, the unit has been tripped, or as directed by the lead evaluator.</b>	

EVENT 8: Given that the unit is at power, and a main steam line break has occurred and the reactor cannot be tripped either automatically nor manually, the crew will be expected to respond in accordance with 1-E-0, "Reactor Trip or Safety Injection," 1-FR-S.1, "Response to Nuclear Power Generation/ATWS," 1-E-2, "Faulted Steam Generator Isolation," and 1-ES-1.1, "SI Termination."

TIME	EXPECTED ACTION	INSTRUCTOR REMARKS
SPD Verified: _____ (Initials) <ul style="list-style-type: none"> <li>• Annunciators F-F1, F-F2, F-F3 illuminate</li> <li>• "A" steam generator pressure decreases until generator is blown down</li> <li>• The reactor does not trip automatically or manually</li> <li>• Control rods do not insert in auto</li> <li>• Neither motor-driven AFW pump auto-starts</li> </ul>		
	Crew identifies a main steam line break has occurred.	
	US directs crew to enter 1-E-0.	
	RO/BOP attempt to trip the reactor.	
	US directs the crew to transition to FR-S.1.	
	<b>Crew identifies reactor did not trip, transitions to 1-FR-S.1, "Response to Nuclear Power Generation/ATWS,"</b> <ul style="list-style-type: none"> <li>• RO/BOP manually trips the reactor. (NO)</li> <li>• BOP trips the turbine</li> <li>• <b>RO manually inserts control rods.</b></li> </ul>	<b>Critical Task</b>
	BOP checks all AFW pumps running, (NO)	
	<b>Crew starts all AFW pumps: BOP starts FW-P-3A, FW-P-3B.</b>	<b>Critical Task</b>
	<b>Crew identifies reactor did not trip, transitions to 1-FR-S.1, "Response to Nuclear Power Generation/ATWS,"</b> <ul style="list-style-type: none"> <li>• RO verifies at least one charging pump running.</li> <li>• <b>RO places in-service boric acid transfer pump in fast speed.</b></li> <li>• <b>RO opens emergency borate valve 1-CH-MOV-1350.</b></li> <li>• Crew verifies adequate negative reactivity insertion or injects the BIT.</li> </ul>	<b>CT Continued</b>

EVENT 8: Given that the unit is at power, and a main steam line break has occurred and the reactor cannot be tripped either automatically nor manually, the crew will be expected to respond in accordance with 1-E-0, "Reactor Trip or Safety Injection," 1-FR-S.1, "Response to Nuclear Power Generation/ATWS," 1-E-2, "Faulted Steam Generator Isolation," and 1-ES-1.1, "SI Termination."

TIME	EXPECTED ACTION	INSTRUCTOR REMARKS
	<b>NOTE: Once the steam leak is reported the crew may close the MSTVs.</b>	
	<b>NOTE: A safety injection will likely occur before the reactor is tripped. The crew will initiate attachment for SI after the reactor has been shutdown.</b>	
	<b>NOTE: Approximately two minutes after operator is dispatched the reactor will be locally tripped.</b>	
	Crew dispatches operator to locally trip reactor.	
	<b>NOTE: If reactor is subcritical the crew will transition to E-0 at this time, see below for steps.</b>	
	Crew checks if reactor is subcritical.	
	<b>NOTE: Crew may throttle auxiliary feed in this or subsequent steps.</b>	
	BOP checks SG levels.	
	Crew verifies all dilution paths isolated.	
	Crew checks for reactivity insertion from uncontrolled cooldown.	
	BOP closes the MSTVs and Bypass Valves.	
	Crew checks for faulted SG.	
	Crew checks CETCs less than 1200°F.	
	Crew verifies the reactor is subcritical.	
	US directs transition to 1-E-0.	<b>E-0 steps</b>
	RO verifies reactor tripped.	
	BOP verifies turbine tripped.	
	RO verifies AC emergency busses energized.	

EVENT 8: Given that the unit is at power, and a main steam line break has occurred and the reactor cannot be tripped either automatically nor manually, the crew will be expected to respond in accordance with 1-E-0, "Reactor Trip or Safety Injection," 1-FR-S.1, "Response to Nuclear Power Generation/ATWS," 1-E-2, "Faulted Steam Generator Isolation," and 1-ES-1.1, "SI Termination."

TIME	EXPECTED ACTION	INSTRUCTOR REMARKS
	RO/BOP check if SI has actuated or is required. (YES)	
	BOP verifies feedwater isolation: <ul style="list-style-type: none"> <li>• MFRVs closed</li> <li>• MFRBVs closed</li> <li>• Main feed MOVs closed</li> <li>• Standby MFP in PTL</li> <li>• Main feed pumps tripped</li> <li>• MFP discharge MOVs closed</li> <li>• SG BD TVs closed.</li> </ul>	
	Crew verifies phase A isolation: <ul style="list-style-type: none"> <li>• Manually initiates Phase A</li> <li>• Initiates Attachment to verify isolation.</li> </ul>	
	BOP verifies aux feed pumps running.	
	RO verifies charging pumps running.	
	BOP verifies low head pumps running.	
	BOP verifies all SW pumps running.	
	Crew checks if main steamlines should be isolated.	
	Crew verifies SI flow.	
	BOP verifies aux feed flow.	
	*RO checks Tave stable at or trending to desired temperature and Aux Feed flow is adjusted, if required.	
	RO checks pressurizer PORVs and spray valves.	
	RO checks RCP trip and charging pump recirc criteria.	
	Crew checks SG not faulted. (NO)	
	US directs transition to 1-E-2.	
	BOP closes the MSTVs and Bypass Valves.	If not done in FR-S.1 or using a focused brief.

EVENT 8: Given that the unit is at power, and a main steam line break has occurred and the reactor cannot be tripped either automatically nor manually, the crew will be expected to respond in accordance with 1-E-0, "Reactor Trip or Safety Injection," 1-FR-S.1, "Response to Nuclear Power Generation/ATWS," 1-E-2, "Faulted Steam Generator Isolation," and 1-ES-1.1, "SI Termination."

TIME	EXPECTED ACTION	INSTRUCTOR REMARKS
	BOP checks pressure in all SGs.	
	Crew identifies "A" as faulted SG.	
	<b>NOTE: Crew may have already isolated feed flow to the faulted generator using a focused brief.</b>	
	<b>Crew isolates the faulted SG.</b> <ul style="list-style-type: none"> <li>• BOP verifies MFW isolated.</li> <li>• BOP closes 1-FW-MOV-100D.</li> <li>• BOP verifies 1-FW-MOV-100A and 1-FW-HCV-100A closed.</li> <li>• BOP verifies "A" SG PORV closed.</li> <li>• BOP verifies all SG blowdown trip valves closed.</li> <li>• Crew dispatches an operator to locally close 1-MS-18.</li> </ul>	<b>Critical Task</b>
	BOP checks ECST level.	
	BOP verifies IA established to containment.	
	Crew checks secondary radiation. <ul style="list-style-type: none"> <li>• RO resets SI</li> <li>• RO resets phase A</li> <li>• RO resets AMSAC (if necessary)</li> <li>• BOP checks secondary radiation normal.</li> </ul>	
	Crew checks if SI can be terminated. (YES)	
	US directs transition to 1-ES-1.1.	
	RO stops all but one charging pump.	
	RO checks RCS pressure.	

EVENT 8: Given that the unit is at power, and a main steam line break has occurred and the reactor cannot be tripped either automatically nor manually, the crew will be expected to respond in accordance with 1-E-0, "Reactor Trip or Safety Injection," 1-FR-S.1, "Response to Nuclear Power Generation/ATWS," 1-E-2, "Faulted Steam Generator Isolation," and 1-ES-1.1, "SI Termination."

TIME	EXPECTED ACTION	INSTRUCTOR REMARKS
	Crew terminates SI: <ul style="list-style-type: none"> <li>• BOP verifies LHSI suctions from sump closed</li> <li>• RO checks charging pump recirc flow path aligned</li> <li>• BOP closes BIT inlet valves 1-SI-MOV-1867A and 1867B</li> <li>• BOP closes BIT outlet valves 1-SI-MOV-1867C and 1867D</li> <li>• BOP verifies alternate SI valves closed.</li> </ul>	
	<b>NOTE: The scenario may be terminated after the crew terminates SI, or as directed by the lead evaluator.</b>	

REFERENCES

PROCEDURE	REV.
Operating Procedure 1-OP-31.1, " Main Feedwater System."	42
Operating Procedure 1-OP-2.1, "Unit Startup from Mode 2 to Mode 1."	86
Abnormal Procedure 1-AP-3, "Loss of Vital Instrumentation."	22
Abnormal Procedure 1-AP-16, "Increasing Primary Plant Leakage."	24
Abnormal Procedure 1-AP-31, "Loss of Main Feedwater."	4
Abnormal Procedure 1-AP-38, "Excessive Load Increase."	14
Functional Restoration Procedure 1-FR-S.1, "Response to Nuclear Power Generation/ATWS."	14
Emergency Procedure 1-E-0, "Reactor Trip or Safety Injection."	36
Emergency Procedure 1-E-2, "Faulted Steam Generator Isolation."	11
Emergency Procedure 1-ES-1.1, "SI Termination."	18
Station Annunciator Response Procedures.	N/A
Guide and Reference Document PI-AA-5000, "Human Performance."	1
INPO, Guideline for Teamwork and Diagnostic Skill Development: INPO 88-003,	Jan. 1988
INPO, ACAD 07-002 Simulator Training Guidelines	Jan. 2007

## ATTACHMENTS

ATTACHMENT 1 - SIMULATOR OPERATOR'S COMPUTER PROGRAM

ATTACHMENT 2 - SCENARIO PERFORMANCE OBJECTIVES

ATTACHMENT 3 – SIMULATOR PERFORMANCE DATASHEET (Last page of scenario)

ATTACHMENT 1  
SIMULATOR OPERATOR'S COMPUTER PROGRAM

**SIMULATOR OPERATOR'S COMPUTER PROGRAM  
NRC 1**

**Initial conditions**

1. Recall IC 161
2. Ensure Tave (555-565), Tref, PDTT level, and VCT level are selected on trend recorders.
3. Place a WR magnet on 1-CH-RI-128.
4. Set D bank to 155 steps in PCS.
5. 1-OP-2.1 and 1-OP-31.1 filled out to appropriate steps.
6. Reactivity plan available.
7. Rods in manual.
8. Rackout 2-CC-P-1A and verify 2-CC-P-1B is running. Close U2\_CC\_11, U2\_CC\_4.

**PRELOADS PRIOR TO SCENARIO START**

CONDITION	MALFUNCTION/OVERRIDE/ETC.
Letdown rad monitor failure	<b>Malfunction:</b> RM0207, Severity = -1
Auto-start failure of 1-CN-P-1B	<b>Switch override:</b> CNP1B ASTOP = OFF
Auto-start failure of 1-FW-P-3A/3B	<b>Malfunctions:</b> FW2601 FW2602
Failure of rods to move in auto	<b>Malfunction:</b> RD14
Failure of Auto or Manual Reactor Trip	<b>Malfunctions:</b> RD32 RD38 <b>Remote function: RP</b> AMSAC_DEFEAT = TRUE

**SCENARIO EVENTS**

EVENT	MALFUNCTION/OVERRIDE/COMMUNICATIONS
1) Start a MFW pump	Give appropriate cues as WCC and field operator. MFW pump suction flows are available on ExtremeView.
2) Unit ramp	Give appropriate cues as WCC and field operators.
3) Trip of "A" Condensate pump/IRPI failure	<p><b>Malfunctions:</b>            CN0201, Delay time = 5, Trigger = 3            RD0121, Delay time = 185, Severity = -1, Trigger = 3</p> <p><b>NOTE: When sent to Condensate pumps, report that "B" is running fine. Can see no nothing wrong with A" locally.</b></p> <p><b>If sent to Condensate pump breaker, report that 15A4 has an overcurrent drop on it.</b></p> <p><b>NOTE: If I&amp;C technicians are called about rod, can report back that it is an IRPI problem. As they would be standing by for IRPI adjustments during the ramp, this communication can be given in a timely manner.</b></p> <p><b>NOTE: The next event can occur once Condensate flow has been re-established and tech specs have been reviewed.</b></p>
4) Failure of 1-CH-FT-1122	<p><b>Malfunction:</b>            CH08, Delay time = 5, Severity = 1, Ramp = 10, Trigger = 4</p> <p><b>NOTE: If dispatched to look at valve, transmitter, etc, report that everything looks normal.</b></p> <p><b>NOTE: The next event can occur once charging has been returned to normal, or as directed by the lead evaluator.</b></p>
5) Failure of "A" SG CH. III steam pressure	<p><b>Malfunction:</b>            MS1701, Delay time = 5, Ramp = 5, Severity = -1, Trigger = 5</p> <p><b>NOTE: The next event can occur once Tech Specs have been reviewed.</b></p>

EVENT	MALFUNCTION/OVERRIDE/COMMUNICATIONS
6) Tube leak in non-regen HX	<p><b>Malfunction:</b> CH13, Delay time = 5, Ramp = 120, Severity = 50, Trigger = 6</p> <p><b>NOTE: The next event can occur once letdown has been isolated and preparations are being made to place excess letdown in service. Do not close breaker for excess letdown procedure until after next event initiated.</b></p>
7) Steam leak outside containment	<p><b>Malfunction:</b> MS1001, Delay time = 5, Ramp = 180, Severity = 2.5, Trigger = 7</p> <p><b>NOTE: When operators have been dispatched, a call will be made stating that there is steam coming out the door of the Unit one main steam valve house.</b></p> <p><b>NOTE: The next event can occur once reactor power has been stabilized, or the unit has been tripped.</b></p>
8) MSLB with ATWS/Rods will not insert in auto	<p><b>Malfunctions:</b> <b>Update MS1001 to a severity of 20 using trigger 8</b> On trigger screen set up trigger 8 as follows: IMF MS1001 (0 5) 20 300</p> <p><b>NOTE: Trigger 10 will open the RTBs TWO minutes after it is inserted.</b></p> <p><b>Remote functions:</b> SP_RTA_BKR = F, Delay time = 120, Trigger = 10 SP_RTB_BKR = F, Delay time = 121, Trigger = 10</p> <p><b>NOTE: Check SG pressure and decide if you could safely enter MSVH at that time.</b></p> <p><b>NOTE: The scenario may be terminated once the crew has terminated safety injection, or at the direction of the lead evaluator.</b></p>

ATTACHMENT 2  
SCENARIO PERFORMANCE OBJECTIVES

## SIMULATOR REQUALIFICATION EXAMINATION

### TERMINAL PERFORMANCE OBJECTIVE

Given equipment failures and operational situations, operate the plant in accordance with Technical Specifications to bring the unit to a safe condition, using applicable procedures, and applying effective teamwork, communication, and diagnostic skills.

### GENERIC PERFORMANCE OBJECTIVES

- A. During shift operations the shift manager will take a conservative course of action, especially when uncertain conditions exist, when dealing with core cooling or heat sink availability, primary system and containment integrity, and reactivity control associated with plant evolutions.
- B. During shift operations the shift manager will provide overall crew guidance by prioritizing and integrating the actions of the shift crew in accordance with administrative procedures.
- C. During shift operations each crew member will participate in a team effort that resolves conflicts, provides input into the team decision and communicates all the necessary information to enhance teamwork in accordance with administrative procedures.
- D. During shift operations the Shift Technical Advisor will independently assess events and based on those assessments make recommendations to the crew regarding mitigation strategy.

## **EVENT 1 PERFORMANCE OBJECTIVES**

**EVENT GOAL:** Given that the unit is at 45% power, the crew will start a second Main Feedwater Pump in accordance with 1-OP-31.1, "Main Feedwater System."

### **NORTHLANNA SPECIFIC TASKS:**

R406 Start a standby main feedwater pump.

### **CRITICAL TASK:**

N/A

## **EVENT 2 PERFORMANCE OBJECTIVES**

**EVENT GOAL:** Given that the unit is at 45% power and the crew has been instructed to increase power, the crew will ramp the unit up in accordance with 1-OP-2.1, "Unit Startup from Mode 2 to Mode 1."

### **NORTH ANNA SPECIFIC TASKS:**

R705 Dilute the RCS using the blender.

### **CRITICAL TASK:**

N/A

### **EVENT 3 PERFORMANCE OBJECTIVES**

**EVENT GOAL:** Given that the unit is at power and a Main Condensate pump has tripped with no auto-start of the standby pump, the crew will be expected to respond in accordance with 1-AP-31, "Loss of Main Feedwater."

#### **NORTH ANNA SPECIFIC TASKS:**

R781 Respond to a loss of main feedwater.

S70 Evaluate compliance with technical specifications.

#### **CRITICAL TASK:**

N/A

**EVENT 4 PERFORMANCE OBJECTIVES**

**EVENT GOAL:** Given that the charging flow transmitter has failed high, the crew will respond in accordance with AR for C-C5 annunciator

**NORTH ANNA SPECIFIC TASKS:**

None

**CRITICAL TASK:**

N/A

## **EVENT 5 PERFORMANCE OBJECTIVES**

**EVENT GOAL:** Given the plant is in mode one with indications of a failed steam pressure transmitter, the crew will respond in accordance with 1-AP-3, "Loss of Vital Instrumentation."

### **NORTH ANNA SPECIFIC TASKS:**

R626 Respond to a steam generator water level control channel failure.

S70 Evaluate compliance with technical specifications.

### **CRITICAL TASK:**

N/A

## **EVENT 6 PERFORMANCE OBJECTIVES**

**EVENT GOAL:** Given that there are indications of primary plant leakage due to a tube leak in the non-regenerative heat exchanger, the crew will take actions in accordance with 1-AP-16, "Increasing Primary Plant Leakage."

### **NORTH ANNA SPECIFIC TASKS:**

R520 Respond to increasing primary-plant leakage.

### **CRITICAL TASK:**

N/A

## **EVENT 7 PERFORMANCE OBJECTIVES**

**EVENT GOAL:** Given a steam leak between a MSTV and containment, the crew will respond in accordance with 1-AP-38, "Excessive Load Increase."

### **NORTH ANNA SPECIFIC TASKS:**

R539 Perform the immediate operator actions in response to an excessive load increase.

### **CRITICAL TASK:**

N/A

## **EVENT 8 PERFORMANCE OBJECTIVES**

**EVENT GOAL:** Given that the unit is at power, and a main steam line break has occurred and the reactor cannot be tripped either automatically nor manually, the crew will be expected to respond in accordance with 1-E-0, "Reactor Trip or Safety Injection," 1-FR-S.1, "Response to Nuclear Power Generation/ATWS," 1-E-2, "Faulted Steam Generator Isolation," and 1-ES-1.1, "SI Termination."

### **NORTH ANNA SPECIFIC TASKS:**

- R224 Perform the immediate operator actions in response to a nuclear power generation/ATWS.
- R183 Identify and isolate a faulted steam generator.
- R189 Terminate safety injection.

### **CRITICAL TASK:**

See Following Pages

CT Statement:

Crew identifies reactor did not trip, transition to 1-FR-S.1, "Response to Nuclear Power Generation/ATWS," and take actions to bring the reactor subcritical.

Safety Significance:

Failure to insert negative reactivity under the postulated plant conditions results in an unnecessary situation in which the reactor remains critical. Failure to insert negative reactivity constitutes "mis-operation or incorrect crew performance which leads to incorrect reactivity control."

Cues:

Valid indication of a required reactor trip by the presence of a first out annunciator, with a failure of the reactor to trip automatically or manually from the control room.

Performance Indicator:

RO inserts control rods in manual  
RO places in-service boric acid transfer pump in fast speed.  
RO opens emergency borate valve 1-CH-MOV-1350

- OR -

Crew dispatches operator to locally trip the reactor using attachment, Remote Reactor Trip.

Feedback:

- \* Control rods moving in or fully inserted.
- \* Emergency boration flow indicated.
- \* Neutron flux decreasing.
- \* Pressurizer pressure less than 2335 psig.

WOG Reference:

FR-S.1 Background.

Conditions:

Prior to completion of step requiring its performance.

CT Statement:

Crew starts all AFW pumps.

Safety Significance:

Failure to start at least the minimum required number of AFW pumps under the postulated plant conditions can lead to violation of the RCS emergency stress limit.

Cues:

Valid indication of a required reactor trip by the presence of a first out annunciator, with a failure of the reactor to trip automatically or manually from the control room.

Performance Indicator:

BOP places motor driven AFW pump control switches to start

Feedback:

Minimum AFW flow indicated to SGs.

WOG Reference:

FR-S.1 Background

Conditions:

Before completing step requiring its performance

CT Statement:

Crew isolates faulted Steam Generator.

Safety Significance:

Failure to isolate a faulted SG that can be isolated causes challenges to the integrity CSF beyond those irreparably introduced by the postulated conditions. For the reference plant, neither of these transients (blowdown of a single SG with or without RCPs running) constitutes an orange-path challenge to the integrity CSF. However, if the faulted SG is not isolated, the cooldown transient for reactor vessel inlet temperature could result in an orange-path challenge to the integrity CSF, especially if RCPs are not running.

Cues:

- \* "A" SG is depressurizing in an uncontrolled manner or is completely depressurized and
- \* Valve position and flow rate indication that AFW continues to be delivered to the faulted SG

Performance Indicator:

BOP closes 1-FW-MOV-100D to secure AFW flow to "A" steam generator.

Feedback:

AFW flow indication to "A" steam generator decreases to zero.

WOG Reference:

E-2 Background.

Conditions:

Prior to transitioning out of E-2.

ATTACHMENT 3  
SIMULATOR PERFORMANCE DATASHEET

### Scenario Performance Datasheet

EVENT 1: Given that the unit is at 45% power, the crew will start a second Main Feedwater Pump in accordance with 1-OP-31.1, "Main Feedwater System."

SPD Verified: \_\_\_\_\_ (Initials)

- 1-FW-P-1C starts and runs normally

EVENT 2: Given that the unit is at 45% power and the crew has been instructed to increase power, the crew will ramp the unit up in accordance with 1-OP-2.1, "Unit Startup from Mode 2 to Mode 1."

SPD Verified: \_\_\_\_\_ (Initials)

- Reactor power increases
- Turbine power increases
- Tavg/Tref increase
- Generator megawatts increase

EVENT 3: Given that the unit is at power and a Main Condensate pump has tripped with no auto-start of the standby pump, the crew will be expected to respond in accordance with 1-AP-31, "Loss of Main Feedwater."

SPD Verified: \_\_\_\_\_ (Initials)

- Annunciators G-G6 and, later, G-F6 illuminate
- 1-CN-P-1A has amber breaker disagreement light lit
- 1-CN-P-1B does not auto-start
- Feed pump suction pressure decreases
- After several minutes: annunciators A-G2 and AF1 will illuminate
- IRPI for rod K-2 in Control Bank A will drop to zero
- Rod Bottom Light for K-2 will illuminate

EVENT 4: Given that the charging flow transmitter has failed high, the crew will respond in accordance with AR for C-C5 annunciator

SPD Verified: \_\_\_\_\_ (Initials)

- Annunciator C-C5 will illuminate
- 1-CH-FI-1122 will indicate full scale high
- 1-CH-FCV-1122 will indicate minimum demand
- Later, C-B3 may alarm if 1-CH-FCV-1122 not yet in manual and open.

### Scenario Performance Datasheet

EVENT 5: Given the plant is in mode one with indications of a failed steam pressure transmitter, the crew will respond in accordance with 1-AP-3, "Loss of Vital Instrumentation."

SPD Verified: \_\_\_\_\_ (Initials)

- Annunciators F-H1 and F-E1 illuminate
- Status lights N-C3 and N-D3 illuminate
- 1-MS-PI-1475 fails low
- 1-MS-FI-1474 fails low
- "A" MFRV ramps closed
- "A" SG level decreases

EVENT 6: Given that there are indications of primary plant leakage due to a tube leak in the non-regenerative heat exchanger, the crew will take actions in accordance with 1-AP-16, "Increasing Primary Plant Leakage."

SPD Verified: \_\_\_\_\_ (Initials)

- Letdown flow decreases
- VCT level slowly decreases
- CC surge tank level slowly increases

EVENT 7: Given a steam leak between a MSTV and containment, the crew will respond in accordance with 1-AP-38, "Excessive Load Increase."

SPD Verified: \_\_\_\_\_ (Initials)

- Main steam pressure decreasing.
- Tave decreasing.
- Power increasing.

EVENT 8: Given that the unit is at power, and a main steam line break has occurred and the reactor cannot be tripped either automatically nor manually, the crew will be expected to respond in accordance with 1-E-0, "Reactor Trip or Safety Injection," 1-FR-S.1, "Response to Nuclear Power Generation/ATWS," 1-E-2, "Faulted Steam Generator Isolation," and 1-ES-1.1, "SI Termination."

SPD Verified: \_\_\_\_\_ (Initials)

- Annunciators F-F1, F-F2, F-F3 illuminate
- "A" steam generator pressure decreases until generator is blown down
- The reactor does not trip automatically or manually
- Control rods do not insert in auto
- Neither motor-driven AFW pump auto-starts

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NORTH ANNA POWER STATION

INITIAL LICENSED OPERATOR EXAMINATION  
SIMULATOR EXAMINATION GUIDE  
SCENARIO NRC 2

## SIMULATOR EXAMINATION GUIDE

<u>EVENT</u>	<u>DESCRIPTION</u>
1.	SW pump trips
2.	Uncontrolled inward rod motion
3.	Loss of condenser vacuum. During ramp will lose level error signal to "A" MFRV
4.	Running charging pump degrades, auto-start defeated on standby pump, discharge check valve will stick on degraded pump
5.	RCS leak
6.	SBLOCA

### Scenario Recapitulation:

Malfunctions after EOP entry	2 (Failure of auto SI, BIT inlets do not open)
Total Malfunctions	8 (SW pump trip, uncontrolled rod motion, loss of condenser vacuum, loss of level error signal to MFRV, degradation of running charging pump/stuck open check valve, RCS leak, SBLOCA, failure of auto SI, BIT inlets do not open)
Abnormal Events	5 (SW pump trip, uncontrolled rod motion, loss of condenser vacuum, loss of level error signal to MFRV, degradation of running charging pump/stuck open check valve, RCS leak)
Major Transients	1 (SBLOCA)
EOPs Entered	1 (E-1)
EOP Contingencies	0
Critical Tasks	6

### SCENARIO DURATION

90 Minutes

## **SIMULATOR EXAMINATION SCENARIO SUMMARY**

### **SCENARIO NRC 2**

The scenario begins with the unit at 100% power. The letdown radiation monitor is OOS and the terry turbine was returned to service last shift. 2-CC-P-1A is tagged out for seal maintenance.

After the crew assumes the watch, the unit 2 "A" service water pump will trip resulting in a loss of service water to "B" header. The crew should respond in accordance with 1-AP-12, "Loss of Service Water," and after checking system integrity, start the unit 1 "B" SW pump. After the service water system has been verified stable, the next event will occur.

The next event will be a failure of the automatic rod control system. Control rods will start inserting for no known reason. The crew will be expected to perform the immediate operator actions of AP-1.1, "Continuous Uncontrolled Rod Motion," and place rod control in manual. After the crew stabilizes the unit and directs I&C department to investigate, the next event will occur.

The crew should identify an increase in Main Condenser pressure and enter 1-AP-14, "Low Condenser Vacuum," to respond to the event. As directed by 1-AP-14, the crew should reduce main turbine load until main condenser vacuum stabilizes. During the ramp the "A" MFRV will lose its level error signal. Due to this failure the valve will not automatically control level at program during transient conditions. When sent to investigate the vacuum loss, the turbine building operator will report that the "A" Air Ejector loop seal is hot to the touch. He will be directed to isolate the loop seal. Once this has been done, vacuum will start to improve and the crew will stop the ramp. When the unit is stable the next event can occur.

Next, the running charging pump, 1-CH-P-1A, will degrade. The crew will start another charging pump. When the crew secures the degraded pump its discharge check valve will stick open. The crew should enter 1-AP-49, "Loss of Normal Charging." The crew will close the "A" charging pump discharge and restore charging to normal. The crew will then use AP-49 to reestablish letdown and stabilize the plant. The Unit Supervisor should refer to Technical Specifications and declare the "A" charging pump inoperable. Due to "C" pump having no auto-start capability, and thus only being operable when running, the crew will make preparations to start this pump. At this point the next event will occur.

The transient on the charging system will cause an RCS leak to occur inside the containment. The crew should respond in accordance with 1-AP-16, "Increasing Primary Plant Leakage." The US should refer to Technical Specifications and either direct the crew to commence a unit shutdown or make preparations for a containment entry due to excessive RCS leakage. Once the crew has commenced either a ramp or started preparations for a containment entry, the next event will occur.

The RCS leak will worsen and the crew will trip the reactor and enter 1-E-0, "Reactor Trip or Safety Injection." Safety injection will fail to actuate automatically, but can be manually initiated. The BIT inlet valves will fail to open automatically and will have to be manually opened. The crew will stop the RCPs and close the charging pump recirc valves. The crew will transition to 1-E-1, "Loss of Reactor or Secondary Coolant." Once the crew has performed some actions in 1-E-1, the scenario can be terminated.

## SCENARIO TURNOVER SHEET

### **Read the following to the crew:**

**Purpose:** This examination is intended to evaluate the crew's performance of various tasks associated with the Licensed Operator Training Program. All activities should be completed in accordance with approved operations standards.

1. You are on a day shift during the week.
2. When conditions allow, utilize the computer log systems as you would in the plant.

### **Unit Status:**

Unit 1 is at 100% power. RCS boron is 978 ppm and core age is 9000 MWD/MTU. Aux steam is on unit 1.

Unit 2 is at 100% power.

### **Equipment Status:**

1-CH-RI-128, Letdown radiation monitor, is OOS. 1-FW-P-2 was returned to service last shift, PMT was SAT. 2-CC-P-1A is tagged out for seal maintenance. Maintenance rule window is green.

### **Shift Orders:**

Maintain current plant conditions and support maintenance on 2-CC-P-1A.

EVENT 1: Given the plant in mode 1 and indications of a loss of one service water pump, the crew will respond in accordance with 0-AP-12, "Loss of Service Water."		
TIME	EXPECTED ACTION	INSTRUCTOR REMARKS
SPD Verified: _____ (Initials)		
<ul style="list-style-type: none"> <li>Annunciators J-D3 and J-B3 illuminate</li> <li>"B" SW header pressure and flow decrease</li> </ul>		
	BOP identifies annunciators J-D3, SW PP 1-P1A, 2-P1A AUTO TRIP, and J-B3, SERV WTR RETURN HDR LO FLOW.	
	BOP identifies low flow condition on "B" SW header.	
	BOP identifies unit-2 "A" SW pump tripped.	
	US directs entry into 0-AP-12.	
	BOP checks SW reservoir level.	
	Crew determines no flooding is indicated.	
	Crew verifies SW headers are intact.	
	BOP verifies at least one SW pump running on each header. (NO)	
	BOP starts "B" SW pump.	
	BOP verifies return header flow is indicated.	
	BOP verifies SW system stable.	
	US makes notifications.	
	US refers to TS-3.7.8 and determines that action "B" applies, which allows 72 hours to verify SW throttled.	
	<b>NOTE: The next event will occur after the US refers to technical specifications, or as directed by the lead evaluator.</b>	

EVENT 2: Given that the unit is operating at power and control rods are inserting for no apparent reason, the crew will be expected to respond in accordance with 1-AP-1.1, "Continuous Uncontrolled Rod Motion."

TIME	EXPECTED ACTION	INSTRUCTOR REMARKS
SPD Verified: _____ (Initials) • Rods step in at maximum speed		
	RO identifies control rods stepping in at maximum speed.	
	RO/BOP identify no known cause of rod insertion.	
	US directs crew to enter AP-1.1.	
	<b>Crew takes action to stop rod motion and stabilize the unit.</b> • RO places rod control in MANUAL. • RO verifies rod motion stopped.	<b>Critical Task</b>
	Crew verifies control rods above the lo-lo insertion limit.	
	RO checks RCS Tave and adjusts as directed by the US.	
	RO checks PRZR pressure.	
	RO checks PRZR level.	
	Crew checks controls rods above the lo insertion limit.	
	Crew maintains stable plant conditions.	
	US notifies I&C to investigate.	
	The US reports the failure to the Work Control Center and requests that the reactivity management admin procedure be referenced, appropriate notifications made, and Work Request and Condition Report be initiated.	
	<b>NOTE: The next event will occur after the crew has stabilized the plant, or as directed by the lead evaluator.</b>	

EVENT 3: Given that the unit is at power and loss of condenser vacuum is occurring, the crew will respond in accordance with 1-AP-14, "Low Condenser Vacuum."

TIME	EXPECTED ACTION	INSTRUCTOR REMARKS
SPD Verified: _____ (Initials) <ul style="list-style-type: none"> <li>• Condenser vacuum worsens</li> <li>• Annunciator A-G1 alarms if vacuum reaches setpoint</li> <li>• "A" MFRV will not control in auto</li> </ul>		
	Crew identifies worsening condenser vacuum.	
	US directs crew to enter 1-AP-14.	
	BOP removes turbine from valve position limiter, as required.	
	BOP places turbine control in IMP-IN.	
	BOP commences manual turbine load reduction.	
	US directs entry into either 1-OP-2.2 or 1-AP-2.2 while continuing with 1-AP-14.	
	*Crew monitors condenser vacuum 3.5" or less.	
	BOP verifies condenser vacuum breaker closed.	
	BOP verifies all condenser waterboxes in service. (YES)	
	<b>NOTE: During the ramp the BOP will identify the failure of the "A" MFRV to automatically control SG level at program. This valve will need to be adjusted in manual during the ramp.</b>	
	BOP verifies air ejector lineup.	
	BOP verifies gland steam operation.	
	Crew dispatches watchstander to perform local actions.	
	<b>NOTE: When dispatched, the field operator will isolate the loop seal per the AP-14 attachment and then inform the control room. At this time vacuum will begin to improve.</b>	
	RO controls RCS temperature with blender or control rods.	

EVENT 3: Given that the unit is at power and loss of condenser vacuum is occurring, the crew will respond in accordance with 1-AP-14, "Low Condenser Vacuum."		
TIME	EXPECTED ACTION	INSTRUCTOR REMARKS
	Crew checks vacuum stable or improving.	
	Crew checks condensate and circ water systems.	
	Crew verifies vacuum stable or improving.	
	Crew verifies main turbine on line	
	Crew checks cause of vacuum loss identified and repaired.	
	US makes report to Work Control Center and requests that WR, CR, and management notifications be made.	
	<b>NOTE: Once the crew has stabilized the unit the next event can occur.</b>	

EVENT 4: Given that the unit is at power and there is a degradation of the running charging pump and a failed open discharge check valve occurs when the pump is secured, the crew will respond in accordance with 1-AP-49, "Loss of Normal Charging."

TIME	EXPECTED ACTION	INSTRUCTOR REMARKS
SPD Verified: _____ (Initials) <ul style="list-style-type: none"> <li>• Charging flow initially decreases</li> <li>• Charging pump discharge pressure decreases</li> <li>• Temperature increases on 1-SW-TI-103A</li> <li>• Annunciator C-B6 illuminates</li> <li>• Annunciators C-B3, C-B5, and C-C5 illuminate when "A" charging pump is stopped</li> <li>• Charging flow goes to zero when "A" charging pump is stopped</li> </ul>		
	RO identifies degrading conditions on 1-CH-P-1A.	
	RO identifies annunciator C-B6, CH-P-1A-B-C LUBE OIL HI TEMP.	
	<b>NOTE: Report from the field will be that 1-CH-P-1A is making a lot of noise.</b>	
	US directs starting of 1-CH-P-1B (C).	
	US directs stopping of 1-CH-P-1A.	
	Crew identifies loss of charging flow.	
	<b>NOTE: The crew may isolate letdown based on AR instructions. If so, step 6 will restore letdown.</b>	
	US directs crew to enter 1-AP-49.	
	Crew checks the charging pump that was started for gas binding. (NO)	
	Crew identifies that a charging pump manipulation has taken place.	
	<b>Crew closes discharge MOVs for the previously running pump ("A").</b>	<b>Critical Task</b>
	RO verifies charging conditions returning to normal.	
	US reviews TS 3.5.2 for having only one operable HHSI pump (if 1-CH-P-1B was started).	
	US reports failures and requests WR, CR, and management notifications be made.	

EVENT 4: Given that the unit is at power and there is a degradation of the running charging pump and a failed open discharge check valve occurs when the pump is secured, the crew will respond in accordance with 1-AP-49, "Loss of Normal Charging."

TIME	EXPECTED ACTION	INSTRUCTOR REMARKS
	<b>NOTE: Crew may also discuss an entry into TS 3.0.3, which was applicable until the "A" discharge MOVs were closed.</b>	
	<b>NOTE: Crew may discuss starting the "C" pump on the 1H bus (if not initially started).</b>	
	<b>NOTE: Once the US has referred to Tech Specs or as directed by the Lead Evaluator, the next event will occur.</b>	

EVENT 5: Given that the unit is at power and an RCS leak has developed, the crew will be expected to respond in accordance with 1-AP-16, "Primary Plant Leakage."

TIME	EXPECTED ACTION	INSTRUCTOR REMARKS
	SPD Verified: _____ (Initials) <ul style="list-style-type: none"> <li>• Pressurizer level decreases (B-F8 alarms)</li> <li>• Containment sump level increases</li> <li>• Charging flow increases</li> <li>• Radiation levels on 1-RM-RMS-160 and 1-RM-RMS-163 increase</li> <li>• Annunciators K-D2, and later, K-D4 alarm</li> </ul>	
	<b>NOTE: Any of the following indications may be identified first.</b>	
	RO identifies charging flow increasing.	
	BOP identifies containment sump level increasing.	
	Crew identifies containment radiation levels are increasing.	
	US directs entry into 1-AP-16 and 1-AP-5.	
	Crew verifies unit in mode 1.	<b>AP-16</b>
	RO verifies primary parameters under operator control.	
	<b>NOTE: Crew may isolate letdown at this time.</b>	
	RO checks LCV-1115A not diverted.	
	RO verifies letdown in service with normal indications.	
	RO checks excess letdown parameters.	
	RO checks charging system parameters normal.	
	BOP checks Auxiliary Building sump level normal.	
	Crew checks containment conditions.	
	Crew identifies increasing containment radiation and sump pumping rate.	
	US/STA refers to Tech. Spec. 3.4.13.	

EVENT 5: Given that the unit is at power and an RCS leak has developed, the crew will be expected to respond in accordance with 1-AP-16, "Primary Plant Leakage."

TIME	EXPECTED ACTION	INSTRUCTOR REMARKS
	US directs crew to either commence a unit shutdown or make preparations for a containment entry.	
	US makes report to Work Control Center and requests CR and management notifications.	
	Health Physics department is informed of the high reading on 1-RM-RMS-160 and asked to take containment gaseous and particulate samples, if required.	<b>AP-5 steps for 1-RM-RMS-160 alarm</b>
	A primary leak rate calculation is initiated.	
	HP is requested to take containment sump samples.	
	<b>NOTE: The next event will occur after the crew either makes preparations to ramp, makes preparations for a containment entry, or as directed by the lead evaluator.</b>	

EVENT 6: Given that the unit is at power and a LOCA has occurred, the crew will respond in accordance with 1-E-0, "Reactor Trip or Safety Injection," and 1-E-1, "Loss of Reactor or Secondary Coolant."

TIME	EXPECTED ACTION	INSTRUCTOR REMARKS
SPD Verified: _____ (Initials) <ul style="list-style-type: none"> <li>• Pressurizer level and pressure rapidly decrease</li> <li>• Containment pressure slowly increases</li> <li>• SI does not automatically actuate, if required</li> <li>• BIT inlet valves do not open automatically</li> </ul>		
	RO identifies PRZR pressure and level rapidly decreasing.	
	US directs crew to enter 1-E-0.	
	Crew manually trips the reactor.	
	BOP verifies turbine trip.	
	RO verifies AC emergency busses energized.	
	Crew checks if safety injection has actuated, or should have actuated.	
	<b>Crew manually actuates SI.</b> <ul style="list-style-type: none"> <li>• <b>RO/BOP manually actuate SI</b></li> </ul>	<b>Critical Task</b> <b>SI will not automatically actuate.</b>
	BOP verifies feedwater isolation: <ul style="list-style-type: none"> <li>• MFRVs closed</li> <li>• MFRBVs closed</li> <li>• Main feed MOVs closed</li> <li>• Standby MFP in PTL</li> <li>• Main feed pumps tripped</li> <li>• MFP discharge MOVs closed</li> <li>• SG BD TVs closed.</li> </ul>	
	RO/BOP manually initiate phase A isolation.	
	BOP verifies AFW pumps running.	
	<b>NOTE: Crew may have previously held a focused briefed and started 1-CH-P-1C.</b>	
	Crew verifies SI pumps running. (NO)	
	Crew starts 1-CH-P-1C.	
	BOP verifies SW pumps running.	

EVENT 6: Given that the unit is at power and a LOCA has occurred, the crew will respond in accordance with 1-E-0, "Reactor Trip or Safety Injection," and 1-E-1, "Loss of Reactor or Secondary Coolant."

TIME	EXPECTED ACTION	INSTRUCTOR REMARKS
	Crew checks if MS should be isolated. (YES)	
	Crew verifies/closes MSTVs.	
	*Crew checks if CDA required. (NO)	
	<b>NOTE: The following is a continuous action step and actions will be performed when containment pressure has exceeded 20 psia.</b>	
	*Crew checks if QS is required. Crew manually starts QS: <ul style="list-style-type: none"> <li>• QS discharge valves are opened</li> <li>• QS pumps are started</li> <li>• CAT outlet valves are opened</li> </ul>	
	<b>NOTE: Crew may have aligned BIT using CAP.</b>	
	Crew verifies SI flow. (NO)	
	US directs initiation of attachment 6.	
	<b>Crew manually aligns the BIT:</b> <ul style="list-style-type: none"> <li>• RO verifies charging pump line-up</li> <li>• BOP verifies BIT recirc valves closed.</li> <li>• BOP verifies BIT outlet valves open.</li> <li>• <b>BOP manually opens 1-SI-MOV: 1867A OR 1867B.</b></li> </ul>	<b>Critical Task Attachment 6 steps</b>
	BOP verifies AFW flow.	
	*RO checks RCS Tave stable at or trending to required temperature.	
	BOP adjusts AFW flow, if required.	
	RO checks PRZR PORVs and spray valves.	
	RO checks RCS subcooling.	
	<b>NOTE: The RCPs may have already been stopped using the CAP.</b>	
	Crew checks at least one charging pump running and flowing to the RCS.	

EVENT 6: Given that the unit is at power and a LOCA has occurred, the crew will respond in accordance with 1-E-0, "Reactor Trip or Safety Injection," and 1-E-1, "Loss of Reactor or Secondary Coolant."

TIME	EXPECTED ACTION	INSTRUCTOR REMARKS
	<b>RO stops all RCPs.</b>	<b>Critical Task</b>
	RO checks RCS pressure < 1275 psig [1475 psig].	
	<b>NOTE: Crew may have already closed HHSI pump recircs per the CAP.</b>	
	<b>RO/BOP closes charging pump recirc valves.</b>	<b>Critical Task</b>
	BOP checks SGs not faulted. (YES)	
	BOP checks SGs not ruptured. (YES)	
	Crew checks if RCS is intact inside containment. (NO)	
	US directs crew to transition to 1-E-1.	
	RO checks RCP trip and charging pump recirc criteria.	
	BOP checks SGs not faulted. (YES)	
	BOP checks intact SG levels.	
	Crew checks secondary radiation: <ul style="list-style-type: none"> <li>• RO resets SI, Phase A</li> <li>• Crew verifies IA trip valves open</li> <li>• RO resets AMSAC</li> <li>• Crew checks SG Blowdown, AE, Main steamline, and terry turbine exhaust radiation monitors normal</li> <li>• BOP checks SG levels</li> <li>• Crew initiates attachment to place BD rad monitors in service</li> <li>• BOP opens SG surface sample trip valves and informs chemistry.</li> </ul>	
	<b>NOTE: The scenario may be terminated after the crew checks secondary radiation, or as directed by the lead evaluator.</b>	

REFERENCES

PROCEDURE	REV.
Abnormal Procedure 0-AP-12, "Loss of Service Water."	31
Abnormal Procedure 1-AP-1.1, "Continuous Uncontrolled Rod Motion."	8
Abnormal Procedure 1-AP-13, "Loss of One or More Circulating Water Pumps."	13
Abnormal Procedure 1-AP-14, "Low Condenser Vacuum."	20
Abnormal Procedure 1-AP-49, "Loss of Normal Charging."	14
Abnormal Procedure 1-AP-16, "Increasing Primary Plant Leakage."	24
Abnormal Procedure 1-AP-5, "Unit 1 Radiation Monitoring System."	26
Emergency Procedure 1-E-0, "Reactor Trip or Safety Injection."	36
Emergency Procedure 1-E-1, "Loss of Reactor or Secondary Coolant."	22
Station Annunciator Response Procedures.	N/A
Guide and Reference Document PI-AA-5000, "Human Performance."	1
INPO, Guideline for Teamwork and Diagnostic Skill Development: INPO 88-003,	Jan. 1988
INPO, ACAD 07-002 Simulator Training Guidelines	Jan. 2007

## ATTACHMENTS

ATTACHMENT 1 - SIMULATOR OPERATOR'S COMPUTER PROGRAM

ATTACHMENT 2 - SCENARIO PERFORMANCE OBJECTIVES

ATTACHMENT 3 – SIMULATOR PERFORMANCE DATASHEET (Last page of scenario)

ATTACHMENT 1  
SIMULATOR OPERATOR'S COMPUTER PROGRAM

**SIMULATOR OPERATOR'S COMPUTER PROGRAM**  
**SXG NRC 2**

**Initial conditions**

1. Recall IC 162
2. Ensure Tave, Tref, PDDT level, and VCT level are selected on trend recorders.
3. Place WR magnet on 1-CH-RI-128.
4. Rackout 2-CC-P-1A and verify 2-CC-P-1B is running. Close U2\_CC\_4, U2-CC\_11.

**PRELOADS PRIOR TO SCENARIO START**

CONDITION	MALFUNCTION/OVERRIDE/ETC.
Letdown RM failure	<b>Malfunction:</b> RM0207, Severity = -1
Failure of BIT inlets to open on SI	<b>Switch Override (SI):</b> (Keeps valves from opening on SI) MOV867A_CLOSE=ON MOV867B_CLOSE=ON  Set up so that valves will open when OPEN button pressed: Set up trigger 10 as follows MOV867A_OPEN(1)=1 (you need the (1) for this valve only) DOR MOV867A_CLOSE  Set up trigger 11 as follows MOV867B_OPEN=1 DOR MOV867B_CLOSE
Failure of auto SI	<b>Malfunction:</b> SI08
1-CH-P-1B will not auto-start	<b>Switch Override:</b> CHP1B_ASTP = OFF

**SCENARIO EVENTS**

EVENT	MALFUNCTION/OVERRIDE/COMMUNICATIONS
1) Loss of service water	<p><b>Malfunction:</b> SW0104, Trigger = 1</p> <p><b>NOTE: When sent to pump can report that 2-SW-P-1A looks normal and 1-SW-P-1B is running normally.</b></p> <p><b>NOTE: When sent to breaker for 2-SW-P-1A (25H5) can report an overcurrent trip.</b></p> <p><b>NOTE: The next event will occur after the US refers to technical specifications, or as directed by the lead evaluator.</b></p>
2) Rod Insertion.	<p><b>Malfunction:</b> RD07, Delay time = 5, Trigger = 2</p> <p><b>NOTE: The next event will occur after the crew has stabilized the plant, or as directed by the lead evaluator.</b></p>
3) Loss of Condenser Vacuum Failure of level signal to "A" MFRV	<p><b>Malfunction:</b> CN0901, Delay time = 5, Ramp = 120, Severity = 100, Trigger = 3</p> <p><b>NOTE: When sent to perform attachment, verify that enough of a ramp has occurred, then close 1-VP-21 either on ExtremeView or a monitor screen. (If no one dispatched with attachment in hand, than initially report the loop seal is hot and get direction to isolate.)</b></p> <p><b>Malfunction:</b> FW0801, Delay time = 5, Trigger = 3</p> <p><b>NOTE: Allow the crew to stabilize the unit before proceeding with next event, or as directed by the Lead Evaluator.</b></p>

EVENT	MALFUNCTION/OVERRIDE/COMMUNICATIONS
4) Degradation of 1-CH-P-1A with check valve failure	<p><b>Malfunctions:</b>            CH2201, Delay time = 5, Ramp = 120, Severity = 50, Trigger = 4            CH2101, Delay time = 5, Trigger = 4</p> <p><b>NOTE: If operator sent to 1-CH-P-1A, can report that it is making a lot of noise. If asked, can also report that 1-SW-TCV-102A is full open.</b></p> <p><b>NOTE: If asked to check on 1-CH-P-1B (C), can report that the pump appears to running satisfactorily, with no seal leakage.</b></p> <p><b>NOTE: Once the US has referred to Tech Specs or as directed by the Lead Evaluator, the next event will occur.</b></p>
5) RCS leak	<p><b>Malfunction:</b>            RC04, Delay time = 5, Ramp = 300, Severity = 10, Trigger = 5             (Thwbrtot ~20754)</p> <p><b>NOTE: The next event will occur after the crew either makes preparations to ramp, makes preparations for a containment entry, or as directed by the lead evaluator.</b></p>
6) SBLOCA	<p><b>Malfunction:</b>            RC0101, Delay time = 5, Ramp = 30, Severity = 0.3, Trigger = 6</p> <p><b>NOTE: The scenario may be terminated after the crew checks SI termination criteria, or as directed by the lead evaluator.</b></p>

ATTACHMENT 2  
SCENARIO PERFORMANCE OBJECTIVES

## SIMULATOR REQUALIFICATION EXAMINATION

### TERMINAL PERFORMANCE OBJECTIVE

Given equipment failures and operational situations, operate the plant in accordance with Technical Specifications to bring the unit to a safe condition, using applicable procedures, and applying effective teamwork, communication, and diagnostic skills.

### GENERIC PERFORMANCE OBJECTIVES

- A. During shift operations the shift manager will take a conservative course of action, especially when uncertain conditions exist, when dealing with core cooling or heat sink availability, primary system and containment integrity, and reactivity control associated with plant evolutions.
- B. During shift operations the shift manager will provide overall crew guidance by prioritizing and integrating the actions of the shift crew in accordance with administrative procedures.
- C. During shift operations each crew member will participate in a team effort that resolves conflicts, provides input into the team decision and communicates all the necessary information to enhance teamwork in accordance with administrative procedures.
- D. During shift operations the Shift Technical Advisor will independently assess events and based on those assessments make recommendations to the crew regarding mitigation strategy.

## **EVENT 1 PERFORMANCE OBJECTIVES**

**EVENT GOAL:** Given the plant in mode 1 and indications of a loss of one service water pump, the crew will respond in accordance with 0-AP-12, "Loss of Service Water."

### **NORTH ANNA SPECIFIC TASKS:**

R653 Respond to a loss of a service water pump.

S70 Evaluate compliance with technical specifications.

### **CRITICAL TASK:**

N/A

## **EVENT 2 PERFORMANCE OBJECTIVES**

**EVENT GOAL:** Given that the unit is operating at power and control rods are inserting for no apparent reason, the crew will be expected to respond in accordance with 1-AP-1.1, "Continuous Uncontrolled Rod Motion."

### **NORTH ANNA SPECIFIC TASKS:**

R474 Restore stable plant conditions following continuous uncontrolled rod motion.

S70 Evaluate compliance with technical specifications.

### **CRITICAL TASK:**

See next page

CT Statement:

Crew takes action in accordance with AP-1.1, to stop rod motion and stabilize the unit.

Safety Significance:

Core reactivity is not under control of the operator due to the failed control channel. "It is expected that the operator will attempt to take manual actions to correct for anomalous conditions during power operation."

Cues:

Continuous inward control rod motion with  $T_{AVE}$  and  $T_{REF}$  matched.

Performance Indicator:

RO places rod control to manual.

Feedback:

Rod motion stops

WOG Reference:

E-0 Background Document

Conditions:

Prior to receiving an automatic reactor trip on low pressure.

### **EVENT 3 PERFORMANCE OBJECTIVES**

**EVENT GOAL:** Given that the unit is at power and loss of condenser vacuum is occurring, the crew will respond in accordance with 1-AP-14, "Low Condenser Vacuum."

#### **NORTH ANNA SPECIFIC TASKS:**

R517 Perform the immediate operator actions in response to a loss of one or more circulating water pumps.

R518 Respond to a partial loss of condenser vacuum.

#### **CRITICAL TASK:**

N/A

## **EVENT 4 PERFORMANCE OBJECTIVES**

**EVENT GOAL:** Given that the unit is at power and there is a degradation of the running charging pump and a failed open discharge check valve occurs when the pump is secured, the crew will respond in accordance with 1-AP-49, "Loss of Normal Charging."

### **NORTH ANNA SPECIFIC TASKS:**

R704 Respond to a loss of normal charging.

S70 Evaluate compliance with technical specifications.

### **CRITICAL TASK:**

See next page

CT Statement:

Crew takes action to prevent charging pump run-out due to a stuck open discharge check valve on a non-running charging pump.

Safety Significance:

Failure to prevent charging pump run-out constitutes a "mis-operation or incorrect crew performance which leads to degraded ECCS capacity."

Cues:

- \*Indication/annunciation that one charging pump has tripped or been shutdown with a stuck open discharge check valve.
- \*High amps on the running charging pump.
- \*Low/no charging flow or seal injection indicated.

Performance Indicator:

Crew closes charging pump discharge MOVs on the previously running charging pump.

Feedback:

Discharge MOVs for the previously running pump indicate closed and charging and seal injection flow returns to normal.

WOG Reference:

None.

Conditions:

Prior to Safety Injection being required by degraded plant conditions.

## **EVENT 5 PERFORMANCE OBJECTIVES**

**EVENT GOAL:** Given that the unit is at power and an RCS leak has developed, the crew will be expected to respond in accordance with 1-AP-16, "Primary Plant Leakage."

### **NORTH ANNA SPECIFIC TASKS:**

R520 Respond to increasing primary-plant leakage.

S70 Evaluate compliance with technical specifications.

### **CRITICAL TASK:**

N/A

## **EVENT 6 PERFORMANCE OBJECTIVES**

**EVENT GOAL:** Given that the unit is at power and a LOCA has occurred, the crew will respond in accordance with 1-E-0, "Reactor Trip or Safety Injection," and 1-E-1, "Loss of Reactor or Secondary Coolant."

### **NORTH ANNA SPECIFIC TASKS:**

- R185 Perform the immediate operator actions in response to a reactor trip or safety injection.
- R184 Restore the Blowdown radiation monitors.
- R730 Verify safety injection flow.

### **CRITICAL TASK:**

See Following Pages

CT Statement:

Crew manually initiates safety injection.

Safety Significance:

Failure to manually actuate SI under the postulated conditions constitutes "mis-operation or incorrect crew performance that leads to degraded ECCS capacity."

Cues:

Indication/annunciation that SI is required, with NO indication that SI has actuated.

Performance Indicator:

RO/BOP manually actuates safety injection.

Feedback:

Indication/annunciation that SI has actuated.

WOG Reference:

E-0 Background.

Conditions:

Prior to transitioning out of E-0.

CT Statement:

Crew aligns Charging pumps.

Safety Significance:

Failure to manually establish flow from at least one HHSI pump constitutes "mis-operation or incorrect crew performance which leads to degraded ECCS...capacity."

Cues:

Indication/annunciation that SI is in progress with no HHSI flow indicated.

Performance Indicator:

RO manually opens MOVSI 1836.

Feedback:

HHSI flow to the cold legs is indicated.

WOG Reference:

E-0 Background.

Conditions:

Prior to completion of step requiring its performance.

CT Statement:

Crew stops Reactor Coolant Pumps.

Safety Significance:

Tripping RCPS at this time "prevents excessive depletion of RCS water inventory through a small break in the RCS which might lead to severe core uncover if the RCPs were tripped for some reason later in the accident." The RCPs should be tripped "before RCS inventory is depleted to the point where tripping the pumps would cause the break to immediately uncover."

Cues:

Indication of:

- Subcooling less than 25°F [85°F].
- At least one charging pump running and flowing to the RCS.

Performance Indicator:

RO/BOP places control switch(es) for all running RCPs in STOP.

Feedback:

Indication/annunciation of no RCPs running.

WOG Reference:

RCP Trip/Restart Background Document.

Conditions:

Prior to completing the step directing its performance.

CT Statement:

Crew takes action to prevent HHSI pump runout.

Safety Significance:

Failure to prevent HHSI pump runout constitutes a "mis-operation or incorrect crew performance which leads to degraded ECCS capacity."

Cues:

- \*Indication/annunciation that SI is actuated and is required and
- \*Indication of RCS pressure less than 1275 psig [1475 psig] and
- \*RCPs tripped

Performance Indicator:

RO closes charging pump recirc valves:

- \* 1-CH-MOV-1275A
- \* 1-CH-MOV-1275B
- \* 1-CH-MOV-1275C.

Feedback:

Charging pump recirc valves indicate closed.

WOG Reference:

None.

Conditions:

Prior to RCS pressure reaching 1000 psig OR completion of transfer to recirculation mode, whichever comes first.

ATTACHMENT 3  
SIMULATOR PERFORMANCE DATASHEET

### Scenario Performance Datasheet

EVENT 1: Given the plant in mode 1 and indications of a loss of one service water pump, the crew will respond in accordance with 0-AP-12, "Loss of Service Water."

SPD Verified: \_\_\_\_\_ (Initials)

- Annunciators J-D3 and J-B3 illuminate
- "B" SW header pressure and flow decrease

EVENT 2: Given that the unit is operating at power and control rods are inserting for no apparent reason, the crew will be expected to respond in accordance with 1-AP-1.1, "Continuous Uncontrolled Rod Motion."

SPD Verified: \_\_\_\_\_ (Initials)

- Rods step in at maximum speed

EVENT 3: Given that the unit is at power and loss of condenser vacuum is occurring, the crew will respond in accordance with 1-AP-14, "Low Condenser Vacuum."

SPD Verified: \_\_\_\_\_ (Initials)

- Condenser vacuum worsens
- Annunciator A-G1 alarms if vacuum reaches setpoint
- "A" MFRV will not control in auto

EVENT 4: Given that the unit is at power and there is a degradation of the running charging pump and a failed open discharge check valve occurs when the pump is secured, the crew will respond in accordance with 1-AP-49, "Loss of Normal Charging."

SPD Verified: \_\_\_\_\_ (Initials)

- Charging flow initially decreases
- Charging pump discharge pressure decreases
- Temperature increases on 1-SW-TI-103A
- Annunciator C-B6 illuminates
- Annunciators C-B3, C-B5, and C-C5 illuminate when "A" charging pump is stopped
- Charging flow goes to zero when "A" charging pump is stopped

EVENT 5: Given that the unit is at power and an RCS leak has developed, the crew will be expected to respond in accordance with 1-AP-16, "Primary Plant Leakage."

SPD Verified: \_\_\_\_\_ (Initials)

- Pressurizer level decreases (B-F8 alarms)
- Containment sump level increases
- Charging flow increases
- Radiation levels on 1-RM-RMS-160 and 1-RM-RMS-163 increase
- Annunciators K-D2, and later, K-D4 alarm

### **Scenario Performance Datasheet**

EVENT 6: Given that the unit is at power and a LOCA has occurred, the crew will respond in accordance with 1-E-0, "Reactor Trip or Safety Injection," and 1-E-1, "Loss of Reactor or Secondary Coolant."

SPD Verified: \_\_\_\_\_ (Initials)

- Pressurizer level and pressure rapidly decrease
- Containment pressure slowly increases
- SI does not automatically actuate, if required
- BIT inlet valves do not open automatically

MEVA 



DOMINION  
NORTH ANNA POWER STATION

INITIAL LICENSED OPERATOR EXAMINATION  
SIMULATOR EXAMINATION GUIDE  
SCENARIO NRC 3

## SIMULATOR EXAMINATION GUIDE

<u>EVENT</u>	<u>DESCRIPTION</u>
1.	BC pump trips and standby pump does not auto-start
2.	Tavg unit fails high causing rods to step in
3.	Running IA compressor trips with no auto-start of standby compressor
4/4a.	Selected pressurizer level channel fails low/restore letdown
5.	SG PORV fails partially open, unit is ramped back
6.	Running feed pump trips with no auto-start of standby pump, unit must be tripped
7.	Main feed line suction will break
8.	Terry turbine will trip on overspeed, discharge line break on one MDAFW pump and the other will degrade, ending in an H.1 scenario

### Scenario Recapitulation:

Malfunctions after EOP entry	<b>2</b> (Main feed line break, AFW pumps not available)
Total Malfunctions	<b>8</b> (BC pump trips/standby pump does not auto-start, Tavg unit fails high, running IA compressor trips/standby compressor does not auto-start, pressurizer level channel fails low, SG PORV fails open, main feed pump trips/standby pump does not auto-start, main feed line break, AFW pumps not available)
Abnormal Events	<b>6</b> (BC pump trips/standby pump does not auto-start, Tavg unit fails high, running IA compressor trips/standby compressor does not auto-start, pressurizer level channel fails low, SG PORV fails open, main feed pump trips/standby pump does not auto-start)
Major Transients	<b>1</b> (Main feed line suction break)
EOPs Entered	<b>2</b> (ES-0.1, FR-H.1)
EOP Contingencies	<b>1</b> (FR-H.1)
Critical Tasks	<b>6</b>

### SCENARIO DURATION

100 Minutes

## SIMULATOR EXAMINATION SCENARIO SUMMARY SCENARIO NRC 2

The scenario begins with the unit at 100% power. The letdown radiation monitor is OOS and the terry turbine was returned to service last shift. 2-CC-P-1A is tagged out for seal maintenance.

The "A" bearing cooling pump, 1-BC-P-1A, will trip. The crew should identify the loss of bearing cooling and respond in accordance with 1-AP-19, "Loss of Bearing Cooling Water." The crew should determine that the "B" bearing cooling pump did not automatically start, and per the RNO start 1-BC-P-1B. Once the crew has verified that the BC System has been restored, or as directed by the Lead Evaluator, the next event will occur.

The next event will be the failure of the median/select Tave unit. The crew will be expected to respond IAW 1-AP-1.1, "Continuous Uncontrolled Rod Motion," and place rod control in MANUAL. Crew should address annunciator response for B-A7, MEDIAN/HI TAVG <> TREF DEVIATION, and take manual control of charging flow, and place steam dumps in steam pressure mode. After these actions have been completed and plant conditions are stable, or as directed by the lead evaluator, the next event will occur.

A loss of instrument air will occur when 2-IA-C-1 trips. The crew will enter 1-AP-28, "Loss of Instrument Air," and start all available air compressors. (1-IA-C-1 will not start automatically, but will start in HAND). Once instrument air pressure is returned to normal, the next event will occur.

Next, PRZR level transmitter, 1-RC-LT-1461, will fail low. The crew will respond to the failed channel IAW 1-AP-3, "Loss of Vital Instrumentation." The crew will swap to an operable level channel, restore letdown (Normal event), and review Tech Specs.

The next failure to occur will be the "B" SG PORV failing open due to the failure of the E/P. The crew will reduce power per 1-AP-38, "Excessive Load Increase." They will restore reactor power to less than 100% and dispatch an operator to find the cause of the power increase, close the valve locally, and stabilize the unit. The next event will occur after the crew has stabilized the unit, or at the direction of the lead evaluator.

Shortly after the unit is stabilized, 1-FW-P-1A will trip due to low oil pressure. The BOP must identify the pump trip, recognize that "B" MFP did not automatically start and take actions IAW 1-AP-31, "Loss of Main Feedwater." The crew will trip the reactor in accordance with the immediate actions of 1-AP-31 and enter 1-E-0, "Reactor Trip or Safety Injection." The next event will take place on the reactor trip.

The reactor will not automatically trip, if required, and as a result of the transient placed on the main feedwater system, a feed line break will occur on the main feed pump suction line resulting in a loss of all main feed pumps. Several minutes after the reactor is tripped, 1-FW-P-2 will trip on overspeed and will not be able to be immediately reset. Since a safety injection will not be required at this time, the crew will transition to 1-ES-0.1, "Reactor Trip Response." Once

the crew transitions to 1-ES-0.1, "Reactor Trip Response," the last event will occur.

"A" MDAFW pump discharge line will break in the MSVH and no flow will reach the SG. The "B" MDAFW pump will degrade due to impeller damage. The crew should identify the loss of all feedwater and transition to 1-FR-H.1, "Response to Loss of Secondary Heat Sink." On their first pass through 1-FR-H.1, the crew will not be able to restore main feed, auxiliary feed, or condensate flow to the steam generators. At this point, 1-FW-P-2 will be reset and the crew should establish adequate auxiliary feedwater flow to the SGs, allowing them to transition out of 1-FR-H.1. The scenario may be terminated after transition, or at the direction of the lead evaluator.

## SCENARIO TURNOVER SHEET

### **Read the following to the crew:**

**Purpose:** This examination is intended to evaluate the crew's performance of various tasks associated with the Licensed Operator Training Program. All activities should be completed in accordance with approved operations standards.

1. You are on a day shift during the week.
2. When conditions allow, utilize the computer log systems as you would in the plant.

### **Unit Status:**

Unit 1 is at 100% power. RCS boron is 978 ppm and core age is 9000 MWD/MTU. Aux steam is on unit 1.

Unit 2 is at 100% power.

### **Equipment Status:**

Letdown radiation monitor, 1-CH-RI-128, is OOS. 1-FW-P-2, terry turbine, was returned to service last shift, PMT was SAT. 2-CC-P-1A is tagged out. Maintenance rule window is green.

### **Shift Orders:**

Maintain current plant conditions and support maintenance on 2-CC-P-1A.

EVENT 1: Given the plant is in Mode 1 and the "A" bearing cooling water pump has tripped the crew will respond in accordance with 1-AP-19, "Loss of Bearing Cooling Water."		
TIME	EXPECTED ACTION	INSTRUCTOR REMARKS
SPD Verified: _____ (Initials)		
<ul style="list-style-type: none"> <li>• Annunciators F-F4, F-E4, F-H8 illuminate</li> <li>• 1-BC-P-1A has a breaker misalignment (amber and green lights lit)</li> <li>• 1-BC-P-1B does not auto-start</li> </ul>		
	BOP identifies annunciator F-F4, BC WTR PP 1A-1B AUTO TRIP SYS MISALIGNED.	
	BOP identifies 1-BC-P-1A has tripped.	
	BOP identifies that 1-BC-P-1B did not automatically start.	
	US directs crew to enter 1-AP-19.	
	BOP checks status of BC pumps.	
	BOP starts 1-BC-P-1B.	
	BOP verifies at least one BC pump running normally.	
	Crew verifies that BC system is operating tower-to-tower.	
	Crew verifies that BC system is operating normally.	
	Crew monitors main generator temperatures.	
	Crew dispatches operator to check equipment supplied by BC: MFP, Cond pumps, EHC, HPs, LPs.	
	US reports loss of BC pump and failure of standby pump to auto-start and requests assistance, Work Request, and Condition Report.	
	<b>NOTE: When sent to investigate, the operator will report that there is an overcurrent trip on the breaker for 1-BC-P-1A.</b>	
	<b>NOTE: The next event can occur once the crew has restored BC or at the discretion of the lead evaluator.</b>	

EVENT 2: Given that the unit is in mode 1 and the median/select Tave unit has failed, the crew will be expected to respond in accordance with 1-AP-1.1, "Continuous Uncontrolled Rod Motion," and annunciators B-A7 and B-A8.

TIME	EXPECTED ACTION	INSTRUCTOR REMARKS
SPD Verified: _____ (Initials) <ul style="list-style-type: none"> <li>• Rods stepping in at maximum speed</li> <li>• Annunciators B-A7 and B-A8 are illuminated</li> <li>• Status light M-E4 illuminates</li> </ul>		
	RO identifies annunciators B-A7, MEDIAN/HI TAVG <> TREF DEVIATION and B-A8, LOOP1A-B-C TAVG DEVIATION.	
	RO identifies control rods stepping in at maximum speed.	
	RO identifies median/select Tave unit failed.	
	US directs crew to enter AP-1.1.	
	<b>Crew takes action to stop rod motion and stabilize the unit.</b> <b>RO places rod control in MANUAL.</b> RO verifies rod motion stopped.	<b>Critical Task</b>
	RO verifies that 1-RC-TI-1408 is normal. (NO)	
	Crew initiates action of AR B-A7, while continuing.	<b>See actions below</b>
	Crew verifies control rods above the lo-lo insertion limit.	
	RO checks RCS Tave and adjusts as directed by the US.	
	RO checks PRZR pressure.	
	RO checks PRZR level.	
	Crew checks controls rods above the lo insertion limit.	
	Crew maintains stable plant conditions.	
	<b>NOTE: The following actions are IAW annunciators B-A7.</b>	
	RO places PRZR level control in MANUAL and controls PRZR level.	

EVENT 2: Given that the unit is in mode 1 and the median/select Tave unit has failed, the crew will be expected to respond in accordance with 1-AP-1.1, "Continuous Uncontrolled Rod Motion," and annunciators B-A7 and B-A8.

TIME	EXPECTED ACTION	INSTRUCTOR REMARKS
	RO transfers condenser steam dumps to steam pressure mode.	
	US informs Work Control Center of failure and requests assistance, WR, and CR.	
	<b>NOTE: If the US requests permission to withdraw rods to restore temperature, it will be given.</b>	
	<b>NOTE: The next event will occur after the crew has stabilized the plant, or as directed by the lead evaluator.</b>	

EVENT 3: Given that the unit is at power and indications exist of a loss of instrument air, the crew will respond in accordance with 1-AP-28, "Loss of Instrument Air."		
TIME	EXPECTED ACTION	INSTRUCTOR REMARKS
SPD Verified: _____ (Initials)		
<ul style="list-style-type: none"> <li>• Annunciator 1J-D2 illuminates</li> <li>• IA pressure drops</li> <li>• 1-IA-C-1 will not start automatically, if required</li> <li>• Annunciators J-E8 and F-F8 illuminate</li> </ul>		
	RO/BOP identifies annunciator J-D2, INST AIR COMPR/DRYER TROUBLE.	
	<b>NOTE: Crew may not enter AP-28 until low air pressure alarms come in.</b>	
	US directs entry into 1-AP-28.	
	<b>NOTE: 1-IA-C-1 will not automatically start, but can be started in HAND.</b>	
	<b>Crew starts all available air compressors</b> <ul style="list-style-type: none"> <li>• <b>BOP starts 1-IA-C-1, 1-IA-C-2A, and 1-IA-C-2B</b></li> </ul>	<b>Critical Task</b>
	Crew verifies instrument air pressure > 70 psig.	
	<b>NOTE: If sent, after approximately 5 minutes, the auxiliary building operator will report a MOTOR OVERLOAD annunciator lit on the local panel for 2-IA-C-1 and an air leak at the compressor. He will request permission to close 2-IA-7 to isolate 2-IA-6, check valve, which is apparently failed.</b>	
	Crew verifies loss of instrument air corrected.	
	Crew verifies instrument air pressure > 94 psig. (NO)	
	BOP isolates IA to containment by closing 1-IA-TV-102A.	
	BOP checks IA pressure outside containment increasing.	
	<b>NOTE: Whether the leak location has been reported and direction made to isolate it will determine how the crew proceeds through 1-AP-28. Once the leak has been isolated the crew should reopen the containment IA TVs, if closed.</b>	

EVENT 3: Given that the unit is at power and indications exist of a loss of instrument air, the crew will respond in accordance with 1-AP-28, "Loss of Instrument Air."		
TIME	EXPECTED ACTION	INSTRUCTOR REMARKS
	<b>NOTE: The next event will occur after instrument air pressure is returned to normal, or as directed by the lead evaluator.</b>	

EVENT 4: Given that the unit is at power and a selected pressurizer level channel has failed, the crew will be expected to respond in accordance with 1-AP-3, "Loss of Vital Instrumentation."		
TIME	EXPECTED ACTION	INSTRUCTOR REMARKS
SPD Verified: _____ (Initials)		
<ul style="list-style-type: none"> <li>Annunciators B-F8, B-G7, and B-E2 are illuminated</li> <li>1-RC-LI-1461 fails low</li> <li>Letdown isolates</li> </ul>		
	RO identifies annunciators B-F8, PZR LO LEVEL and B-G7, PZR LO LVL HTRS OFF-LETDOWN ISOL.	
	<b>NOTE: Identification of failure may not occur at this time.</b>	
	RO identifies 1-RC-LT-1461 failing low and the loss of letdown.	
	RO notifies US of failure.	
	US directs crew to perform the immediate actions of AP-3.	
	Crew verifies redundant indication normal.	
	Crew verifies SG control parameters normal.	
	Crew verifies first stage pressure indications normal.	
	RO verifies/places 1-CH-FCV-1122 in manual and adjusts to control pressurizer level at program.	
	RO selects operable pressurizer level channel.	
	RO verifies letdown in service. (NO)	
	<b>Crew returns letdown to service using attachment of 1-AP-3:</b> <ul style="list-style-type: none"> <li>RO establishes at least 25 gpm of charging</li> <li>RO opens 1-CH-LCV-1460A and 1460B</li> <li>RO puts 1-CH-PCV-1145 in manual</li> <li>RO fully opens 1-CH-PCV-1145</li> <li>RO opens 1-CH-HCV-1200B</li> <li>RO adjusts 1-CH-PCV-1145 to maintain 300 psig</li> <li>RO places 1-CH-PCV-1145 in Auto.</li> </ul>	<b>Critical Task</b> Normal Event

EVENT 4: Given that the unit is at power and a selected pressurizer level channel has failed, the crew will be expected to respond in accordance with 1-AP-3, "Loss of Vital Instrumentation."		
TIME	EXPECTED ACTION	INSTRUCTOR REMARKS
	RO verifies PRZR level control in auto. (NO)	
	RO restores pressurizer level to program.	
	RO verifies/adjusts output of 1-RC-LCV-1459G.	
	Crew discusses need to leave charging control in manual due to previous failure.	
	RO verifies pressurizer control heaters not tripped. (NO)	
	RO resets control heaters by placing switch to START.	
	BOP verifies both first stage pressure channels normal.	
	BOP verifies operable channels selected for SGWLCS.	
	Crew identifies the correct MOP (55.72) for placing channel in trip.	
	US refers to T.S. 3.3.1 (Function 9 – 72 hours) and TS 3.3.3 (Function 13 – Info action).	
	US/SS make notifications about failed channel.	
	<b>NOTE: When the crew reestablishes letdown and the US has reviewed TS, then the next event will occur.</b>	

EVENT 5: Given that the unit is at power and a SG PORV has failed open, the crew will respond in accordance with 1-AP-38, "Excessive Load Increase."		
TIME	EXPECTED ACTION	INSTRUCTOR REMARKS
SPD Verified: _____ (Initials)		
<ul style="list-style-type: none"> <li>• Reactor power slowly increases.</li> <li>• Megawatts slowly decrease.</li> </ul>		
	RO/BOP identifies increase in reactor power/decrease in MW.	
	US directs crew to enter 1-AP-38.	
	RO verifies all steam dumps closed.	
	<b>NOTE: Crew may identify "B" PORV open from PCS alarm and PNID screen.</b>	
	<b>NOTE: BOP may place "B" PORV in manual and press the "Down" button.</b>	
	BOP verifies all SG PORVs indicate closed.	
	BOP verifies turbine load normal.	
	RO verifies reactor power is less than or equal to 100% power. (NO)	
	BOP ramps down turbine to reduce power to $\leq 100\%$ .	
	Crew dispatches operators to check for the source of steam.	
	<b>NOTE: The operator will report that the "B" steam generator PORV is open.</b>	
	Crew directs the operator to locally close the "B" SG PORV.	
	Crew checks power level reduced to the power level before the event started.	
	Crew stops ramp.	
	BOP places turbine in IMP-IN, if required.	
	BOP checks main generator output.	
	BOP checks all steam flow indications normal.	
	BOP checks turbine control in operator auto.	

EVENT 5: Given that the unit is at power and a SG PORV has failed open, the crew will respond in accordance with 1-AP-38, "Excessive Load Increase."		
TIME	EXPECTED ACTION	INSTRUCTOR REMARKS
	Crew checks plant steam systems: SG PORVs SG safeties MSR inlet FCVs AS PCV.	
	US/STA consult tech spec 3.7.4.A and determine that the PORV is operable as it can be manually operated.	
	Crew references Reactivity admin (OP-AP-300), as time permits.	
	<b>NOTE: US may request permission to restore reactor power.</b>	
	<b>NOTE: The next event will occur after the crew has stabilized the unit, or at the direction of the lead evaluator.</b>	

EVENT 6: Given the plant is in Mode 1 with indications of a loss of "A" Main Feedwater Pump and a failure of "B" Main Feedwater Pump to automatically start, the crew will respond in accordance with 1-AP-31, "Loss of Main Feedwater," and 1-E-0, "Reactor Trip or Safety Injection."

TIME	EXPECTED ACTION	INSTRUCTOR REMARKS
SPD Verified: _____ (Initials) <ul style="list-style-type: none"> <li>• Annunciator E-H5 illuminates</li> <li>• "A" MFP breakers have amber and green lights lit</li> <li>• "B" MFP does not auto-start</li> <li>• Available feed flow is less than steam flow</li> </ul>		
	BOP identifies annunciator 1E-H5, FW PUMP 1A LUBE OIL PRESS LOW.	
	BOP identifies trip of "A" MFP.	
	BOP informs US of MFP trip.	
	BOP identifies start failure of "B" MFP.	
	US direct the BOP to take actions of 1-AP-31.	
	BOP checks reactor power greater than 70%. (YES)	
	BOP checks 2 feed pumps running. (NO)	
	US direct crew to enter 1-E-0.	
	<b>NOTE: The next event will be initiated when the reactor is tripped.</b>	

EVENT 7: Given that a main feed suction line has broken, the crew will respond in accordance with 1-E-0, Reactor Trip or Safety Injection."		
TIME	EXPECTED ACTION	INSTRUCTOR REMARKS
SPD Verified: _____ (Initials)		
<ul style="list-style-type: none"> <li>• The reactor does not trip automatically, if required</li> <li>• Annunciators F-B6, G-F6, F-D1, F-D2, F-D3, F-A4, F-B5, F-F1, F-F2, F-F3 illuminate</li> <li>• Main feed pump suction pressure rapidly decreases</li> <li>• Standby main Condensate pump starts</li> <li>• Various turbine building sump alarms illuminate</li> </ul>		
	<b>NOTE: The reactor will not automatically trip, if required.</b>	
	<b>RO/BOP trip the reactor.</b>	<b>Critical Task</b>
	BOP verifies/trips turbine.	
	RO verifies AC emergency busses energized.	
	BOP identifies annunciator 1F-B6, MAIN FD PUMPS SUCT HDR LO PRESS.	
	BOP identifies auto-start of the standby condensate pump.	
	BOP informs crew that feed pump suction pressure is rapidly decreasing.	
	RO verifies power to AC emergency busses.	
	Crew checks if SI has actuated. (NO)	
	Crew checks if SI is required. (NO)	
	US directs team to transition to 1-ES-0.1.	
	<b>NOTE: Crew may use 0-AP-39.1 for Turbine Building Flooding to direct securing of secondary pumps.</b>	
	US directs BOP to secure main feed, condensate and heater drain pumps.	
	BOP secures main feed, condensate, and heater drain pumps.	

EVENT 7: Given that a main feed suction line has broken, the crew will respond in accordance with 1-E-0, Reactor Trip or Safety Injection."		
TIME	EXPECTED ACTION	INSTRUCTOR REMARKS
	<p><b>NOTE: The terry turbine will trip 2 minutes after starting.</b></p> <p><b>A break will occur on "A" AFW pump discharge line in the MSVH, and the "B" AFW pump will degrade after starting.</b></p> <p><b>These are to set up for the next event that will be handled when identified.</b></p>	
	<p><b>NOTE: The next event can occur once secondary pumps have been stopped.</b></p>	

EVENT 8: Given that a loss of all main and auxiliary feed water pumps has occurred, the crew will respond in accordance with 1-FR-H.1, "Response to Loss of Secondary Heat Sink."		
TIME	EXPECTED ACTION	INSTRUCTOR REMARKS
SPD Verified: _____ (Initials) <ul style="list-style-type: none"> <li>• Annunciators F-D8 illuminates</li> <li>• No flow indicated to "A" SG</li> <li>• Flow from 1-FW-P-3A is not reaching the "C" SG, WR level decreasing</li> <li>• 1-FW-P-3B degrades and flow drops to zero</li> </ul>		
	*RO checks RCS average temperature stable or trending to desired temperature.	
	BOP identifies annunciator F-D8, TURBINE DRIVEN AFW PUMP TROUBLE OR LUBE OIL TRBL.	
	<b>NOTE: Once H.1 is entered, any operator sent to the vicinity of the MSVH will report that water and steam are issuing out the door.</b>	
	Crew identifies that "B" SG WR level is not increasing.	
	Crew identifies that 1-FW-P-3B flow is degrading.	
	BOP identifies there is no AFW flow available.	
	Crew identifies that there has been a loss of the heat sink critical safety function.	
	US directs crew to transition to 1-FR-H.1.	
	Crew checks if secondary heat sink is required. (YES)	
	Crew dispatches an operator to check 1-FW-P-3A and the terry turbine.	
	<b>NOTE: Operator will report "B" AFW pump does not sound right, mechanics suspect internal damage. The terry turbine trip valve is closed.</b>	
	<b>NOTE: The operator instructed to reset the overspeed trip valve will report that the he can't get it to stay reset.</b>	

EVENT 8: Given that a loss of all main and auxiliary feed water pumps has occurred, the crew will respond in accordance with 1-FR-H.1, "Response to Loss of Secondary Heat Sink."

TIME	EXPECTED ACTION	INSTRUCTOR REMARKS
	Crew tries to establish AFW flow to at least one SG: <ul style="list-style-type: none"> <li>• BOP checks SG Blowdown and sample isolation valves closed</li> <li>• Crew reviews control room indications to determine loss of AFW flow</li> <li>• Crew determines that they cannot start an AFW pump from the MCR</li> <li>• Crew determines that they do not have adequate AFW flow</li> </ul>	
	<b>Crew stops reactor coolant pumps.</b> <ul style="list-style-type: none"> <li>• <b>RO stops all reactor coolant pumps.</b></li> </ul>	<b>Critical Task</b>
	Crew dispatches an operator with AP-22 series procedures.	
	Crew attempts to establish main feed flow to the SGs: <ul style="list-style-type: none"> <li>• Crew determines that there are no condensate pumps running.</li> </ul>	
	BOP checks SG wide range levels in 2/3 SGs less the 14%. (NO)	
	US returns to step 1.	
	<b>NOTE: The operator dispatched to reset the overspeed trip valve will now inform the crew that 1-FW-P-2 has been reset.</b>	
	<b>Crew establishes adequate AFW flow to SG(s).</b> <ul style="list-style-type: none"> <li>• <b>BOP establishes adequate AFW flow as indicated by core-exit TCs decreasing and SG wide-range level increasing (may be &lt;340 gpm.)</b></li> </ul>	
	Crew verifies core-exit TCs decreasing and "A" SG W/R level increasing.	
	US directs transition to 1-ES-0.1.	
	<b>NOTE: An SI may occur on delta P if AFW flow is not throttled to "A" SG.</b>	
	<b>NOTE: The scenario may be terminated once the crew has established adequate AFW flow, or at the discretion of the lead evaluator.</b>	

REFERENCES

PROCEDURE	REV.
Abnormal Procedure 1-AP-19, "Loss of Bearing Cooling Water."	16
Abnormal Procedure 1-AP-1.1, "Continuous Uncontrolled Rod Motion."	8
Abnormal Procedure 1-AP-28, "Loss of Instrument Air."	30
Abnormal Procedure 1-AP-3, "Loss of Vital Instrumentation."	22
Abnormal Procedure 1-AP-38, "Excessive Load Increase."	14
Abnormal Procedure 1-AP-31, "Loss of Main Feedwater."	4
Emergency Procedure 1-E-0, "Reactor Trip or Safety Injection."	36
Emergency Procedure 1-ES-0.1, "Reactor Trip Response."	26
Functional Restoration Procedure 1-FR-H.1, "Response to Loss of Secondary Heat Sink."	17
Station Annunciator Response Procedures.	N/A
Guide and Reference Document PI-AA-5000, "Human Performance."	1
INPO, Guideline for Teamwork and Diagnostic Skill Development: INPO 88-003,	Jan. 1988
INPO, ACAD 07-002 Simulator Training Guidelines	Jan. 2007

## ATTACHMENTS

ATTACHMENT 1 - SIMULATOR OPERATOR'S COMPUTER PROGRAM

ATTACHMENT 2 - SCENARIO PERFORMANCE OBJECTIVES

ATTACHMENT 3 – SIMULATOR PERFORMANCE DATASHEET (Last page of scenario)

ATTACHMENT 1  
SIMULATOR OPERATOR'S COMPUTER PROGRAM

**SIMULATOR OPERATOR'S COMPUTER PROGRAM**  
**SXG NRC 3**

**Initial conditions**

1. Recall IC 163
2. Ensure Tave, Tref, PDTT level, and VCT level are selected on trend recorders.
3. Place a WR magnet on 1-CH-RI-128.
4. Rackout 2-CC-P-1A and verify 2-CC-P-1B is running. Close U2\_CC\_11, U2\_CC\_4.

**PRELOADS PRIOR TO SCENARIO START**

CONDITION	MALFUNCTION/OVERRIDE/ETC.
Failure of "B" MFP to auto-start	<b>Switch override:</b> FWP1B1_ASTOP = OFF FWP1B2_ASTOP = OFF
Failure of auto reactor trip	<b>Malfunction:</b> RD32
Letdown rad monitor failure	<b>Malfunction:</b> RM0207, Severity = -1
Failure of 1-IA-C-1 to auto-start	<b>Switch override:</b> IAC1_AUTO, Override = OFF

**SCENARIO EVENTS**

EVENT	MALFUNCTION/OVERRIDE/COMMUNICATIONS
1) Loss of BC	<p><b>Remote functions:</b> BCP1A_PROTECT = T, Delay time = 5, Trigger = 1 BCP_AUTO_DEFEAT = T, Delay time = 5, Trigger = 1</p> <p><b>NOTE: When sent to investigate, the operator will report that there is an overcurrent drop on the breaker for "A" BC pump.</b></p> <p><b>NOTE: The next event will occur once BC is restored, or at the discretion of the lead evaluator.</b></p>

EVENT	MALFUNCTION/OVERRIDE/COMMUNICATIONS
2) Median/select Tave failure	<p><b>Malfunction:</b> RC1501, Delay time = 5, Ramp = 5, Severity = 1, Trigger = 2</p> <p><b>NOTE: If the US requests permission to withdraw rods to restore temperature, it can be given.</b></p> <p><b>NOTE: The next event will occur after the crew has stabilized the plant, or as directed by the lead evaluator.</b></p>
3) Loss of instrument air	<p><b>Remote function:</b> U2_IAC1_FAULT = TRUE, Trigger = 3</p> <p><b>Malfunction:</b> CA0402, Delay time = 8, Ramp = 10, Severity = 10, Trigger = 3</p> <p><b>NOTE: If sent to investigate, then report that the MOTOR OVERLOAD annunciator is lit on the local panel for 2-IA-C-1. Can also report that 2-IA-6, a check valve, is apparently failed and air is blowing back through the compressor. Isolating 2-IA-7 should stop the air leak.</b></p> <p><b>NOTE: If sent to check 2-IA-TV-211 can report it either open or closed (opens when IA pressure at the dryer is &lt;90 psig). If open report was made, can later report that reset was pressed when so directed.</b></p> <p><b>NOTE: When told to close 2- IA-7, wait 1 minute then delete malfunction CA0402 and report that leak is isolated.</b></p> <p><b>NOTE: The next event will occur after instrument air pressure is returned to normal, or as directed by the lead evaluator.</b></p>
4) PRZR level Ch I, LT-461 fails low	<p><b>Malfunction:</b> RC0803, Delay time =5, Ramp = 30, Severity = -1, Trigger = 4</p> <p><b>NOTE: When the crew reestablishes letdown and identifies the correct MOP and TS action, then the next event will occur.</b></p>

EVENT	MALFUNCTION/OVERRIDE/COMMUNICATIONS
5) Stuck open SG PORV	<p><b>Remote function:</b> MSPCV101B_K, Delay time = 5, Ramp = 5, Value = 100, Trigger = 5</p> <p><b>NOTE: Approximately two minutes after crew dispatches an operator to the MSVH, report that the "B" steam generator PORV is open.</b></p> <p><b>NOTE: When the crew directs the operator to isolate the valve, wait one minute, then ramp MSPCV101B_K to 0 over 120 seconds.</b></p> <p><b>NOTE: The next event will occur after the crew has stabilized the unit, or at the direction of the lead evaluator.</b></p>
6) Trip of "A" MFP	<p><b>Malfunction:</b> FW0401, Delay time = 5, Ramp = 60, Severity = 100, Trigger = 6</p> <p><b>NOTE: When requested to investigate cause for loss of oil pressure informs US that oil is leaking from a flanged connection on the south end of the MFP.</b></p> <p><b>NOTE: The next event will occur when the reactor is tripped.</b></p>

EVENT	MALFUNCTION/OVERRIDE/COMMUNICATIONS
7) Loss of MFW	<p><b>Malfunctions:</b> FW2101, 2102, 2103, Delay time = 5, Ramp = 0, Severity = 100, Trigger = 7</p> <p><b>Alarm overrides:</b> V1DF8_W, Delay time = 15, Override = ON, Trigger = 7 V1DG8_W, Delay time = 20, Override = ON, Trigger = 7 V1AD6_W, Delay time = 20, Override = ON, Trigger = 7 V2GC8_W, Delay time = 25, Override = ON, Trigger = 7 V1AD3_W, Delay time = 30, Override = ON, Trigger = 7</p> <p><b>Set up trigger 7 to occur when the reactor is tripped.</b> RX_RTA_52 .EQ. 0</p> <p><b>NOTE: A security officer, or operator if one has been sent to area, will call the MCR on the gaitronics and inform the crew that there is a large amount of steam in the east end of the turbine building basement.</b></p> <p><b>NOTE: The following trips the Terry Turbine on overspeed 2 minutes after the reactor is tripped:</b></p> <p><b>Remote function:</b> MSTV115 = 0, Delay time = 120, Trigger = 10</p> <p><b>Set up trigger 10 to actuate on reactor trip breaker being open.</b> RX_RTA_52 .EQ. 0</p> <p><b>NOTE: Operator will report the terry turbine trip valve is closed.</b></p> <p><b>NOTE: The operator instructed to reset the overspeed trip valve will report that the valve will not stay reset and request assistance.</b></p> <p><b>NOTE: The next event will occur after the crew secures FW and CN pumps, or as directed by the lead evaluator.</b></p>

EVENT	MALFUNCTION/OVERRIDE/COMMUNICATIONS
8) Loss of heat sink	<p><b>Malfunction:</b>  FW1402, Delay time = 5, Severity = 30, Ramp = 30, Trigger = 8  FW1102, Delay time = 10, Severity = 30, Ramp = 120, Trigger = 8</p> <p><b>NOTE: Operator will report "B" AFW pump is noisy. If sent, mechanics can report suspected impeller damage.</b></p> <p><b>NOTE: Once operators have determined that they have a loss of heat sink and have entered H.1, any operator dispatched to the vicinity of the MSVH can report that steam and water are coming out the door.</b></p> <p><b>NOTE: Watch SG WR levels, reset terry turbine before feed and bleed criteria are met.</b></p> <p><b>NOTE: After the crew has looped back to step 1 of 1-FR-H.1, reset overspeed trip valve using remote function:</b></p> <p><b>MSTV115 = 100, Ramp = 30</b></p> <p><b>NOTE: The operator dispatched to reset the overspeed trip valve will inform the crew that 1-FW-P-2 has been reset.</b></p> <p><b>NOTE: The scenario may be terminated once the crew has established adequate AFW flow, or at the discretion of the lead evaluator.</b></p>

ATTACHMENT 2  
SCENARIO PERFORMANCE OBJECTIVES

## SIMULATOR REQUALIFICATION EXAMINATION

### TERMINAL PERFORMANCE OBJECTIVE

Given equipment failures and operational situations, operate the plant in accordance with Technical Specifications to bring the unit to a safe condition, using applicable procedures, and applying effective teamwork, communication, and diagnostic skills.

### GENERIC PERFORMANCE OBJECTIVES

- A. During shift operations the shift manager will take a conservative course of action, especially when uncertain conditions exist, when dealing with core cooling or heat sink availability, primary system and containment integrity, and reactivity control associated with plant evolutions.
- B. During shift operations the shift manager will provide overall crew guidance by prioritizing and integrating the actions of the shift crew in accordance with administrative procedures.
- C. During shift operations each crew member will participate in a team effort that resolves conflicts, provides input into the team decision and communicates all the necessary information to enhance teamwork in accordance with administrative procedures.
- D. During shift operations the Shift Technical Advisor will independently assess events and based on those assessments make recommendations to the crew regarding mitigation strategy.

## **EVENT 1 PERFORMANCE OBJECTIVES**

**EVENT GOAL:** Given the plant is in Mode 1 and the "A" bearing cooling water pump has tripped the crew will respond in accordance with 1-AP-19, "Loss of Bearing Cooling Water."

### **NORTH ANNA SPECIFIC TASKS:**

R522 Stabilize the unit following a loss of bearing cooling water.

### **CRITICAL TASK:**

N/A

## **EVENT 2 PERFORMANCE OBJECTIVES**

**EVENT GOAL:** Given that the unit is in mode 1 and the median/select Tave unit has failed, the crew will be expected to respond in accordance with 1-AP-1.1, "Continuous Uncontrolled Rod Motion," and annunciators B-A7 and B-A8.

### **NORTH ANNA SPECIFIC TASKS:**

- R248 Respond to a T-AVG/-REF DEVIATION annunciator alarm.
- R475 Perform the immediate operator actions in response to a continuous uncontrolled rod motion.

### **CRITICAL TASK:**

See next Page

CT Statement:

Crew takes action in accordance with AP-1.1, to stop rod motion and stabilize the unit.

Safety Significance:

Core reactivity is not under control of the operator due to the failed control channel. "It is expected that the operator will attempt to take manual actions to correct for anomalous conditions during power operation."

Cues:

Indication of a failed MMS Unit.  
Continuous inward control rod motion with Tave and Tref matched.

Performance Indicator:

RO places rod control in manual.

Feedback:

Rod motion stops.

WOG Reference:

None

Conditions:

Prior to a PRZR low pressure reactor trip.

### **EVENT 3 PERFORMANCE OBJECTIVES**

**EVENT GOAL:** Given that the unit is at power and indications exist of a loss of instrument air, the crew will respond in accordance with 1-AP-28, "Loss of Instrument Air."

#### **NORTH ANNA SPECIFIC TASKS:**

R530 Respond to a loss of instrument air outside containment.

#### **CRITICAL TASK:**

See next page

CT Statement:

Crew starts all available air compressors.

Safety Significance:

Failure to start all available air compressors under the postulated plant conditions constitutes mis-operation or incorrect crew performance which leads to degradation of plant conditions which could result in a unit trip and/or safety injection. In this case, the instrument air pressure can be maintained above the trip set point by starting the air compressors. Therefore, failure to start the air compressors also represents a "demonstrated inability by the crew to take an action or combination of actions that would prevent a challenge to plant safety."

Cues:

Instrument air low pressure alarm.  
Meter indication of low instrument air pressure.

Performance Indicator:

BOP starts all available air compressors.

Feedback:

Instrument air pressure stabilizes above the trip set point.

WOG Reference:

None.

Conditions:

Prior to reaching the trip set point of 70 PSIG.

## **EVENT 4 PERFORMANCE OBJECTIVES**

**EVENT GOAL:** Given that the unit is at power and a selected pressurizer level channel has failed, the crew will be expected to respond in accordance with I-AP-3, "Loss of Vital Instrumentation."

### **NORTH ANNA SPECIFIC TASKS:**

R633 Respond to a failure of the controlling pressurizer level channel.

S70 Evaluate compliance with technical specifications.

### **CRITICAL TASK:**

See next page

CT Statement:

Crew takes manual control of PRZR level, minimizes charging, and restores letdown.

Safety Significance:

Failure to take manual control of PRZR level constitutes a "mis-operation or incorrect crew performance" which will result in an unnecessary reactor trip on high PRZR level.

Cues:

The controlling PRZR level channel is failed low, letdown is isolated.

Performance Indicator:

RO verifies/places controller for 1-CH-FCV-1122 in manual and controls PRZR level.  
RO performs RNO step and selects operable channel.  
RO restores charging and letdown as directed by the US.

Feedback:

PRZR level does not exceed trip setpoint.

WOG Reference:

None.

Conditions:

Prior to a PRZR high level reactor trip.

## **EVENT 5 PERFORMANCE OBJECTIVES**

**EVENT GOAL:** Given that the unit is at power and a SG PORV has failed open, the crew will respond in accordance with 1-AP-38, "Excessive Load Increase."

### **NORTH ANNA SPECIFIC TASKS:**

R539 Perform the immediate operator actions in response to an excessive load increase.

S70 Evaluate compliance with technical specifications.

### **CRITICAL TASK:**

N/A

## **EVENT 6 PERFORMANCE OBJECTIVES**

**EVENT GOAL:** Given the plant is in Mode 1 with indications of a loss of "A" Main Feedwater Pump and a failure of "B" Main Feedwater Pump to automatically start, the crew will respond in accordance with 1-AP-31, "Loss of Main Feedwater," and 1-E-0, "Reactor Trip or Safety Injection."

### **NORTH ANNA SPECIFIC TASKS:**

R781 Respond to a loss of main feedwater.

### **CRITICAL TASK:**

N/A

## EVENT 7 PERFORMANCE OBJECTIVES

**EVENT GOAL:** Given that a main feed suction line has broken, the crew will respond in accordance with 1-E-0, Reactor Trip or Safety Injection."

### **NORTH ANNA SPECIFIC TASKS:**

R185 Perform the immediate operator actions in response to a reactor trip or safety injection.

### **CRITICAL TASK:**

See next page

CT Statement:

Crew manually trips the Reactor.

Safety Significance:

Failure to manually trip the reactor causes a challenge to the subcriticality CSF beyond that irreparably introduced by the postulated conditions. Additionally, it constitutes an "incorrect performance that necessitates the crew taking compensating action which complicates the event mitigation strategy and demonstrates the inability by the crew to recognize a failure of the automatic actuation of the RPS."

Cues:

Indication and/or annunciation that plant parameter(s) exist that should result in automatic reactor trip but reactor does not automatically trip.

Performance Indicator:

RO/BOP opens both reactor trip breakers.

Feedback:

Reactor trip breakers open, rod bottom lights lit, IRPIs at zero steps, reactor power <5%.

WOG Reference:

E-0 Background.

Conditions:

Prior to a transition to FR-S.1.

CT Statement:

Crew stops reactor coolant pumps.

Safety Significance:

Tripping the RCPs when entering this guideline "...can appreciably delay the need for bleed and feed and loss of secondary heat sink..." Failure to trip the RCPs "...can also reduce the effectiveness of bleed and feed. RCP heat input to the RCS will result in increased steam generation hindering the depressurization of the RCS during bleed and feed."

Cues:

Indication of:

- Reactor trip and
- total feedwater flow less than 340 gpm, and
- all SG levels less than 11% NR.

Performance Indicator:

RO/BOP puts control switch(es) for all running RCPs in STOP.

Feedback:

Indication/annunciation of no RCPs running.

WOG Reference:

FR-H.1 background document.

Conditions:

Prior to being required to initiate RCS bleed and feed.

## **EVENT 8 PERFORMANCE OBJECTIVES**

**EVENT GOAL:** Given that a loss of all main and auxiliary feed water pumps has occurred, the crew will respond in accordance with 1-FR-H.1, "Response to Loss of Secondary Heat Sink."

### **NORTH ANNA SPECIFIC TASKS:**

None.

### **CRITICAL TASK:**

See Following Pages

CT Statement:

Crew establishes Feed Flow to at least one SG.

Safety Significance:

Failure to establish feedwater flow to any SG results in the crew's having to rely upon the lower-priority action of establishing RCS bleed and feed to minimize core uncover. This constitutes incorrect performance that "leads to degradation of any barrier to fission product release."

Cues:

Extreme (red-path) challenge to the heat sink CSF  
Indication that RCS pressure remains above the pressure of all SGs  
Indication that RCS temperature remains above the temperature for placing the RHR system in service  
Indication and/or annunciation that no AFW flow is available after repeated attempts to establish  
-AND-  
Level indication that SG dryout has not yet occurred.

Performance Indicator:

Crew directs operator to locally reset terry turbine trip valve and establish flow with 1-FW-P-2. BOP establishes adequate AFW flow as indicated by core-exit TCs decreasing and SG wide-range level increasing.

Feedback:

Indication of AFW flow, increasing wide-range SG level and decreasing core-exit thermocouples.

WOG Reference:

FR-H.1 Background document.

Conditions:

Prior to being required to perform RCS feed and bleed.

ATTACHMENT 3  
SIMULATOR PERFORMANCE DATASHEET

### Scenario Performance Datasheet

EVENT 1: Given the plant is in Mode 1 and the "A" bearing cooling water pump has tripped the crew will respond in accordance with 1-AP-19, "Loss of Bearing Cooling Water."

SPD Verified: \_\_\_\_\_ (Initials)

- Annunciators F-F4, F-E4, F-H8 illuminate
- 1-BC-P-1A has a breaker misalignment (amber and green lights lit)
- 1-BC-P-1B does not auto-start

EVENT 2: Given that the unit is in mode 1 and the median/select Tave unit has failed, the crew will be expected to respond in accordance with 1-AP-1.1, "Continuous Uncontrolled Rod Motion," and annunciators B-A7 and B-A8.

SPD Verified: \_\_\_\_\_ (Initials)

- Rods stepping in at maximum speed
- Annunciators B-A7 and B-A8 are illuminated
- Status light M-E4 illuminates

EVENT 3: Given that the unit is at power and indications exist of a loss of instrument air, the crew will respond in accordance with 1-AP-28, "Loss of Instrument Air."

SPD Verified: \_\_\_\_\_ (Initials)

- Annunciator 1J-D2 illuminates
- IA pressure drops
- 1-IA-C-1 will not start automatically, if required
- Annunciators J-E8 and F-F8 illuminate

EVENT 4: Given that the unit is at power and a selected pressurizer level channel has failed, the crew will be expected to respond in accordance with 1-AP-3, "Loss of Vital Instrumentation."

SPD Verified: \_\_\_\_\_ (Initials)

- Annunciators B-F8, B-G7, and B-E2 are illuminated
- 1-RC-LI-1461 fails low
- Letdown isolates

EVENT 5: Given that the unit is in mode 1 and the median/select Tave unit has failed, the crew will be expected to respond in accordance with 1-AP-1.1, "Continuous Uncontrolled Rod Motion," and annunciators B-A7 and B-A8.

SPD Verified: \_\_\_\_\_ (Initials)

- Rods stepping in at maximum speed
- Annunciators B-A7 and B-A8 are illuminated
- Status light M-E4 illuminates

EVENT 6: Given the plant is in Mode 1 with indications of a loss of "A" Main Feedwater Pump and a failure of "B" Main Feedwater Pump to automatically start, the crew will respond in accordance with 1-AP-31, "Loss of Main Feedwater," and 1-E-0, "Reactor Trip or Safety Injection."

SPD Verified: \_\_\_\_\_ (Initials)

- Annunciator E-H5 illuminates
- "A" MFP breakers have amber and green lights lit
- "B" MFP does not auto-start
- Available feed flow is less than steam flow

EVENT 7: Given that a main feed suction line has broken, the crew will respond in accordance with 1-E-0, Reactor Trip or Safety Injection."

SPD Verified: \_\_\_\_\_ (Initials)

- The reactor does not trip automatically, if required
- Annunciators F-B6, G-F6, F-D1, F-D2, F-D3, F-A4, F-B5, F-F1, F-F2, F-F3 illuminate
- Main feed pump suction pressure rapidly decreases
- Standby main Condensate pump starts
- Various turbine building sump alarms illuminate

EVENT 8: Given that a loss of all main and auxiliary feed water pumps has occurred, the crew will respond in accordance with 1-FR-H.1, "Response to Loss of Secondary Heat Sink."

SPD Verified: \_\_\_\_\_ (Initials)

- Annunciators F-D8 illuminates
- No flow indicated to "A" SG
- Flow from 1-FW-P-3A is not reaching the "C" SG, WR level decreasing
- 1-FW-P-3B degrades and flow drops to zero

MEVA 

Facility: <u>North Anna</u>	Scenario No.: <u>4</u>	Op-Test No.: <u>1</u>	
Examiners: _____ _____	Operators: _____ _____		
<p>Initial Conditions: Unit at approximately 22% power with ramp held to allow turnover. Unit was returned to service last shift after an outage to repair a leak on the EHC interface valve. 1-FW-P-2 (terry turbine) was tagged out during the outage and was just returned to service. The letdown radiation monitor is OOS. 2-CC-P-1A is tagged out for seal maintenance. Control rods are in Manual while I&amp;C verifies proper operation due to a prior problem.</p> <p>Turnover: Shift orders are to ramp unit to 100% power.</p>			
Event No.	Malfunction No.	Event Type*	Event Description
1		R (R) (S) N (B)	Commence ramping unit to 100% power
2	TU1101	C (B)(S)	Running EHC pump trips and standby pump does not auto-start (Crew will be informed during this time that rods can now be placed in AUTO.)
3	RC29	C (R) (S) TS (S)	Master pressure controller fails high causing PORV and sprays to open
4	FW0106	I (B) (S) TS (S)	Failure of "B" SG channel III level transmitter
5	NI0104	I (R) (S) TS (S)	N-44 failure
5a		N (R) (S)	N-44 is placed in trip
6	RC2402	C (All)	"B" SGTL increasing until reactor trip is required
7	RC2402	M (All)	"B" SGTR after unit stabilizes from trip
8	TU03	I (B) (S)	Turbine does not trip automatically
9	RC1201	C (R) (S)	Seal leak on "A" RCP after reactor trip
			Terminate scenario once crew completes cooldown in E-3
* (N)ormal, (R)eactivity, (I)nstrument, (C)omponent, (M)ajor			

DOMINION  
NORTH ANNA POWER STATION

INITIAL LICENSED OPERATOR EXAMINATION  
SIMULATOR EXAMINATION GUIDE  
SCENARIO NRC 4

## SIMULATOR EXAMINATION GUIDE

<u>EVENT</u>	<u>DESCRIPTION</u>
1.	Commence ramping unit to 100% power
2.	Trip of running EHC pump/Failure of standby pump to auto-start
3.	Master pressure controller fails high causing PORV and sprays to open
4.	"B" SG channel III level transmitter fails low
5/5a.	N-44 fails and is placed in trip
6.	"B" SGTL increasing until reactor trip is required. Turbine does not trip automatically. RCP seal failure.
7.	"B" SGTR

### Scenario Recapitulation:

Malfunctions after EOP entry	<b>2</b> (Failure of turbine to trip automatically, RCP seal failure)
Total Malfunctions	<b>8</b> (Trip of running EHC pump/failure of standby pump to auto-start, master pressure controller fails high, SG level channel fails low, N-44 fails, SGTL requiring reactor trip, SGTR, failure of turbine to trip automatically, RCP seal failure)
Abnormal Events	<b>4</b> (Master pressure controller fails high, SG level channel fails low, N-44 fails, SGTL requiring reactor trip)
Major Transients	<b>1</b> (SGTR)
EOPs Entered	<b>2</b> (ES-0.1, E-3)
EOP Contingencies	<b>0</b>
Critical Tasks	<b>5</b>

### SCENARIO DURATION

120 Minutes

## **SIMULATOR EXAMINATION SCENARIO SUMMARY**

### **SCENARIO NRC 2**

Scenario begins with the unit at approximately 22% power with a power increase held for turnover. Unit was returned to service last shift after an outage to repair a leak on the EHC interface valve. The terry turbine was tagged out during the outage and has just been returned to service. The letdown radiation monitor is OOS. 2-CC-P-1A is tagged out for seal maintenance. Shift orders are to ramp to 100%. Control rods are in manual while the instrument shop verifies proper operation due to a previous problem.

The crew will increase reactor power in accordance with 1-OP-2.1, "Unit Startup from Mode 2 to Mode 1."

Once a satisfactory power increase has been seen, the running EHC pump will trip with a failure of the standby pump to auto-start. The crew will start the standby pump per AR for T-B4 or US direction. At this time the crew will be informed that control rods can be placed in AUTO. Once the standby pump is running the next event can occur.

The PRZR master pressure controller will fail causing 1-RC-PCV-1455C and both spray valves to open. The US should direct the crew to enter 1-AP-44, "Loss of RCS Pressure." The RO will manually close 1-RC-PCV-1455C and use the master pressure controller to close the spray valves. Once the crew has stabilized RCS pressure and consulted Tech Specs, or at the direction of the lead evaluator, the next event will occur.

Channel III level transmitter for the "B" steam generator will fail low. The crew should identify this failure and take manual control of the "B" main feed reg. valve to restore level in the "B" SG. The crew should enter 1-AP-3, "Loss of Vital Instrumentation," and refer to technical specifications to determine operability of the transmitter. Once the crew has identified the applicable MOP and referred to Tech Specs, the next event will occur.

Next, Nuclear Instrument channel N-44 will fail high causing the control rods to drive in at maximum speed. The RO must identify N-44 as failing and place rod control in MANUAL. The crew will enter 1-AP-4.3, "Malfunction of Nuclear Instrumentation (Power Range)," and place N-44 in trip (Normal event). The US/STA should review Technical Specification 3.3.1. After N-44 has been placed in trip, the next event will occur.

A tube leak will occur on "B" SG. The first indication will be the N-16 radiation monitor for "B" SG indicating increased leakage. The US should direct the crew to enter 1-AP-5, "Unit 1 Radiation Monitoring System," and direct HP/Chemistry to obtain and analyze a "B" SG blowdown sample. Eventually, the main steamline header N-16 monitor indication will increase and the crew will have backup indication of a tube leak in the "B" SG. Based on confirmed leakage, the US should direct the crew to enter 1-AP-24, "Steam Generator Tube Leak." The tube leakage will increase until a reactor trip is necessary. The crew will enter 1-E-0, "Reactor Trip or Safety Injection."

The turbine will not trip automatically and must be tripped using pushbuttons. Following a transition to ES-0.1, "Reactor Trip Response," a SGTR will develop in the "B" steam generator.

Following identification of degrading primary plant conditions the crew will manually safety inject and transition back to E-0, "Reactor Trip or Safety Injection." The crew will proceed through E-0 and transition to and perform E-3, "Steam Generator Tube Rupture." During this time the "A" RCP will develop a seal failure and the crew will need to secure it and close the seal leakoff valve per 1-AP-33.1, "Reactor Coolant Pump Seal Failure." The crew will cooldown the RCS using E-3. At this time the scenario can be terminated.

## SCENARIO TURNOVER SHEET

### **Read the following to the crew:**

**Purpose:** This examination is intended to evaluate the crew's performance of various tasks associated with the Licensed Operator Training Program. All activities should be completed in accordance with approved operations standards.

1. You are on a day shift during the week.
2. When conditions allow, utilize the computer log systems as you would in the plant.

### **Unit Status:**

Unit 1 is at approximately 22% power. The unit was returned to service last shift after an outage to repair a leak on the EHC interface valve. The ramp was held for turnover. RCS boron is 1412 ppm and core age is 9000. Aux steam is on unit 2.

Unit 2 is at 100% power.

### **Equipment Status:**

Letdown rad monitor, 1-CH-RI-128, is OOS. 1-FW-P-2, terry turbine, was tagged out during outage and has just been returned to service. 2-CC-P-1A is tagged out for seal maintenance. Control rods are in manual while the instrument shop verifies proper operation due to a previous failure. They are currently monitoring rod motion and will inform the crew when rods may be returned to auto. The maintenance rule window is green.

### **Shift Orders:**

Ramp the unit to 100%.

EVENT 1: Given that the unit is at approximately 22% power and it is desired to increase reactor power, the crew will ramp the unit in accordance with 1-OP-2.1, "Unit Startup Mode 2 to Mode 1."

TIME	EXPECTED ACTION	INSTRUCTOR REMARKS
	SPD Verified: _____ (Initials) <ul style="list-style-type: none"> <li>• Reactor power increases</li> <li>• Turbine power increases</li> <li>• Tavg/Tref increase</li> <li>• Generator output increases</li> </ul>	
	BOP increases turbine setter to desired position.	
	BOP presses GO on turbine.	
	BOP monitors turbine ramp.	
	RO starts a dilution when required.	
	RO withdraws control rods to maintain primary temperature.	
	<b>NOTE: The next event can occur once the crew has ramped approximately 5% as determined by the lead evaluator.</b>	

EVENT 2: Given that the running EHC pump has tripped and the backup EHC pump has not auto-started, the crew will respond in accordance with the AR.		
TIME	EXPECTED ACTION	INSTRUCTOR REMARKS
	SPD Verified: _____ (Initials) <ul style="list-style-type: none"> <li>• Annunciators K-F5 and T-B4 will illuminate</li> <li>• "A" EHC pump trips</li> <li>• "B" EHC pump does not auto-start.</li> </ul>	
	BOP identifies K-F5, TURB SUPERV PANEL TROUBLE.	
	Crew identifies T-B4, EH FLUID RESERVOIR LOW-PRESSURE.	
	Crew refers to AR for T-B4.	
	US directs BOP to start the standby EHC pump.	
	<b>NOTE: Crew may hold the ramp and stop the dilution at this time.</b>	
	BOP manually starts 1-TM-P-4.	
	<b>NOTE: If crew dispatches and operator to look at EHC pumps, the operator will report that 1-TM-P-3 is unusually hot, and 1-TM-P-4 appears normal.</b>	
	<b>NOTE: The Work Control Center will inform the crew at this time that rods may be returned to AUTO.</b>	
	US requests Work Request, Condition Report, and appropriate notifications be made to Operations management and maintenance.	
	<b>NOTE: The next event will occur after the backup EHC pump is running, or at the direction of the lead evaluator.</b>	

EVENT 3: Given the unit is at power and the PRZR pressure master controller fails high, the crew will respond in accordance with 1-AP-44, "Loss of Reactor Coolant System Pressure."

TIME	EXPECTED ACTION	INSTRUCTOR REMARKS
SPD Verified: _____ (Initials) <ul style="list-style-type: none"> <li>• Annunciator B-E6 illuminates</li> <li>• Master pressure controller fails high</li> <li>• 1-RC-PCV-1455C indicates open</li> <li>• RCS pressure decreases</li> </ul>		
<p><b>NOTE: If the ramp was not previously stopped, the crew should stop the ramp and dilution once immediate actions have been completed.</b></p>		
Crew identifies annunciator B-E6, PRZR PRESS CONT HI OUTPUT.		
US directs crew to enter 1-AP-44.		
RO verifies PRZR PORV's closed. (NO)		
<p><b>Crew stops RCS pressure decrease:</b></p> <ul style="list-style-type: none"> <li>• <b>RO closes 1-RC-PCV-1455C.</b></li> <li>• RO checks master pressure controller controlling properly. (NO)</li> <li>• <b>RO places master pressure controller to manual and adjusts to stabilize and restore pressure.</b></li> </ul>		<p><b>Critical Task</b></p>
RO verifies PRZR spray valves closed.		
RO verifies all PRZR heaters energized.		
RO verifies auxiliary spray valve closed.		
Crew verifies PORV and safety valves closed.		
RO verifies RCS pressure stable or increasing.		
RO verifies RCS pressure normal and adjusts sprays or heaters, as required.		
US refers to TS-3.4.1 (DNB), TS 3.4.13 (RCS Leakage), and TS 3.4.11. He determines that PORV is operable.		
Crew evaluates malfunction and requests a work request and condition report be submitted.		

EVENT 3: Given the unit is at power and the PRZR pressure master controller fails high, the crew will respond in accordance with 1-AP-44, "Loss of Reactor Coolant System Pressure."

TIME	EXPECTED ACTION	INSTRUCTOR REMARKS
	<b>NOTE: The next event will occur after the crew has stabilized RCS pressure and consulted Tech Specs, or at the direction of the lead evaluator.</b>	

EVENT 4: Given that the unit is at power and a steam generator level transmitter has failed, the crew will be expected to respond in accordance with 1-AP-3, "Loss of Vital Instrumentation."		
TIME	EXPECTED ACTION	INSTRUCTOR REMARKS
SPD Verified: _____ (Initials) <ul style="list-style-type: none"> <li>Annunciators F-F2 and F-B2 are illuminated</li> <li>"B" Channel III SG level indicator is reading off-scale low</li> <li>"B" MFRV is ramping open</li> </ul>		
	BOP identifies annunciator 1F-F2, SG 1B LEVEL ERROR.	
	BOP identifies "B" MFRV is ramping open.	
	US directs entry into 1-AP-3.	
	Crew identifies "B" SG level channel III has failed low.	
	Crew checks redundant instrumentation normal.	
	Crew checks SGWLC parameters normal. (NO)	
	BOP takes manual control of the "B" MFRV to restore SG level.	
	Crew verifies first-stage pressure indications normal.	
	RO verifies systems affected by PRZR level channels normal: <ul style="list-style-type: none"> <li>RO verifies operable pressurizer level channel selected</li> <li>RO verifies letdown in service</li> <li>RO verifies pressurizer level control in AUTO</li> <li>RO verifies control group heaters are not tripped.</li> </ul>	
	Crew verifies both turbine first stage pressure channels normal.	
	Crew verifies operable channels selected for SGWLC.	
	Crew verifies that no other instrumentation has failed.	
	US refers to tech specs 3.3.1 (Functions 14 and 15) and 3.3.2 (Functions 5b and 6b) and reports that channel must be placed in trip within 72 hours. Info action is entered on TS 3.3.3	

EVENT 4: Given that the unit is at power and a steam generator level transmitter has failed, the crew will be expected to respond in accordance with 1-AP-3, "Loss of Vital Instrumentation."

TIME	EXPECTED ACTION	INSTRUCTOR REMARKS
	Crew identifies 1-MOP-55.76.	
	US informs Work Control Center of failure and requests WR, CR, and craft assistance.	
	<b>NOTE: The next event will occur after the crew has identified the appropriate MOP, or at the direction of the lead evaluator.</b>	

EVENT 5: Given that the unit is stable at power and power-range channel N-44 has failed high resulting in rods stepping in, the crew will respond in accordance with 1-AP-4.3, "Malfunction of Nuclear Instrumentation (Power Range)."

TIME	EXPECTED ACTION	INSTRUCTOR REMARKS
SPD Verified: _____ (Initials) <ul style="list-style-type: none"> <li>• N-44 indicates &gt; 120%</li> <li>• Control rods step in at maximum speed</li> <li>• RCS pressure and TAVE decrease</li> </ul>		
<b>NOTE: Verify control rods are in AUTO before this event.</b>		
	RO identifies control rods stepping in.	
	RO identifies N-44 failed high.	
	US directs entry into 1-AP-4.3.	
	<b>Crew stops control rod movement due to N-44 failure.</b> <ul style="list-style-type: none"> <li>• Crew verifies power not increasing.</li> <li>• <b>RO places rod control in MANUAL.</b></li> <li>• BOP verifies MFRVs in MANUAL.</li> </ul>	<b>Critical Task</b>
	Crew verifies three power-range instruments operable.	
	Crew verifies unit in mode 1.	
	Crew verifies 1-hour permissives.	
	RO places N-44 in trip. <ul style="list-style-type: none"> <li>• N-44 is selected on Comparator Channel Defeat</li> <li>• N-44 is defeated on Rod Stop Bypass</li> <li>• N-44 is defeated on Upper section</li> <li>• N-44 is defeated on Lower section</li> <li>• Control power fuses are removed.</li> </ul>	Normal event
	Crew selects N-43 on the N-16 panel, if required.	
	Crew checks reactor power greater than 5% and removes computer points from scan.	
	Crew notifies chemistry N-44 input to OLCMS is unreliable.	
	US reviews TS 3.3.1 (Functions 2 and 3). QPTR will be required once per 12 hours when power is >50%.	

EVENT 5: Given that the unit is stable at power and power-range channel N-44 has failed high resulting in rods stepping in, the crew will respond in accordance with 1-AP-4.3, "Malfunction of Nuclear Instrumentation (Power Range)."

TIME	EXPECTED ACTION	INSTRUCTOR REMARKS
	Crew verifies N-44 placed in trip within 72 hours.	
	RO verifies TAVE and TREF matched within 1.5°F.	
	Crew determines if rod control should be placed in AUTO.	
	US reports failure to Work Control Center and requests WR, CR, and craft assistance.	
	<b>NOTE: The next event will occur after the crew places N-44 in trip, or as directed by the lead evaluator.</b>	

EVENT 6: Given that the unit is at power and indications exist of a SG tube leak, the crew will be expected to respond in accordance with 1-AP-5, "Unit 1 Radiation Monitoring System," 1-AP-24, "Steam Generator Tube Leak," and 1-E-0, "Reactor Trip or Safety Injection."

TIME	EXPECTED ACTION	INSTRUCTOR REMARKS
	SPD Verified: _____ (Initials) <ul style="list-style-type: none"> <li>• 1-MS-RI-191, "B" SG N-16, in Alert</li> <li>• Annunciator K-G6 illuminated</li> <li>• Annunciator K-G6 reflashes</li> <li>• Indications of increasing leakage on all N-16 RMs</li> <li>• Charging flow slowly increases</li> <li>• <b>Later:</b> Annunciators C-G7 and C-G5 illuminate</li> <li>• "A" RCP seal leakoff flow indication is pegged high</li> </ul>	
	RO/BOP identifies annunciator K-G6, N-16 RAD DET.	
	Crew identifies an Alert alarm on 1-MS-RI-191, "B" SG main steamline N-16 radiation monitor.	
	<b>NOTE: US may not immediately break off an operator to address 1-AP-5.</b>	
	US directs entry into 1-AP-5, "Unit 1 Radiation Monitoring System," and/or 1-AP-24, "Steam Generator Tube Leak."	
	STA is notified to evaluate SG leak rate trend data.	<b>AP-5 steps</b>
	<b>NOTE: If crew requests HP to perform local radiation surveys on the MS lines, HP will inform the crew that contact readings on the "B" MS line are elevated.</b>	
	US notifies the Ops Manager or Operations Manager On Call (OMOC).	
	Crew monitors radiation on N-16 trend recorder and determines leakage is increasing.	
	Crew identifies increasing radiation on main steamline header N-16 radiation monitor.	
	US directs crew to initiate the 1-AP-5 attachment for monitoring primary to secondary leakage, and enter 1-AP-24.	

EVENT 6: Given that the unit is at power and indications exist of a SG tube leak, the crew will be expected to respond in accordance with 1-AP-5, "Unit 1 Radiation Monitoring System," 1-AP-24, "Steam Generator Tube Leak," and 1-E-0, "Reactor Trip or Safety Injection."

TIME	EXPECTED ACTION	INSTRUCTOR REMARKS
	Crew checks if reactor should be tripped: <ul style="list-style-type: none"> <li>Valid indication of high radiation on a secondary radiation monitor</li> <li>AND any of the following: <ul style="list-style-type: none"> <li>Noticeably increased charging flow</li> <li>Increase in VCT makeup frequency</li> <li>Unexpected SG level increase</li> <li>Unexpected feed flow decrease.</li> </ul> </li> </ul>	<b>AP-24</b>
	Crew identifies reflash on annunciator K-G6, N-16 RAD DET.	
	Crew identifies all N-16 RM indications increasing.	
	US directs crew enter E-0, while continuing with 1-AP-24.	
	RO/BOP trip the reactor.	
	BOP trips the turbine using the turbine trip pushbuttons.	<b>Turbine will not trip automatically</b>
	RO verifies AC emergency busses energized.	
	Crew checks if SI has actuated.	
	Crew checks if SI is required. (NO)	
	US directs transition to 1-ES-0.1.	
	Crew initiates monitoring of critical safety function status trees.	
	*RO checks RCS Tave stable at or trending to expected value.	
	BOP adjusts AFW flow as required	
	<b>NOTE: At this time the "A" RCP will develop a seal leak.</b>	
	RO identifies annunciators C-G7 RCP 1A-B-C SEAL LEAK HI FLOW, and C-G5, RCP 1A-B-C SHAFT SEAL WATER LO DP.	
	RO identifies "A" RCP seal leakoff flow is pegged high.	

EVENT 6: Given that the unit is at power and indications exist of a SG tube leak, the crew will be expected to respond in accordance with 1-AP-5, "Unit 1 Radiation Monitoring System," 1-AP-24, "Steam Generator Tube Leak," and 1-E-0, "Reactor Trip or Safety Injection."

TIME	EXPECTED ACTION	INSTRUCTOR REMARKS
	US directs crew to enter 1-AP-33.1.	
	Crew determines RCP must be tripped.	
	<p><b>Crew isolates affected Reactor Coolant Pump seal leakoff</b></p> <ul style="list-style-type: none"> <li>• Crew trips "A" RCP.</li> <li>• Crew closes 1-CH-HCV-1303A, #1 seal leakoff valve once the "A" RCP indicates stopped.</li> </ul>	<b>Critical Task</b>
*	<p><b>NOTE: RCP should be tripped and seal leakoff valve should be closed within five minutes of initial seal failure.</b></p>	
	US reports seal failure to Work Control Center and requests WR, CR, and craft assistance.	
	US announces continuation of ES-0.1.	
	<p><b>NOTE: The next event will occur once the RCP is stopped and auxiliary feed flow has been throttled, or as directed by the lead evaluator.</b></p>	

EVENT 7: Given that the unit is shutdown following a reactor trip, and indications exist of a SGTR, the crew will be expected to respond in accordance with 1-E-0, "Reactor Trip or Safety Injection," and 1-E-3, "Steam Generator Tube Rupture."

TIME	EXPECTED ACTION	INSTRUCTOR REMARKS
SPD Verified: _____ (Initials) <ul style="list-style-type: none"> <li>• "B" SG level increases unexpectedly</li> <li>• Pressurizer level and pressure decreases unexpectedly</li> </ul>		
	Crew observes indications that the SG tube leak has worsened.	
	US directs entry into 1-E-0.	
	RO/BOP verify reactor tripped.	
	BOP verifies turbine trip.	
	RO verifies AC emergency busses energized.	
	<b>NOTE: 1-AP-24 is no longer applicable once SI has been actuated.</b>	
	Crew manually actuates SI.	
	BOP verifies feedwater isolation: <ul style="list-style-type: none"> <li>• MFRVs closed</li> <li>• MFRBVs closed</li> <li>• Main feed MOVs closed</li> <li>• Standby MFP in PTL</li> <li>• Main feed pumps tripped</li> <li>• MFP discharge MOVs closed</li> <li>• SG BD TVs closed.</li> </ul>	
	Crew verifies phase A isolation: <ul style="list-style-type: none"> <li>• Manually initiates Phase A</li> <li>• Initiates Attachment to verify isolation.</li> </ul>	
	BOP verifies AFW pumps are running, as required.	
	Crew verifies SI pumps are running.	
	Crew checks if main steamlines should be isolated.	
	Crew verifies SI flow.	
	BOP verifies AFW flow.	
	RO checks RCS average temperature.	

EVENT 7: Given that the unit is shutdown following a reactor trip, and indications exist of a SGTR, the crew will be expected to respond in accordance with 1-E-0, "Reactor Trip or Safety Injection," and 1-E-3, "Steam Generator Tube Rupture."

TIME	EXPECTED ACTION	INSTRUCTOR REMARKS
	RO checks pressurizer PORVs and spray valves.	
	RO checks RCP trip and charging pump recirc criteria.	
	Crew checks SGs not faulted. (YES)	
	Crew checks SG tubes not ruptured. (NO)	
	US directs transition to 1-E-3.	
	RO checks RCP trip and charging pump recirc criteria.	
	Crew identifies "B" SG as the ruptured SG.	
	<b>NOTE: Crew may have closed 1-FW-MOV-100B earlier in the scenario. SG level &gt;11%.</b>	
	<p><b>Crew isolates ruptured SG by performing/directing the following:</b></p> <ul style="list-style-type: none"> <li>• BOP adjusts "B" SG PORV setpoint at 1050 PSIG</li> <li>• BOP checks "B" SG PORV closed</li> <li>• <b>Crew initiates attachment for MSVH isolation local actions</b></li> <li>• RO checks decay heat release valve closed</li> <li>• BOP verifies "B" SG blowdown valves closed</li> <li>• <b>BOP closes "B" SG MSTV and bypass valve</b></li> <li>• <b>BOP closes FW-MOV-100B when "B" SG level &gt;11%.</b></li> </ul>	<b>Critical Task</b>
	Crew initiates attachment for turbine building actions.	
	*RO checks PRZR PORVs and block valves and safety valves.	
	*BOP checks intact SG levels.	
	RO resets both trains of SI.	

EVENT 7: Given that the unit is shutdown following a reactor trip, and indications exist of a SGTR, the crew will be expected to respond in accordance with 1-E-0, "Reactor Trip or Safety Injection," and 1-E-3, "Steam Generator Tube Rupture."

TIME	EXPECTED ACTION	INSTRUCTOR REMARKS
	Crew aligns air ejectors to containment: <ul style="list-style-type: none"> <li>• Crew removes fuses from AE RM</li> <li>• RO resets phase A</li> <li>• Crew places AE divert switches to DIVERT</li> <li>• Crew verifies valve alignment</li> <li>• Crew opens steam supply to air ejectors.</li> </ul>	
	BOP establishes IA to containment.	
	Crew verifies flow from "B" SG isolated: <ul style="list-style-type: none"> <li>• Procedure step 3 complete</li> <li>• Attachment 7 complete through step 3</li> <li>• Ruptured SG pressure &gt;350 psig.</li> </ul>	
	*RO checks interlock blocks and blocks SI signals when required.	
	<b>Crew initiates RCS cooldown:</b> <ul style="list-style-type: none"> <li>• Crew determines required CETC temperature based on ruptured SG pressure.</li> <li>• <b>RO/BOP dumps steam.</b></li> <li>• RO verifies CETCs &lt; required temperature.</li> <li>• RO/BOP stop dumping steam.</li> </ul>	<b>Critical Task</b>
	<b>NOTE: Scenario may be terminated after crew completes cooldown, or as directed by the Lead Evaluator.</b>	

REFERENCES

PROCEDURE	REV.
Operating Procedure 1-OP-2.1, "Unit Startup from Mode 2 to Mode 1."	87
Abnormal Procedure 1-AP-44, "Loss of Reactor Coolant System Pressure."	19
Abnormal Procedure 1-AP-4.3, "Malfunction of Nuclear Instrumentation (Power Range)."	18
Abnormal Procedure 1-AP-3, "Loss of Vital Instrumentation."	22
Abnormal Procedure 1-AP-24, "Steam Generator Tube Leak."	20
Abnormal Procedure 1-AP-33.1, "Reactor Coolant Pump Seal Failure."	13
Emergency Procedure 1-E-0, "Reactor Trip or Safety Injection."	36
Emergency Procedure 1-E-3, "Steam Generator Tube Rupture."23	23
Station Annunciator Response Procedures.	N/A
Guide and Reference Document PI-AA-5000, "Human Performance."	1
INPO, Guideline for Teamwork and Diagnostic Skill Development: INPO 88-003,	Jan. 1988
INPO, ACAD 07-002 Simulator Training Guidelines	Jan. 2007

## ATTACHMENTS

ATTACHMENT 1 - SIMULATOR OPERATOR'S COMPUTER PROGRAM

ATTACHMENT 2 - SCENARIO PERFORMANCE OBJECTIVES

ATTACHMENT 3 – SIMULATOR PERFORMANCE DATASHEET (Last page of scenario)\*

ATTACHMENT 1  
SIMULATOR OPERATOR'S COMPUTER PROGRAM

**SIMULATOR OPERATOR'S COMPUTER PROGRAM**  
**SXG NRC 4**

**Initial conditions**

1. Recall IC 164
2. Ensure Tave, Tref (550-560), PDTT level, and VCT level are selected on trend recorders.
3. Place a WR magnet on 1-CH-RI-128.
4. Set rods on PCS to 140 steps on D bank.
5. 1-OP-2.1 filled out to correct step.
6. Reactivity plan available.
7. Rackout breaker for 2-CC-P-1A and verify 2-CC-P-1B running. Close U2\_CC\_11, U2\_CC\_4.

**PRELOADS PRIOR TO SCENARIO START**

CONDITION	MALFUNCTION/OVERRIDE/ETC.
Letdown rad monitor failure	<b>Malfunction:</b> RM0207, Severity = -1
Auto-start failure of EHC pump	<b>Switch override:</b> TMP4_ASTP, Delay time = 0, Value = False
Failure of auto turbine trip	<b>Malfunction:</b> TU03

**SCENARIO EVENTS**

EVENT	MALFUNCTION/OVERRIDE/COMMUNICATIONS
1) Unit ramp	<b>NOTE: The next event will occur once the crew has ramped approximately 5%.</b>

EVENT	MALFUNCTION/OVERRIDE/COMMUNICATIONS
2) EHC pump trip	<p><b>Malfunction:</b> TU1101, Delay time = 5, Trigger = 2</p> <p><b>NOTE: If crew dispatches and operator to look at EHC pumps, the operator will report that 1-TM-P-3 is unusually hot, and 1-TM-P-4 appears normal.</b></p> <p><b>NOTE: When the US reports the failure the WCC can tell him that all I&amp;C paperwork has been signed off for the previous control rod problem and rods may be placed in AUTO at this time.</b></p> <p><b>NOTE: The next event will occur after the backup EHC pump is running, or at the direction of the lead evaluator.</b></p>
3) PRZR master pressure controller failure	<p><b>Malfunction:</b> RC29, Delay time = 5, Ramp = 5, Severity = 2, Trigger = 3</p> <p><b>NOTE: The next event will occur after the crew has stabilized RCS pressure and consulted Tech Specs, or at the direction of the lead evaluator.</b></p>
4) "B" SG level transmitter failure	<p><b>Malfunction:</b> FW0106, Delay time = 5, Ramp = 5, Stop = -1, Trigger = 4</p> <p><b>NOTE: The next event will occur after the crew has reviewed TS, or at the direction of the lead evaluator.</b></p>
5) Power-range channel IV failure	<p><b>NOTE: Verify control rods have been returned to AUTO before inserting this event.</b></p> <p><b>Malfunction:</b> NI0204, Delay time = 5, Ramp = 0, Severity = 1, Trigger = 5</p> <p><b>NOTE: The next event will occur after the crew stabilizes unit and places N-44 in trip, or as directed by the lead evaluator.</b></p>

EVENT	MALFUNCTION/OVERRIDE/COMMUNICATIONS
<p>6) Steam generator tube leak requiring shutdown/"A" RCP seal leak</p>	<p><b>Malfunctions:</b>  RC2402, Delay time = 5, Ramp = 300, Severity = 1.0, Trigger = 6  RC1201, Delay time = 180, Ramp = 5, Severity = 100, Trigger = 25</p> <p><b>NOTE: Put in trigger 25 when crew transitions to ES-0.1 and starts to throttle AFW.</b></p> <p><b>NOTE: HP surveys should take approximately 5 minutes. Chemistry samples should take approximately 30 minutes.</b></p> <p><b>NOTE: HP will initially inform the crew that there is increasing radiation in contact readings on the "B" MS line.</b></p> <p><b>NOTE: The next event will occur after the crew throttles AFW and stops the "A" RCP, or at the direction of the lead evaluator.</b></p>
<p>7) SGTR</p>	<p><b>Update tube leak using trigger 7 on trigger screen:</b>  IMF RC2402 (7 5) 50 60</p> <p><b>Remote Function:</b>  MS_57, Delay time = 120, Ramp = 60, Value = 0, Trigger = 15</p> <p><b>NOTE: Scenario may be terminated after the RCS cooldown has been completed, or as directed by the Lead Evaluator.</b></p>

ATTACHMENT 2  
SCENARIO PERFORMANCE OBJECTIVES

## SIMULATOR REQUALIFICATION EXAMINATION

### TERMINAL PERFORMANCE OBJECTIVE

Given equipment failures and operational situations, operate the plant in accordance with Technical Specifications to bring the unit to a safe condition, using applicable procedures, and applying effective teamwork, communication, and diagnostic skills.

### GENERIC PERFORMANCE OBJECTIVES

- A. During shift operations the shift manager will take a conservative course of action, especially when uncertain conditions exist, when dealing with core cooling or heat sink availability, primary system and containment integrity, and reactivity control associated with plant evolutions.
- B. During shift operations the shift manager will provide overall crew guidance by prioritizing and integrating the actions of the shift crew in accordance with administrative procedures.
- C. During shift operations each crew member will participate in a team effort that resolves conflicts, provides input into the team decision and communicates all the necessary information to enhance teamwork in accordance with administrative procedures.
- D. During shift operations the Shift Technical Advisor will independently assess events and based on those assessments make recommendations to the crew regarding mitigation strategy.

## **EVENT 1 PERFORMANCE OBJECTIVES**

**EVENT GOAL:** Given that the unit is at approximately 22% power and it is desired to increase reactor power, the crew will ramp the unit in accordance with 1-OP-2.1, "Unit Startup Mode 2 to Mode 1."

### **NORTH ANNA SPECIFIC TASKS:**

R705 Dilute the RCS using the blender.

### **CRITICAL TASK:**

N/A

**EVENT 2 PERFORMANCE OBJECTIVES**

**EVENT GOAL:** Given that the running EHC pump has tripped and the backup EHC pump has not auto-started, the crew will respond in accordance with the AR.

**NORTH ANNA SPECIFIC TASKS:**

N/A

**CRITICAL TASK:**

N/A

### **EVENT 3 PERFORMANCE OBJECTIVES**

**EVENT GOAL:** Given the unit is at power and the PRZR pressure master controller fails high, the crew will respond in accordance with 1-AP-44, "Loss of Reactor Coolant System Pressure."

#### **NORTH ANNA SPECIFIC TASKS:**

R634 Respond to a loss of reactor coolant system pressure.

S70 Evaluate compliance with technical specifications.

#### **CRITICAL TASK:**

See next page

CT Statement:

Crew stops RCS pressure decrease.

Safety Significance:

Failure to close the PORV and spray valves under the postulated plant conditions constitutes "mis-operation or incorrect crew performance which leads to degradation of any barrier to fission product release." In this case, the RCS fission-product barrier can be restored to full integrity simply by closing the PORV and spray valves. Therefore, failure to close the PORV and spray valves also represents a "demonstrated inability by the crew to take an action or combination of actions that would prevent a challenge to plant safety."

Cues:

Valid indication of pressure decreasing by the presence of various annunciators, indication of PORV and spray valves open, and RCS pressure indication decreasing.

Performance Indicator:

RO manually closes PORV and sprays valves.

Feedback:

RCS pressure decrease stopped.

WOG Reference:

E-0 - Background Document.

Conditions:

Prior to receiving an automatic reactor trip on low pressure.

## **EVENT 4 PERFORMANCE OBJECTIVES**

**EVENT GOAL:** Given that the unit is at power and a steam generator level transmitter has failed, the crew will be expected to respond in accordance with 1-AP-3, "Loss of Vital Instrumentation."

### **NORTH ANNA SPECIFIC TASKS:**

R626 Respond to a steam generator water level control channel failure.

S70 Evaluate compliance with technical specifications.

### **CRITICAL TASK:**

N/A

## **EVENT 5 PERFORMANCE OBJECTIVES**

**EVENT GOAL:** Given that the unit is stable at power and power-range channel N-44 has failed high resulting in rods stepping in, the crew will respond in accordance with 1-AP-4.3, "Malfunction of Nuclear Instrumentation (Power Range)."

### **NORTH ANNA SPECIFIC TASKS:**

R713 Perform the immediate operator actions in response to a malfunction of power-range nuclear instrumentation.

S70 Evaluate compliance with technical specifications.

### **CRITICAL TASK:**

See next page

CT Statement:

Crew takes action to stop rod motion and stabilize the unit.

Safety Significance:

Core reactivity is not under control of the operator due to the failed control channel. "It is expected that the operator will attempt to take manual actions to correct for anomalous conditions during power operation."

Cues:

Indication of a failed power range NI.  
Continuous inward control rod motion with TAVE and TREF matched.

Performance Indicator:

RO places rod control in manual.

Feedback:

Rod motion stops.

WOG Reference:

None.

Conditions:

Prior to a PRZR low pressure reactor trip.

## **EVENT 6 PERFORMANCE OBJECTIVES**

**EVENT GOAL:** Given that the unit is at power and indications exist of a SG tube leak, the crew will be expected to respond in accordance with 1-AP-5, "Unit 1 Radiation Monitoring System," 1-AP-24, "Steam Generator Tube Leak," and 1-E-0, "Reactor Trip or Safety Injection."

### **NORTH ANNA SPECIFIC TASKS:**

R185 Perform the immediate operator actions in response to a reactor trip or safety injection.

R533 Respond to a reactor coolant pump seal failure.

S70 Evaluate compliance with technical specifications.

### **CRITICAL TASK:**

See next page

CT Statement:

Crew isolates affected Reactor Coolant Pump seal leakoff.

Safety Significance:

"...an indication of a failure of the #1 seal in any RCP with controlled seal leakoff requires prompt action to secure the leakoff path as soon as is practical and in no case longer than five minutes after seal leakoff exceeds the high flow alarm setpoint. Failure to isolate the affected RCP seal leakoff in a timely manner may subject the RCP shaft, lower radial bearing, and seals to high temperature conditions which could lead to premature failure of the remaining seals, failure of the lower radial bearing, and warping of the RCP shaft...."

Cues:

Indication and annunciation of:

- Affected RCP #1 seal DP less than 200 psid  
OR
- Valid indication of #1 seal leakoff greater than alarm setpoint.

Performance Indicator:

- Crew stops affected RCP (once reactor is tripped).
- Crew closes affected RCP #1 seal leakoff valve (once loop flow indicates affected RCP is stopped).

Feedback:

Indication of:

- decreasing or zero flow for loop with affected RCP
- affected RCP seal leakoff valve closed.

WOG Reference:

Westinghouse RCP vendor manual - addendum #3.

Conditions:

Within 5 minutes of seal leakoff exceeding alarm setpoint.

## **EVENT 7 PERFORMANCE OBJECTIVES**

**EVENT GOAL:** Given that the unit is shutdown following a reactor trip, and indications exist of a SGTR, the crew will be expected to respond in accordance with 1-E-0, "Reactor Trip or Safety Injection," and 1-E-3, "Steam Generator Tube Rupture."

### **NORTH ANNA SPECIFIC TASKS:**

- R187 Identify and isolate a ruptured steam generator.
- R759 Cool down the Reactor Coolant System during the response to a steam generator tube rupture.

### **CRITICAL TASK:**

See Following Pages

CT Statement:

Crew isolates flow to/from ruptured SG.

Safety Significance:

Failure to isolate the ruptured SG causes a loss of differential pressure between the ruptured SG and the intact SGs. Upon loss of differential pressure, the crew must transition to a contingency procedure that constitutes an incorrect performance that "...necessitates the crew taking compensating action which complicates the event mitigation strategy..."

Cues:

Indication and annunciation of:

- \* Increasing SG water level and radiation; and
- \* a reactor trip; and
- \* a safety injection.

Performance Indicator:

BOP adjusts ruptured SG PORV setpoint at 1050 PSIG.  
BOP checks ruptured SG PORV closed.  
RO checks decay heat release valve closed.  
BOP checks "B" SG blowdown trip valves closed.  
BOP closes ruptured SG MSTV and Bypass valve.  
RO/BOP directs an auxiliary operator to locally close 1-MS-57, Steam to the Terry Turbine from "B" SG.  
BOP closes 1-FW-MOV-100B.

Feedback:

Indication of:

- \* stable or increasing pressure in the ruptured SG.
- \* decreasing or zero feedwater flow rate to the ruptured SG.

WOG Reference:

E-3 Background.

Conditions:

Isolate before a transition to ECA-3.1 occurs.

CT Statement:

Crew initiates RCS Cooldown.

Safety Significance:

Failure to establish and maintain the correct RCS temperature during a SGTR leads to a transition from E-3 to a contingency procedure, which constitutes an incorrect performance that "...necessitates the crew taking compensating action which complicates the event mitigation strategy...."

Cues:

Procedurally directed by E-3.

Performance Indicator:

RO/BOP dumps steam.

Feedback:

Indication of steam flow rate greater than zero.

Indication of RCS temperature decreasing

OR

Indication of RCS temperature less than target temperature.

WOG Reference:

E-3 Background.

Conditions:

Crew maintains adequate subcooling.

ATTACHMENT 3  
SIMULATOR PERFORMANCE DATASHEET

### Scenario Performance Datasheet

EVENT 1: Given that the unit is at approximately 22% power and it is desired to increase reactor power, the crew will ramp the unit in accordance with 1-OP-2.1, "Unit Startup Mode 2 to Mode 1."

SPD Verified: \_\_\_\_\_ (Initials)

- Reactor power increases
- Turbine power increases
- Tavg/Tref increase
- Generator output increases

EVENT 2: Given that the running EHC pump has tripped and the backup EHC pump has not auto-started, the crew will respond in accordance with the AR.

SPD Verified: \_\_\_\_\_ (Initials)

- Annunciators K-F5 and T-B4 will illuminate
- "A" EHC pump trips
- "B" EHC pump does not auto-start.

EVENT 3: Given the unit is at power and the PRZR pressure master controller fails high, the crew will respond in accordance with 1-AP-44, "Loss of Reactor Coolant System Pressure."

SPD Verified: \_\_\_\_\_ (Initials)

- Annunciator B-E6 illuminates
- Master pressure controller fails high
- 1-RC-PCV-1455C indicates open
- RCS pressure decreases

EVENT 4: Given that the unit is at power and a steam generator level transmitter has failed, the crew will be expected to respond in accordance with 1-AP-3, "Loss of Vital Instrumentation."

SPD Verified: \_\_\_\_\_ (Initials)

- Annunciators F-F2 and F-B2 are illuminated
- "B" Channel III SG level indicator is reading off-scale low
- "B" MFRV is ramping open

EVENT 5: Given that the unit is stable at power and power-range channel N-44 has failed high resulting in rods stepping in, the crew will respond in accordance with 1-AP-4.3, "Malfunction of Nuclear Instrumentation (Power Range)."

SPD Verified: \_\_\_\_\_ (Initials)

- N-44 indicates > 120%
- Control rods step in at maximum speed
- RCS pressure and TAVE decrease

EVENT 6: Given that the unit is at power and indications exist of a SG tube leak, the crew will be expected to respond in accordance with 1-AP-5, "Unit 1 Radiation Monitoring System," 1-AP-24, "Steam Generator Tube Leak," and 1-E-0, "Reactor Trip or Safety Injection."

SPD Verified: \_\_\_\_\_ (Initials)

- 1-MS-RI-191, "B" SG N-16, in Alert
  - Annunciator K-G6 illuminated
  - Annunciator K-G6 reflashes
  - Indications of increasing leakage on all N-16 RMs
  - Charging flow slowly increases
  - **Later:** Annunciators C-G7 and C-G5 illuminate
- "A" RCP seal leakoff flow indication is pegged high

EVENT 7: Given that the unit is shutdown following a reactor trip, and indications exist of a SGTR, the crew will be expected to respond in accordance with 1-E-0, "Reactor Trip or Safety Injection," and 1-E-3, "Steam Generator Tube Rupture."

SPD Verifies: \_\_\_\_\_ (Initials)

- "B" SG level increases unexpectedly
- Pressurizer level and pressure decreases unexpectedly

MEVA 

DOMINION  
NORTH ANNA POWER STATION

INITIAL LICENSED OPERATOR EXAMINATION  
SIMULATOR EXAMINATION GUIDE  
SCENARIO NRC 5

## SIMULATOR EXAMINATION GUIDE

<u>EVENT</u>	<u>DESCRIPTION</u>
1.	Failure of 1-CH-LT-1112, VCT level transmitter, high
2.	"A" High Pressure Heater Drain Tank high-level divert fails open. Standby Condensate pump will not auto-start. Rods will not work in auto.
3.	1-RC-PCV-1455B, spray valve, fails open and will not close with controller
4.	Main Generator voltage regulator fails
5.	Loss of 1H bus requiring crew to reduce power
6.	Loss of switchyard with failure of 1J EDG to start in AUTO-REMOTE
7.	LOCA outside containment with failure of "B" train of Phase A

### Scenario Recapitulation:

Malfunctions after EOP entry	<b>3</b> (Failure of 1J EDG to start in AUTO-REMOTE, LOCA outside containment, failure of "B" train of Phase A to function in auto)
Total Malfunctions	<b>10</b> (Failure of 1-CH-LT-1112 high, "A" HPHDT HLD fails open/standby Condensate pump does not auto-start if required, no auto rod control, "B" pressurizer spray valve fails open, MG VR failure, loss of 1H emergency bus, loss of switchyard, 1JEDG fails to start in AUTO-REMOTE, LOCA outside containment, failure of "B" train Phase A)
Abnormal Events	<b>4</b> ("A" HPHDT HLD fails open/standby Condensate pump does not auto-start if required, "B" pressurizer spray valve fails open, MG VR failure, loss of 1H emergency bus)
Major Transients	<b>1</b> (Loss of switchyard)
EOPs Entered	<b>1</b> (ES-0.1)
EOP Contingencies	<b>2</b> (ECA-0.0, ECA-1.2)
Critical Tasks	<b>3</b>

### SCENARIO DURATION

# Minutes

## **SIMULATOR EXAMINATION SCENARIO SUMMARY**

### **SCENARIO NRC 2**

The scenario begins with the unit at 100% power. The letdown radiation monitor is OOS and the terry turbine was returned to service last shift. 2-CC-P-1A is tagged out for seal maintenance.

VCT Level transmitter 112 will fail high. The crew will respond in accordance with the AR for VCT HI-LO LEVEL L-112, by placing 1-CH-LCV-1115A in manual and raising the output to 100% to stop diverting to the stripper. The crew should discuss the loss of the RWST swapover on low level. Once the crew has stopped the VCT divert the next event can occur.

The high-level divert for the "A" HP heater drain tank will fail open. The "A" HP heater drain pump will trip. The "B" Condensate pump will not start in auto, if required. Power will increase due to the colder water entering the SGs. The crew will enter 1-AP-31, "Loss of Main Feedwater," and start the standby Condensate pump along with 1-AP-38, "Excessive Load Increase," to ramp the unit down slightly to reduce power to less than 100%. Rods will not step in auto if required and will have to be operated in manual. An operator will report that the controller was found to be loose, and level can be restored to within the normal band. The next event will occur once the crew has stabilized the unit and restored the high-level divert.

The "A" pressurizer spray valve will fail open. The crew will enter 1-AP-44, "Loss of Reactor Coolant System Pressure," and the RO will be required to use the remote close SOV in order to close the spray valve. Once the crew has stabilized RCS pressure, the next event can occur.

The main generator voltage regulator will fail and the crew will be expected to respond in accordance with 1-AP-26, "Loss of Main Generator Voltage Control." The BOP will turn off the voltage regulator and control voltage using base adjust. After generator voltage has been brought under control, the next event will occur.

A loss of 1H bus will occur. Due to a fault on the bus the 1H EDG output breaker will not close to reenergize the bus. This will result in the High-Level Divert Valves failing open and a loss of CC to the RCP thermal barriers. The crew will need to enter 1-AP-38, "Excessive Load Increase," and ramp the unit to reduce reactor power. Reminder: Rods will not step in auto. As time permits, the crew will enter 0-AP-10, "Loss of Electrical Power," to diagnose the power loss. The crew will eventually be informed that the electricians will need a tagout in order to examine the bus for damage. Once reactor power has been reduced to the previous power level, the next event can occur.

A loss of the switchyard will occur as a result of problem on the grid. The 1J EDG will not start in automatic. The crew will enter 1-ECA-0.0, "Loss of All AC," and will be able to restore the 1J bus using the attachment. They will be able to transition to 1-E-0, "Reactor Trip or Safety Injection," and then to 1-ES-0.1, "Reactor Trip Response." At this time the 1H bus will be restored.

Once the crew has stabilized the unit and reenergized 1H bus, a leak will develop in the Safeguards area. The crew will transition back to 1-E-0 and eventually to 1-ECA-1.2, "LOCA Outside Containment," where they will isolate the leak. At this time the scenario can be terminated.

## SCENARIO TURNOVER SHEET

**Read the following to the crew:**

**Purpose:** This examination is intended to evaluate the crew's performance of various tasks associated with the Licensed Operator Training Program. All activities should be completed in accordance with approved operations standards.

1. You are on a day shift during the week.
2. When conditions allow, utilize the computer log systems as you would in the plant.

**Unit Status:**

Unit 1 is at 100% power. RCS boron is 978 ppm and core age is 9000 MWD/MTU. Aux steam is on unit 1.

Unit 2 is at 100% power.

**Equipment Status:**

1-CH-RI-128, Letdown radiation monitor, is OOS. 1-FW-P-2 was returned to service last shift, PMT was SAT. 2-CC-P-1A is tagged out for seal maintenance. Maintenance rule window is green.

**Shift Orders:**

Maintain current plant conditions and support maintenance on 2-CC-P-1A.

EVENT 1: Given that the unit is at power and VCT level transmitter, 1-CH-LT- 1112, has failed high, the crew will respond in accordance with the applicable annunciator response.

TIME	EXPECTED ACTION	INSTRUCTOR REMARKS
	SPD Verified: _____ (Initials) <ul style="list-style-type: none"> <li>• Annunciator C-A4 will illuminate</li> <li>• 1-CH-LI-1112 will indicate off-scale high</li> <li>• 1-CH-LCV-1112C output will go to zero</li> <li>• VCT level will decrease</li> <li>• "A" Stripper level will increase</li> </ul>	
	RO identifies annunciator C-A4, VCT HI-LO LEVEL L-112.	
	RO identifies LT-1112 is failed high and VCT is diverting to stripper.	
	US reads note in AR about 1-CH-LT-1115 failing high - loss of auto swapper capability, full divert to stripper.	
	RO places 1-CH-LCV-1112C in manual and raises output to 100%.	
	US makes notifications about LT-1112 failure and requests instrument shop assistance along with WR, CR.	
	<b>NOTE: The next event may occur once the letdown divert valve has been closed, or at the discretion of the lead evaluator.</b>	

EVENT 2: Given that "A" HP heater drain tank high-level divert has failed open, the crew will be expected to respond in accordance with 1-AP-31, "Loss of Main Feedwater," and 1-AP-38, "Excessive Load Increase."

TIME	EXPECTED ACTION	INSTRUCTOR REMARKS
SPD Verified: _____ (Initials) <ul style="list-style-type: none"> <li>• Annunciator Q-E3 illuminates</li> <li>• 1-SD-P-1A trips as indicated by amber light lit</li> <li>• Reactor power increases</li> <li>• Main feed pump suction pressure decreases</li> <li>• 1-CN-P-1B does not auto-start, if required</li> </ul>		
	BOP identifies level decreasing in "A" HP heater drain tank.	
	Crew identifies annunciator Q-E3, 2 <sup>ND</sup> PT HTR DR RECVR TK A HI-LO LEVEL.	
	BOP identifies trip of 1-SD-P-1A.	
	US directs entry into AP-31.	
	BOP verifies power > 70%.	
	BOP verifies 2 main feed pump running.	
	<b>NOTE: Feed pump suction pressure may initially be greater than 300 psig, but it will be decreasing.</b>	
	BOP checks main feed pump suction pressure > 300 psig.	
	BOP starts 3 <sup>rd</sup> condensate pump.	
	Crew identifies increase in reactor power.	
	US directs entry into AP-38.	
	RO verifies steam dumps closed.	
	BOP verifies SG PORVs indicate closed.	
	<b>NOTE: Rods will not operate in auto if required and will have to be stepped in manual.</b>	
	Crew ramps turbine down until power indicates ≤ 100%.	
	<b>NOTE: PCS will indicate opening of several high-level divers.</b>	

EVENT 2: Given that "A" HP heater drain tank high-level divert has failed open, the crew will be expected to respond in accordance with 1-AP-31, "Loss of Main Feedwater," and 1-AP-38, "Excessive Load Increase."

TIME	EXPECTED ACTION	INSTRUCTOR REMARKS
	Watchstander is dispatched to investigate cause for trip of "A" HP.	
	<b>NOTE: Watchstander will report 1-SD-LCV-107A was open with dial for setpoint loose. Setpoint has now been returned to normal.</b>	
	US reports failures to WCC and requests WR, CR, and maintenance assistance.	
	<b>NOTE: The next event will occur once the unit is stable and 1-SD-LCV-107A has been isolated, or at the discretion of the lead evaluator.</b>	

EVENT 3: Given that the unit is at power and a PRZR spray valve has failed open, the crew will be expected to respond in accordance with 1-AP-44, "Loss of Reactor Coolant Pressure."

TIME	EXPECTED ACTION	INSTRUCTOR REMARKS
	SPD Verified: _____ (Initials) <ul style="list-style-type: none"> <li>• PRZR spray valve 1-RC-PCV-1455B has full open indication.</li> <li>• Master pressure controller output decreases.</li> <li>• PRZR pressure decreases.</li> <li>• Annunciators B-F7, B-H6 illuminate</li> </ul>	
	RO identifies annunciator B-F7, PRZ HI-LO PRESS.	
	RO identifies RCS pressure decreasing.	
	US directs crew to enter 1-AP-44.	
	RO monitors RCS pressure greater than 1870 psig.	
	RO checks PRZR PORVs closed.	
	RO checks master pressure controller not failed.	
	RO checks spray valves closed. (NO)	
	<b>NOTE: Valve cannot be manually closed. Crew must use SOV.</b>	
	<b>Crew stops RCS pressure decrease:</b> <ul style="list-style-type: none"> <li>• RO closes REMOTE CLOSE SOV for spray valve.</li> </ul>	
	RO verifies all PRZR heaters are energized.	
	RO checks that aux spray valve is closed.	
	RO checks PRZR safety valves closed.	
	RO verifies RCS pressure stable or increasing.	
	RO verifies RCS pressure returned to normal.	
	RO adjusts sprays and heaters, as required, to maintain normal pressure.	
	US refers to DNB 3.4.1, Action A (2 hour), if pressure went below 2205 psig.	

EVENT 3: Given that the unit is at power and a PRZR spray valve has failed open, the crew will be expected to respond in accordance with 1-AP-44, "Loss of Reactor Coolant Pressure."

TIME	EXPECTED ACTION	INSTRUCTOR REMARKS
	US requests Work Control Center supervisor to inform the OMOC of the failure and initiate WR and CR.	
	<b>NOTE: The next event will occur after the crew has returned RCS pressure to normal, or at the direction of the lead evaluator.</b>	

EVENT 4: Given that the unit is at power, and the main generator voltage regulator has failed, the crew will be expected to respond in accordance with 1-AP-26, "Loss of Main Generator Voltage Control."

TIME	EXPECTED ACTION	INSTRUCTOR REMARKS
SPD Verified: _____ (Initials) <ul style="list-style-type: none"> <li>• Annunciators K-B4 and K-C7, and K-C1 illuminate</li> <li>• Generator output voltage increases</li> </ul>		
	BOP identifies annunciator K-B4, EXCITER FIELD FORCING.	
	US directs entry into 1-AP-26.	
	BOP identifies generator output voltage and MVARs increasing with MW stable.	
	BOP places voltage regulator control switch to OFF.	
	Crew notifies system operator.	
	US requests Work Control Center supervisor to inform the OMOC of the failure and to initiate WR and CR.	
	<b>NOTE: The next event will occur after the crew has stabilized the plant, or at the direction of the lead evaluator.</b>	

EVENT 5: Given that a loss of 1H emergency bus has occurred at power, the crew will respond in accordance with 1-AP-38, "Excessive Load Increase," and 0-AP-10, "Loss of Electrical Power."

TIME	EXPECTED ACTION	INSTRUCTOR REMARKS
	SPD Verified: _____ (Initials) <ul style="list-style-type: none"> <li>• Various annunciators light indicating a loss of 1H bus including: C-C1/2/3/4, F-C7, H-F5</li> <li>• 1H diesel is running, but not loaded onto bus</li> <li>• Breakers 15H11 and 15F3 are open</li> <li>• 1H emergency bus has no voltage</li> <li>• 1A semi-vital bus has not voltage</li> <li>• Reactor power is increasing</li> </ul>	
	Crews identifies various annunciators which indicate a loss of the 1H emergency bus.	
	<b>NOTE: Entry into AP-38 will be required due to high-level divert valves failing open.</b>	
	US directs entry into 1-AP-38.	
	Crew checks steam dumps closed.	
	Crew checks SG PORVs closed.	
	Crew verifies main turbine load turbine load normal and reactor power is < 100% and stable.	
	BOP ramps the turbine to return power to the power level before the event started.	
	RO inserts rods to maintain RCS temperature.	
	Crew checks turbine load control: <ul style="list-style-type: none"> <li>• Reactor power reduced to the power level before the event started</li> <li>• Load control in IMP-IN</li> <li>• Places turbine in IMP-IN, if required.</li> </ul>	
	Crew checks that plant is stable: <ul style="list-style-type: none"> <li>• Main Generator output stable</li> <li>• Tave on program (RO inserts rods or borates, as required.)</li> <li>• Steam flow indications normal</li> <li>• Turbine in Operator Auto.</li> </ul>	

EVENT 5: Given that a loss of 1H emergency bus has occurred at power, the crew will respond in accordance with 1-AP-38, "Excessive Load Increase," and 0-AP-10, "Loss of Electrical Power."

TIME	EXPECTED ACTION	INSTRUCTOR REMARKS
	Crew checks plant steam systems: <ul style="list-style-type: none"> <li>• PORVs</li> <li>• Safeties</li> <li>• MSR inlets</li> <li>• AS PCV.</li> </ul>	
	US directs entry into 0-AP-10, as manpower permits.	
	Crew reviews annunciators and notes that there is no thermal barrier flow. U-1 RMs, MGPIs, and N-16s are deenergized. Also, the in-service BATP is deenergized.	
	US makes report of conditions to WCC and requests assistance, WR, CR.	
	US reviews tech spec 3.8.1A.	
	<b>NOTE: Crew will eventually be informed that there is an overcurrent drop on 15H11 and the electricians will need 15H2 to placed in PTL so they can examine the bus for damage.</b>	
	<b>NOTE: Once US has reviewed TS the next event can occur.</b>	

EVENT 6: Given that with the unit at power and both emergency busses have been lost, the crew will be expected to respond in accordance with 1-ECA-0.0, "Loss of All AC Power."		
TIME	EXPECTED ACTION	INSTRUCTOR REMARKS
SPD Verified: _____ (Initials) <ul style="list-style-type: none"> <li>• A loss of switchyard occurs</li> <li>• 1J EDG does not start</li> </ul>		
	Crew identifies a loss of the switchyard.	
	Crew recognizes a loss of the "J" 4160V emergency bus.	
	US directs the crew to enter ECA-0.0.	
	RO verifies reactor trip.	
	BOP verifies turbine trip.	
	Crew verifies all RCPs are stopped.	
	<b>Crew restores power to any AC Emergency bus.</b> <ul style="list-style-type: none"> <li>• Crew verifies Emergency Diesel running. (NO)</li> <li>• Crew checks RCP seal water outlet temperatures.</li> <li>• <b>Crew manually starts "J" EDG by placing switch in MAN REMOTE.</b></li> </ul>	
	Crew performs RCS isolation: <ul style="list-style-type: none"> <li>• RO verifies PZR PORVs closed.</li> <li>• RO verifies Letdown isolation valves closed.</li> <li>• RO verifies Excess Letdown isolation valves closed.</li> <li>• RO closes RHR to Letdown isolation valve.</li> <li>• BOP verifies RCS sample valves closed</li> <li>• BOP verifies RCS Head vents closed.</li> <li>• BOP verifies PZR vent valves closed.</li> </ul>	
	Crew verifies AFW flow.	
	Crew verifies no fire in emergency switchgear.	
	Crew verifies power restored to an emergency bus.	

EVENT 6: Given that with the unit at power and both emergency busses have been lost, the crew will be expected to respond in accordance with 1-ECA-0.0, "Loss of All AC Power."

TIME	EXPECTED ACTION	INSTRUCTOR REMARKS
	US directs crew to transition to E-0.	
	Crew verifies reactor and turbine trips.	
	Crew verifies one emergency bus energized.	
	Crew checks that no SI has occurred, or is required.	
	US directs transition to 1-ES-0.1.	
	*Crew checks RCS average temperature trending to expected value.	
	Crew throttles AFW, as required.	
	<b>NOTE: During this time, VCT level will be decreasing. An auto makeup will commence, but there will be no boric acid flow. Crew should also discuss the fact that there will be no auto-swap to the RWST.</b>	
	Crew checks feedwater status: RCS temperature MFRVs AFW pumps AFW flow.	
	<b>NOTE: At this time the crew will be informed that a relay problem caused the loss of the 1H bus. At this time, if desired, the crew can reenergize the bus by taking the EDG output breaker out of PTL.</b>	
	Crew checks SG levels.	
	Crew verifies charging in service.	
	<b>NOTE: Once power has been restored to the 1H bus, the next event can be inserted.</b>	

EVENT 7: With the unit stabilized in 1-ES-0.1, "Reactor Trip Response," and indications exist of a SBLOCA outside containment, the crew will respond in accordance with "1-E-0, "Reactor Trip or Safety Injection," and 1-ECA-1.2, "LOCA Outside Containment."

TIME	EXPECTED ACTION	INSTRUCTOR REMARKS
SPD Verified: _____ (Initials) <ul style="list-style-type: none"> <li>• Annunciators A-C1, E-F8, then A-C4 illuminate</li> <li>• RCS pressure and pressurizer level decrease</li> <li>• Charging flow increases, when required</li> <li>• Vent stack "B" radiation increases to alarm setpoint</li> </ul>		
	Crew continues in ES-0.1.	
	Crew checks pressurizer level control.	
	Crew checks pressurizer pressure control.	
	Crew identifies annunciator A-C1, SFGDS AREA SUMP HI/HI-HI LEVEL.	
	RO identifies charging flow increasing and PRZR level decreasing.	
	<b>NOTE: Crew may not enter AP-16.</b>	
	US directs entry into 1-AP-16.	
	<b>NOTE: If crew dispatches an operator to check the safeguards building, the operator will report that the door is hot and steam is issuing from around the door seals.</b>	
	Crew verifies unit in mode 3.	
	RO verifies primary parameters under operator control. (NO)	
	RO isolates letdown and maximizes charging flow.	
	RO commences a VCT makeup from the blender.	
	RO informs US that PRZR level is still decreasing.	
	Crew identifies Vent Stack "B" high radiation alarm.	
	Crew identifies annunciator A-C4, AREA AMBIENT AIR TEMP HIGH.	
	Crew identifies high temperature in U-1 SFGDS.	

EVENT 7: With the unit stabilized in 1-ES-0.1, "Reactor Trip Response," and indications exist of a SBLOCA outside containment, the crew will respond in accordance with "1-E-0, "Reactor Trip or Safety Injection," and 1-ECA-1.2, "LOCA Outside Containment."

TIME	EXPECTED ACTION	INSTRUCTOR REMARKS
	US directs crew to manually initiate SI and return to 1-E-0.	<b>E-0</b>
	RO/BOP manually initiate SI.	
	Crew verifies 1-E-0 immediate operator actions.	
	<b>NOTE: The crew may hold a brief and perform actions in 1-ECA-1.2 before the procedure transition.</b>	
	BOP verifies feedwater isolation: <ul style="list-style-type: none"> <li>• MFRVs closed</li> <li>• MFRBVs closed</li> <li>• Main feed MOVs closed</li> <li>• Standby MFP placed in PTL</li> <li>• Main feed pumps tripped</li> <li>• MFP discharge MOVs closed</li> <li>• SG BD TVs closed.</li> </ul>	
	RO/BOP manually initiate phase "A".	
	Crew initiates attachment for phase "A" isolation.	
	BOP verifies AFW pumps running.	
	Crew verifies SI pumps running.	
	BOP verifies SW pumps running.	
	Crew checks if MS should be isolated. (NO)	
	Crew verifies SI flow.	
	BOP verifies AFW flow.	
	RO checks RCS Tave stable at or trending to 547°F.	
	RO checks PRZR PORVs and spray valves.	
	RO checks RCP trip and charging pump recirc criteria.	
	BOP checks SGs not faulted. (YES)	

EVENT 7: With the unit stabilized in 1-ES-0.1, "Reactor Trip Response," and indications exist of a SBLOCA outside containment, the crew will respond in accordance with "1-E-0, "Reactor Trip or Safety Injection," and 1-ECA-1.2, "LOCA Outside Containment."		
TIME	EXPECTED ACTION	INSTRUCTOR REMARKS
	BOP checks SGs not ruptured. (YES)	
	Crew checks if RCS is intact inside containment. (YES)	
	Crew checks for outside containment inventory loss. (YES)	
	US directs crew to transition to 1-ECA-1.2.	
	BOP verifies LHSI pump hot-leg valves closed.	
	BOP verifies SI accumulator sample valves closed.	
	<p><b>Crew isolates LOCA outside containment.</b></p> <ul style="list-style-type: none"> <li>• BOP closes LHSI pump cold-leg injection valves 1-SI-MOV-1890C and 1890D.</li> <li>• BOP closes LHSI pump discharge valves.</li> </ul>	
	RO checks RCS pressure increasing. (YES)	
	US directs crew to transition to 1-E-1.	
	<p><b>NOTE: The scenario may be terminated after the crew isolates the leak, or as directed by the lead evaluator.</b></p>	

REFERENCES

PROCEDURE	REV.
Abnormal Procedure 1-AP-31, "Loss of Main Feedwater."	4
Abnormal Procedure 1-AP-44, "Loss of Reactor Coolant System Pressure."	19
Abnormal Procedure 1-AP-26, "Failure of Main Generator Voltage Regulator High."	9
Abnormal Procedure 1-AP-38, "Excessive Load Increase."	14
Abnormal Procedure 0-AP-10, "Loss of Electrical Power."	59
Abnormal Procedure 1-AP-16, "Increasing Primary Plant Leakage."	25
Maintenance Operating Procedure 1-MOP-6.70, "1-EE-SW-1H, 4160-Volt Emergency Bus."	31
Emergency Contingency Action 1-ECA-0.0, "Loss of All AC."	21
Emergency Procedure 1-E-0, "Reactor Trip or Safety Injection."	36
Emergency Procedure 1-ES-0.1, "Reactor Trip Response."	26
Emergency Contingency Action 1-ECA-1.2, "LOCA Outside Containment."	6
Station Annunciator Response Procedures.	N/A
Guide and Reference Document PI-AA-5000, "Human Performance."	1
INPO, Guideline for Teamwork and Diagnostic Skill Development: INPO 88-003,	Jan. 1988
INPO, ACAD 07-002 Simulator Training Guidelines	Jan. 2007

## ATTACHMENTS

ATTACHMENT 1 - SIMULATOR OPERATOR'S COMPUTER PROGRAM

ATTACHMENT 2 - SCENARIO PERFORMANCE OBJECTIVES

ATTACHMENT 3 – SIMULATOR PERFORMANCE DATASHEET (Last page of scenario)\*

ATTACHMENT 1  
SIMULATOR OPERATOR'S COMPUTER PROGRAM

**SIMULATOR OPERATOR'S COMPUTER PROGRAM**  
**SXG NRC 5**

**Initial conditions**

1. Recall IC 165
2. Ensure Tave, Tref, PDTT level, and VCT level are selected on trend recorders.
3. Place a WR magnet on 1-CH-RI-128.
4. Rackout breaker for 2-CC-P-1A and verify 2-CC-P-1B running. Close U2\_CC\_11, U2\_CC\_4.

**PRELOADS PRIOR TO SCENARIO START**

CONDITION	MALFUNCTION/OVERRIDE/ETC.
Letdown rad monitor failure	<b>Malfunction:</b> RM0207, Severity = -1
Rods will not move in auto	<b>Malfunction:</b> RD14
"B" Condensate pump will not auto-start	<b>Switch override:</b> CNP1B_ASTOP = OFF
1J EDG does not start in auto-remote	<b>Switch override:</b> EG1J_AUTO_REMOTE = OFF
Train "B" of Phase A does not function with SI	<b>Malfunction:</b> SI1304  Set up triggers to delete this malfunction when the manual switches are used.  Trigger 10 PHASEA_ISO1_INIT==1 .OR. PHASEA_ISO2_INIT==1 DMF SI1304

**SCENARIO EVENTS**

EVENT	MALFUNCTION/OVERRIDE/COMMUNICATIONS
1) 1-CH-LT-1112 fails high	<p><b>Malfunction:</b> CH1201, Delay time = 5, Ramp = 10, Severity = 1, Trigger = 1</p> <p><b>NOTE: The next event may occur once the letdown divert valve has been closed, or at the discretion of the lead evaluator.</b></p>
2) High level divert for 1-SD-TK-1A fails open	<p><b>Remote function:</b> SDLCV107A_SETPT, Delay time = 5, Value = 0, Ramp = 5, Trigger = 2</p> <p><b>NOTE: When dispatched, wait 5 minutes and slowly increase setpoint to stabilize drain tank level. Report 1-SD-LCV-107A was open with dial for setpoint loose. Setpoint has now been returned to normal.</b></p> <p><b>NOTE: The next event will occur once the unit is stable and 1-SD-LCV-107A has been returned to normal, or at the discretion of the lead evaluator.</b></p>
3) "B" spray valve fails open	<p><b>Malfunction:</b> RC2002, Delay time = 5, Value = True, Trigger = 3</p> <p><b>NOTE: The next event will occur after the crew has returned RCS pressure to normal, or at the direction of the lead evaluator.</b></p>
4) VR failure	<p><b>Malfunction:</b> EL09, Delay time = 5, Ramp = 35, Severity = 50, Trigger = 4</p> <p><b>NOTE: If called, can report that no abnormalities can be seen at the VR panel.</b></p> <p><b>NOTE: The next event will occur after the crew stabilizes the plant, or as directed by the lead evaluator.</b></p>

EVENT	MALFUNCTION/OVERRIDE/COMMUNICATIONS
5) Loss of 1H emergency bus	<p><b>Malfunction:</b> EL1901, Delay time = 5, Value = True, Trigger = 5</p> <p><b>NOTE: Once electricians have been dispatched wait about 10 minutes and then inform the crew that there is an overcurrent drop on 15H11 and the electricians need to have 15H2 placed in PTL while they examine the bus for damage.</b></p> <p><b>NOTE: Once the unit has been stabilized and the US has reviewed TS, the next event can occur.</b></p>
6) Loss of off-site power with failure of 1J EDG to start	<p><b>Malfunction:</b> EL01, Delay time = 5, Value = True, Trigger = 6</p> <p><b>NOTE: If dispatched, can report that 1J EDG looks normal.</b></p> <p><b>NOTE: Once the crew has performed some actions in 1-ES-0.1, the 1H bus can be reenergized as follows:</b></p> <p><b>Delete malfunction EL1901</b>  <b>Report to crew that a faulty relay caused to bus loss</b>  <b>Inform crew that 15H2 can be taken out of PTL, this should allow it to close and reenergize the bus.</b></p> <p><b>NOTE: Once power has been restored to the 1H bus the next event can occur.</b></p>
7) LOCA outside containment	<p><b>Malfunction:</b> SII16, Delay time = 5, Ramp = 120, Severity = 50, Trigger = 7</p> <p><b>NOTE: Verify pressurizer pressure continues to decrease. If not, then increase leak size as necessary.</b></p> <p><b>NOTE: If sent to Safeguards, report that door is hot. If leak has already been isolated can report that there was a loud noise, but it has not stopped.</b></p> <p><b>NOTE: The scenario may be terminated after the crew isolates the leak, or as directed by the lead evaluator.</b></p>

ATTACHMENT 2  
SCENARIO PERFORMANCE OBJECTIVES

## SIMULATOR REQUALIFICATION EXAMINATION

### TERMINAL PERFORMANCE OBJECTIVE

Given equipment failures and operational situations, operate the plant in accordance with Technical Specifications to bring the unit to a safe condition, using applicable procedures, and applying effective teamwork, communication, and diagnostic skills.

### GENERIC PERFORMANCE OBJECTIVES

- A. During shift operations the shift manager will take a conservative course of action, especially when uncertain conditions exist, when dealing with core cooling or heat sink availability, primary system and containment integrity, and reactivity control associated with plant evolutions.
- B. During shift operations the shift manager will provide overall crew guidance by prioritizing and integrating the actions of the shift crew in accordance with administrative procedures.
- C. During shift operations each crew member will participate in a team effort that resolves conflicts, provides input into the team decision and communicates all the necessary information to enhance teamwork in accordance with administrative procedures.
- D. During shift operations the Shift Technical Advisor will independently assess events and based on those assessments make recommendations to the crew regarding mitigation strategy.

**EVENT 1 PERFORMANCE OBJECTIVES**

**EVENT GOAL:** Given that the unit is at power and VCT level transmitter, 1-CH-LT- 1112, has failed high, the crew will respond in accordance with the applicable annunciator response.

**NORTH ANNA SPECIFIC TASKS:**

NA

**CRITICAL TASK:**

N/A

## **EVENT 2 PERFORMANCE OBJECTIVES**

**EVENT GOAL:** Given that "A" HP heater drain tank high-level divert has failed open, the crew will be expected to respond in accordance with 1-AP-31, "Loss of Main Feedwater," and 1-AP-38, "Excessive Load Increase."

### **NORTH ANNA SPECIFIC TASKS:**

R781 Respond to a loss of main feedwater.

R539 Perform the immediate operator actions in response to an excessive load increase.

### **CRITICAL TASK:**

N/A

### **EVENT 3 PERFORMANCE OBJECTIVES**

**EVENT GOAL:** Given that the unit is at power and a PRZR spray valve has failed open, the crew will be expected to respond in accordance with 1-AP-44, "Loss of Reactor Coolant Pressure."

#### **NORTH ANNA SPECIFIC TASKS:**

R634 Respond to a loss of Reactor Coolant System pressure

#### **CRITICAL TASK:**

See next page

CT Statement:

Crew stops RCS pressure decrease.

Safety Significance:

Failure to close the RCS spray valve under the postulated plant conditions constitutes "mis-operation or incorrect crew performance which leads to degradation of any barrier to fission product release." In this case, DNBR is reduced. Therefore, failure to close the spray valve represents a "demonstrated inability by the crew to take an action or combination of actions that would prevent a challenge to plant safety."

Cues:

Valid indication of pressure decreasing by the presence of various annunciators, indication of RCS spray valve open, and RCS pressure indication decreasing and procedurally directed by 1-AP-44.

Performance Indicator:

RO places REMOTE CLOSE SOV in CLOSE for associated spray

Feedback:

RCS pressure decrease stopped.

WOG Reference:

N/A

Conditions:

Prior to reaching an automatic reactor trip on low pressure.

**EVENT 4 PERFORMANCE OBJECTIVES**

**EVENT GOAL:** Given that the unit is at power, and the main generator voltage regulator has failed, the crew will be expected to respond in accordance with 1-AP-26, "Loss of Main Generator Voltage Control."

**NORTH ANNA SPECIFIC TASKS:**

R675 Respond to a failure of main generator voltage regulator high.

**CRITICAL TASK:**

N/A

## EVENT 5 PERFORMANCE OBJECTIVES

**EVENT GOAL:** Given that a loss of 1H emergency bus has occurred at power, the crew will respond in accordance with 1-AP-38, "Excessive Load Increase," and 0-AP-10, "Loss of Electrical Power."

### **NORTH ANNA SPECIFIC TASKS:**

R539 Perform the immediate operator actions in response to an excessive load increase.

### **CRITICAL TASK:**

N/A

## EVENT 6 PERFORMANCE OBJECTIVES

**EVENT GOAL:** Given that with the unit at power and both emergency busses have been lost, the crew will be expected to respond in accordance with 1-ECA-0.0, "Loss of All AC Power."

### **NORTH ANNA SPECIFIC TASKS:**

N1561 Re-start an emergency diesel generator with an emergency start signal present.

R214 Perform the immediate operator actions in response to a loss of all AC power.

### **CRITICAL TASK:**

See Next Page

CT Statement:

Crew restores power to any AC Emergency bus.

Safety Significance:

Failure to energize an ac emergency bus constitutes "mis-operation or incorrect crew performance which leads to degraded...emergency power capacity." Failure to perform the critical task also results in needless degradation of a barrier to fission product release, specifically of the RCS barrier at the point of the RCP seals. Additionally, failure to perform the critical task results in the unnecessary continuation of a situation in which RCS inventory is being lost uncontrollably and cannot be replaced. This situation is equivalent to "mis-operation or incorrect crew performance which leads to degraded ECCS...capacity" at a time when a small-break LOCA is in progress.

Cues:

Indication of loss of both 4160V emergency buses.

- \* No voltage indicated on emergency buses.
- \* Loss of various emergency equipment.
- \* Numerous annunciators.

Performance Indicator:

Crew manually starts "J" EDG

Feedback:

Indication of Voltage indicated on the "J" 4160 emergency bus.

WOG Reference:

E-0 - Background

Conditions:

To be performed prior to depressurizing all intact SGs.

## **EVENT 7 PERFORMANCE OBJECTIVES**

**EVENT GOAL:** With the unit stabilized in 1-ES-0.1, "Reactor Trip Response," and indications exist of a SBLOCA outside containment, the crew will respond in accordance with "1-E-0, "Reactor Trip or Safety Injection," and 1-ECA-1.2, "LOCA Outside Containment."

### **NORTH ANNA SPECIFIC TASKS:**

R520 Respond to increasing primary plant leakage.  
R761 Respond to a LOCA outside containment.

### **CRITICAL TASK:**

See next page

CT Statement:

Crew isolates LOCA outside containment.

Safety Significance:

Failure to isolate a LOCA outside containment (that can be isolated) degrades containment integrity beyond the level of degradation irreparably by the postulated conditions. It also constitutes a "mis-operation or incorrect crew performance which leads to degradation of a barrier to fission product release" and eventually "to degraded ECCS capacity.

Cues:

Indication/annunciation that SI is actuated and is required

AND

Indication and/or annunciation of abnormally high temperature in the safeguards building

AND

Indication and/or annunciation of abnormally high sump level in the safeguards building

Performance Indicator:

BOP closes LHSI pump Cold Leg Injection valves.

1-SI-MOV-1890C

1-SI-MOV-1890D

Feedback:

RCS pressure increasing.

WOG Reference:

ECA-1.2 – Background Document

Conditions:

When directed by procedure.

ATTACHMENT 3  
SIMULATOR PERFORMANCE DATASHEET

### Scenario Performance Datasheet

EVENT 1: Given that the unit is at power and VCT level transmitter, 1-CH-LT- 1112, has failed high, the crew will respond in accordance with the applicable annunciator response.

SPD Verified: \_\_\_\_\_ (Initials)

- Annunciator C-A4 will illuminate
- 1-CH-LI-1112 will indicate off-scale high
- 1-CH-LCV-1112C output will go to zero
- VCT level will decrease
- "A" Stripper level will increase

EVENT 2: Given that "A" HP heater drain tank high-level divert has failed open, the crew will be expected to respond in accordance with 1-AP-31, "Loss of Main Feedwater," and 1-AP-38, "Excessive Load Increase."

SPD Verified: \_\_\_\_\_ (Initials)

- Annunciator Q-E3 illuminates
- 1-SD-P-1A trips as indicated by amber light lit
- Reactor power increases
- Main feed pump suction pressure decreases
- 1-CN-P-1B does not auto-start, if required

EVENT 3: Given that the unit is at power and a PRZR spray valve has failed open, the crew will be expected to respond in accordance with 1-AP-44, "Loss of Reactor Coolant Pressure."

SPD Verified: \_\_\_\_\_ (Initials)

- PRZR spray valve 1-RC-PCV-1455B has full open indication.
- Master pressure controller output decreases.
- PRZR pressure decreases.
- Annunciators B-F7, B-H6 illuminate

EVENT 4: Given that the unit is at power, and the main generator voltage regulator has failed, the crew will be expected to respond in accordance with 1-AP-26, "Loss of Main Generator Voltage Control."

SPD Verified: \_\_\_\_\_ (Initials)

- Annunciators K-B4 and K-C7, and K-C1 illuminate
- Generator output voltage increases

EVENT 5: Given that a loss of 1H emergency bus has occurred at power, the crew will respond in accordance with 1-AP-38, "Excessive Load Increase," and 0-AP-10, "Loss of Electrical Power."

SPD Verified: \_\_\_\_\_ (Initials)

- Various annunciators light indicating a loss of 1H bus including: C-C1/2/3/4, F-C7, H-F5
- 1H diesel is running, but not loaded onto bus
- Breakers 15H11 and 15F3 are open
- 1H emergency bus has no voltage
- 1A semi-vital bus has not voltage
- Reactor power is increasing

EVENT 6: Given that with the unit at power and both emergency busses have been lost, the crew will be expected to respond in accordance with 1-ECA-0.0, "Loss of All AC Power."

SPD Verified: \_\_\_\_\_ (Initials)

- A loss of switchyard occurs
- 1J EDG does not start

EVENT 7: With the unit stabilized in 1-ES-0.1, "Reactor Trip Response," and indications exist of a SBLOCA outside containment, the crew will respond in accordance with "1-E-0, "Reactor Trip or Safety Injection," and 1-ECA-1.2, "LOCA Outside Containment."

SPD Verified: \_\_\_\_\_ (Initials)

- Annunciators A-C1, E-F8, then A-C4 illuminate
- RCS pressure and pressurizer level decrease
- Charging flow increases, when required
- Vent stack "B" radiation increases to alarm setpoint