Final Submittal
(Blue Paper)

FINAL SIMULATOR SCENARIOS

NORTH ANNA JUNE 2008 EXAM
05000338/2008301 & 05000339/2008301

Facility: North Anna Scenario No.: 1 Op-Test No.: 1

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Initial Conditions: Reactor is at approximately 45% power MOL ready to start a second feed pump. Unit was returned to power yesterday following feed train work, and cleared chemistry hold 1 hour ago. Rods are in manual due to a problem with auto rod control. The letdown radiation monitor is OOS. 1-FW-P-2 (terry turbine) was tagged out during the chemistry hold and was just returned to service. 2-CC-P-1A is tagged out for seal work.

Turnover: Start the "C" feed pump; the pump seals have already been vented in preparation for the start. Continue to ramp unit to 100% using manual rods until instrument shop is finished troubleshooting the rod control problem.

Event No.	Malf. No.	Event Type*	Event Description
1		N (B)	Start a second feed pump per OP
2		N (B) R (R) (S)	Ramp unit up using normal ramping OP
3	CN0201	C (B) (S)	Condensate pump trips with no auto-start of standby pump
3a	RD0121	TS (S)	Several minutes later IRPI indication for CB "A" rod K2 drops to 0
4	CH08	I (R) (S)	Failure of 1-CH-FT-1122 high
5	MS1701	I (B) (S) TS (S)	Failure of "A" SG steam pressure channel III low (which also fails steam flow)
6	CH13	C (R) (S)	Tube leak in non-regenerative HX
7	MS1001	C (B) (S)	"A" SG Steam leak outside containment
8	MS1001	M (ALL)	"A" SG MSLB outside containment. (Reactor fails to trip. Rods will not insert in auto. Motor-driven AFW pumps do not start automatically.)
9	RD32 RD38	C (ALL)	Reactor doesn't trip automatically or manually (or with AMSAC).
10	RD14	C (R) (S)	Rods will not insert in auto
11	FW2601 FW2602	I (B) (S)	Motor-driven AFW pumps don't auto-start
			Scenario may be ended when safety injection has been terminated
			(Events 9-11occur during event 8 and are numbered only for use on Forms 301-5 and 301-6)

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

DOMINION

NORTH ANNA POWER STATION

INITIAL LICENSED OPERATOR EXAMINATION

SIMULATOR EXAMINATION GUIDE
SCENARIO NRC 1

EVENT	DESCRIPTION
1.	Start a second feed pump using OP
2.	Ramp unit up using normal ramping OP
3/3a.	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	**2** (Reactor will not trip automatically or manually/rods will not insert in auto, motor-driven aux feed pumps do not auto-start)
Total Malfunctions	**9** (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	**5** (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	**1** (MSLB outside containment)
EOPs Entered	**3** (FR-S.1, E-2, ES-1.1)
EOP Contingencies	**1** (FR-S.1)
Critical Tasks	**3**

SCENARIO DURATION

130 Minutes

SIMULATOR EXAMINATION SCENARIO SUMMARY
SCENARIO NRC 1

The scenario starts with the unit at approximately 45% power ready for a second Main Feed 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, 1-CH-RM-128, is OOS. The turbine-driven auxiliary feedwater pump, 1-FWP-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" steamline 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 steamline 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.

Pre-job Brief for Scenario NRC-1

Unit Status:
Unit 1 is at approximately 45% power. The unit was returned to power last shift following feed train work and cleared a 30% chemistry hold 1 hour ago. 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:
Control rods are in manual while the Instrument Department investigates a problem with auto rod control. 1-CH-RM-128, Letdown Radiation Monitor, is out of service. 2-CC-P-1A is tagged out for seal work.

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. 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.

The Unit 1 turbine building operator has been briefed and is standing by at the "C" Main Feed pump with 1-OP-31.1.

Control rods are to remain in Manual at this time due to the problem with auto rod control.

Ramp Directions

Reactor engineering estimates it will take approximately 4033 gallons of PG to return the unit to 100% power.

Approximate rod positions: 178 steps at 75% power
202 steps at 90% power

AFD limits: 50% power -27 / +20
100% power -12 / +6

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. A rough log should be maintained to aid in making reports and to help during briefs.

3. Respond to what you see. In the unlikely event that the simulator fails such that illogical indications result, the session will be terminated and the crew informed.

Unit Status:
Unit 1 is at approximately 45% power. The unit was returned to power last shift following feed train work and cleared a 30% chemistry hold 1 hour ago. 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:
Control rods are in manual while the Instrument Department investigates a problem with auto rod control. 1-CH-RM-128, Letdown Radiation Monitor, is out of service. 2-CC-P-1A is tagged out for seal work.

The turbine-driven auxiliary feedwater pump, 1-FWP-2, was tagged out during the chemistry hold and was just returned to service, PMT was SAT. 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 approximately 45% power, the crew will start a second Main Feedwater Pump in accordance with 1-GP-31.1, "Main Feedwater System"		
TIME	EXPECTED ACTION	INSTRUCTOR REMARKS
SPD Verified: _____ (Initials) • 1-FWP-1C starts and runs normally		
	BOP places "B" Condensate pump in PTL.	
	BOP places both control switches for 1-FWP-1C in PTL.	
	BOP closes 1-FWMOV-150C.	
	BOP verifies/places switches for "B" MFP in PTL.	
	BOP verifies/aligns feed recircs.	
	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.	
	NOTE: The next event can occur once the crew has placed "C" MFP in service.	

EVENT 2: Given that the unit is at approximately 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) • Reactor power increases • Turbine power increases • Tavg/Tref increase • Generator megawatts increase		
	NOTE: The crew needs to ramp to >50% power for a TS call during Event 3. Suggest approximately 53% power.	
	NOTE: The crew may raise primary temperature prior to ramping the turbine.	
	BOP adjusts limiter position, as required.	
	BOP verifies/sets desired ramp rate (.3% per minute).	
	BOP increases turbine setter to desired position.	
	BOP presses GO on turbine.	
	BOP monitors turbine ramp.	
	RO starts a dilution when required.	GOPS included at back of scenario.
	RO withdraws control rods to maintain Tave within 1.5°F of Tref with rods above insertion limits.	
	RO places AMSAC in "Normal" when procedure criteria met.	
	NOTE: The next event can occur once the crew has ramped to greater than 50% power, or as determined by the lead evaluator.	

EVENT 3/3a: 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) • Annunciators G-C6 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-C2 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		
	NOTE: Three minutes after the Condensate pump trip, IRPI K-2 will drop to zero.	
	BOP identifies annunciator G-C6, 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.	
	NOTE: Crew may not stop the ramp until immediate actions of AP have been completed.	
	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.	

EVENT 3/3a: 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
	*Crew verifies MFP performance: • Suction pressure adequate • <550 amps on motors • Annunciator F-B5 NOT lit.	
	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.	
	Crew maintains stable plant conditions.	
	NOTE: Three minutes after the Condensate pump trip, IRPI K-2 will drop to zero.	**Event 3a**
	RO identifies annunciators A-G2, RPI ROD BOT ROD DROP, and A-F1, CMPTR ALARM ROD DEV/SEQ	
	NOTE: If unsure of conditions, the crew may enter 1-AP-1.2 for a dropped rod. Steps in this procedure were not included.	
	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	
	NOTE: If I&C is asked to investigate the K-2 rod, they will report that it is an IRPI problem.	
	US reviews Technical Specification 3.1.7A and determines that a flux map must be done within 8 hours (or power reduced to <50%).	
	US makes notifications on Condensate pump trip/auto-start failure, and IRPI indication.	
	NOTE: The next event may occur once the standby Condensate pump has been started and tech specs have been reviewed.	

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) • 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.		
	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.	
	NOTE: RO will need to monitor pressurizer and VCT levels, and/or letdown temperature, to adjust charging flow.	
	RO takes manual control of 1-CH-FCV-1122 and restores charging flow to normal.	
	Crew makes report of instrument failure and requests assistance.	
	NOTE: The next event can occur once the crew has restored charging flow to normal.	

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) • 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		
	BOP identifies annunciators F-H1, HI STM LINE ΔP SG 1A LO and F-E1, STM GEN 1A 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: • RO verifies operable pressurizer level channel selected • RO verifies letdown in service • Crew leaves 1-CH-FCV-1122 in manual due to previous failure • RO verifies control group heaters are not tripped.	
	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. • RO verifies control rods in manual • Crew places steam dumps in either OFF or steam pressure mode • BOP checks all bypass MFRVs in manual • BOP places all MFRVs in manual • Crew selects channel IV on SGWLCS • Crew verifies all SG level channels are operable • BOP verifies steam generator levels are on program • BOP places MFRVs in Auto • RO returns steam dumps to Tave mode • Crew leaves control rods in manual due to auto rod control problem	
	Crew verifies operation of instruments and enters applicable MOPs (1-MOP-55.77 for steam flow and 55.79 for steam pressure).	
	US reviews Technical Specifications: • 3.3.1 (function 15 Condition E - 72 hours to place in trip) • 3.3.2 (functions 1e, 1f, 4d, 4e Condition D – 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	
	NOTE: The next event can occur once TS have been reviewed, or as directed by the lead evaluator.	

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) • Letdown flow decreases • VCT level slowly decreases • CC surge tank level slowly increases		
	RO identifies a decrease in letdown flow and/or a decrease in VCT level.	
	NOTE: Crew may also check Aux Building and Containment sump levels at this time.	
	US announces entry into AP-16.	
	Crew verifies unit in modes 1, 2, or 3.	
	*RO verifies parameters under his control: • PRZR level • RCS subcooling • VCT level.	
	RO checks 1-CH-LCV-1115A not diverted.	
	NOTE: Crew may also notice increase in CC surge tank level at any time.	
	Crew checks letdown parameters normal for plant conditions: • Letdown flow (NO)	
	RO isolates letdown: • Closes 1-CH-HCV-1200B • Closes 1-CH-LCV-1460A and 1460B	
	NOTE: Until letdown valves are closed TS 3.4.13A for RCS leakage applies (4 hours to reduce leakage to within limits).	
	Crew checks excess letdown temperature and pressure.	

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 charging parameters normal: • Pump discharge pressure • Flow • Regen HX outlet temperature • Seal Injection flow • AB sump level.	
	Crew checks containment parameters: • Sump pumping rate • Temperature • Pressure • Radiation • Dispatches operator with AB attachment, as time permits.	
	Crew checks safeguards parameters: • Sump alarms • Radiation monitors • Temperatures • Locally check for leaks, as required.	
	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.	

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 makes preparations to place excess letdown in service.	
	NOTE: The next event can occur once letdown has been isolated and the crew is making preparations to place excess letdown in service.	

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) • Main steam pressure decreasing. • Tave decreasing. • Power increasing.		
	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 ≤ 100% and stable. (NO)	
	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.	
	RO commences lowering Tave using boration/control rods.	
	BOP commences lowering main turbine load.	
	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.	
	Crew checks reactor power reduced to the power level before the event started.	
	NOTE: The next event will occur when ramp has been stopped, the unit has been tripped, or as directed by the lead evaluator.	

EVENT 8: Given that the unit is at power, and a main steamline 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) • 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		
	Crew identifies a main steamline 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.	
CT 1	**Crew identifies reactor did not trip, transitions to 1-FR-S.1, "Response to Nuclear Power Generation/ATWS,"** • RO/BOP manually trips the reactor. (NO) • BOP trips the turbine • **RO manually inserts control rods.**	**Critical Task** Inserting control rods manually is only critical if an emergency boration is not started
	BOP checks all AFW pumps running, (NO)	

EVENT 8: Given that the unit is at power, and a main steamline 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
CT 2	**Crew starts AFW pumps to obtain required minimum of 680 gpm flow:** **BOP starts either 1-FW-P-3A, 1-FW-P-3B.**	**Critical Task** *Before H1 criteria are met
	Crew identifies reactor did not trip, transitions to 1-FR-S.1, "Response to Nuclear Power Generation/ATWS," • RO verifies at least one charging pump running. • **RO places in-service boric acid transfer pump in fast speed.** • **RO opens emergency borate valve 1-CH-MOV-1350.** • Crew verifies adequate negative reactivity insertion or injects the BIT.	**CT 1 Continued** Starting emergency boration is only critical if rods are not being manually inserted.
	NOTE: Once the steam leak is reported the crew may close the MSTVs.	
	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. This attachment is included at the back of the scenario.	
	NOTE: Approximately two minutes after operator is dispatched the reactor will be locally tripped.	
	Crew dispatches operator to locally trip reactor.	
	NOTE: If reactor is subcritical the crew will transition to E-0 at this time, see next page for steps.	
	Crew checks if reactor is subcritical.	
	NOTE: Crew may throttle auxiliary feed in this or subsequent steps.	
	BOP checks SG levels.	

EVENT 8: Given that the unit is at power, and a main steamline 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 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.	**E-0 steps**
	RO verifies reactor tripped.	
	BOP verifies turbine tripped.	
	RO verifies AC emergency busses energized.	
	RO/BOP check if SI has actuated or is required. (YES)	
	BOP verifies feedwater isolation: • MFRVs closed • MFRBVs closed • Main feed MOVs closed • Standby MFP in PTL • Main feed pumps tripped • MFP discharge MOVS closed • SG BD TVs closed.	
	Crew verifies phase A isolation: • Manually initiates Phase A • Initiates Attachment to verify isolation.	
	BOP verifies aux feed pumps running.	

EVENT 8: Given that the unit is at power, and a main steamline 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 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. • PORVs closed • Spray valves closed • At least one PORV block valve open.	
	RO checks RCP trip and charging pump recirc criteria: Subcooling < 25°F. (NO)	
	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.
	BOP checks pressure in all SGs.	
	Crew identifies "A" as faulted SG.	
	NOTE: Crew may have already isolated feed flow to the faulted generator using a focused brief.	

EVENT 8: Given that the unit is at power, and a main steamline 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
CT 3	**Crew isolates the faulted SG.** • BOP verifies MFW isolated. • BOP closes 1-FW-MOV-100D. • BOP verifies 1-FW-MOV-100A and 1-FW-HCV-100A closed. • BOP verifies "A" SG PORV closed. • BOP verifies all SG blowdown trip valves closed. • Crew dispatches an operator to locally close 1-MS-18.	**Critical Task** *Prior to transition out of E-2
	BOP checks ECST level.	
	BOP verifies IA established to containment.	
	Crew checks secondary radiation. • RO resets SI • RO resets phase A • RO resets AMSAC (if necessary) • BOP checks secondary radiation normal.	
	Crew checks if SI can be terminated. (YES) • Subcooling > 25°F • AFW flow to intact SG > 340 gpm OR at least one intact SG level >11% • RCS pressure stable or increasing • PRZR level >21%	
	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 steamline 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: • BOP verifies LHSI suctions from sump closed • RO checks charging pump recirc flow path aligned • BOP closes BIT inlet valves 1-SI-MOV-1867A and 1867B • BOP closes BIT outlet valves 1-SI-MOV-1867C and 1867D • BOP verifies alternate SI valves closed.	
	NOTE: The scenario may be terminated after the crew terminates SI, or as directed by the lead evaluator.	

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."	25
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, PDIT 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	**Malfunction:** RM0207, Severity = -1
Auto-start failure of 1-CN-P-1B	**Switch override:** CNP1B_ASTOP = OFF
Auto-start failure of 1-FWP-3A/3B	**Malfunctions:** FW2601 FW2602
Failure of rods to move in auto	**Malfunction:** RD14
Failure of Auto or Manual Reactor Trip	**Malfunctions:** RD82 RD88 **Remote function: RP** 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 Extreme View.
2) Unit ramp	Give appropriate cues as WCC and field operators.
3) Trip of "A" Condensate pump/ IRPI failure	**NOTE: If for some reason the crew starts 1-CN-P-1B during event 1, then delete CN0201 and change delay time on RD0121 to 5 seconds.** **Malfunctions:** CN0201, Delay time = 5, Trigger = 3 RD0121, Delay time = 185, Severity = -1, Trigger = 3 **NOTE: When sent to Condensate pumps, report that "B" is running fine. Can see no nothing wrong with A" locally.** **If sent to Condensate pump breaker, report that 15A4 has an overcurrent drop on it.** **NOTE: If I&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.** **NOTE: The next event can occur once Condensate flow has been re-established and tech specs have been reviewed.**
4) Failure of 1-CH-FT-1122	**Malfunction:** CH08, Delay time = 5, Severity = 1, Ramp = 10, Trigger = 4 **NOTE: If dispatched to look at valve, transmitter, etc, report that everything looks normal.** **NOTE: The next event can occur once charging has been returned to normal, or as directed by the lead evaluator.**
5) Failure of "A" SG CH III steam pressure	**Malfunction:** MS1701, Delay time = 5, Ramp = 5, Severity = -1, Trigger = 5 **NOTE: The next event can occur once Tech Specs have been reviewed.**

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

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 45% power, the crew will start a second Main Feedwater Pump in accordance with 1-OP-31.1, "Main Feedwater System"

NORTH ANNA 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 approximately 45% power and the crew has been instructed to increase power, the crew will ramp the unit up in accordance with 1-GP-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 steamline 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 OR
RO places in-service boric acid transfer pump in fast speed AND
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 OR
* Emergency boration flow indicated
* Neutron flux decreasing.
* Pressurizer pressure less than 2335 psig.

WOG Reference:

FR-S.1 C-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 at least one motor driven AFW pump control switch to start

Feedback:

Minimum AFW flow (680 gpm) indicated to SGs.

WOG Reference:

FR-S.1 B-Background

Conditions:

Prior to meeting FR-H.1 criteria

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 A-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 approximately 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-FWP-1C starts and runs normally

EVENT 2: Given that the unit is at approximately 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-D8 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 steamline 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

Dominion
North Anna Power Station

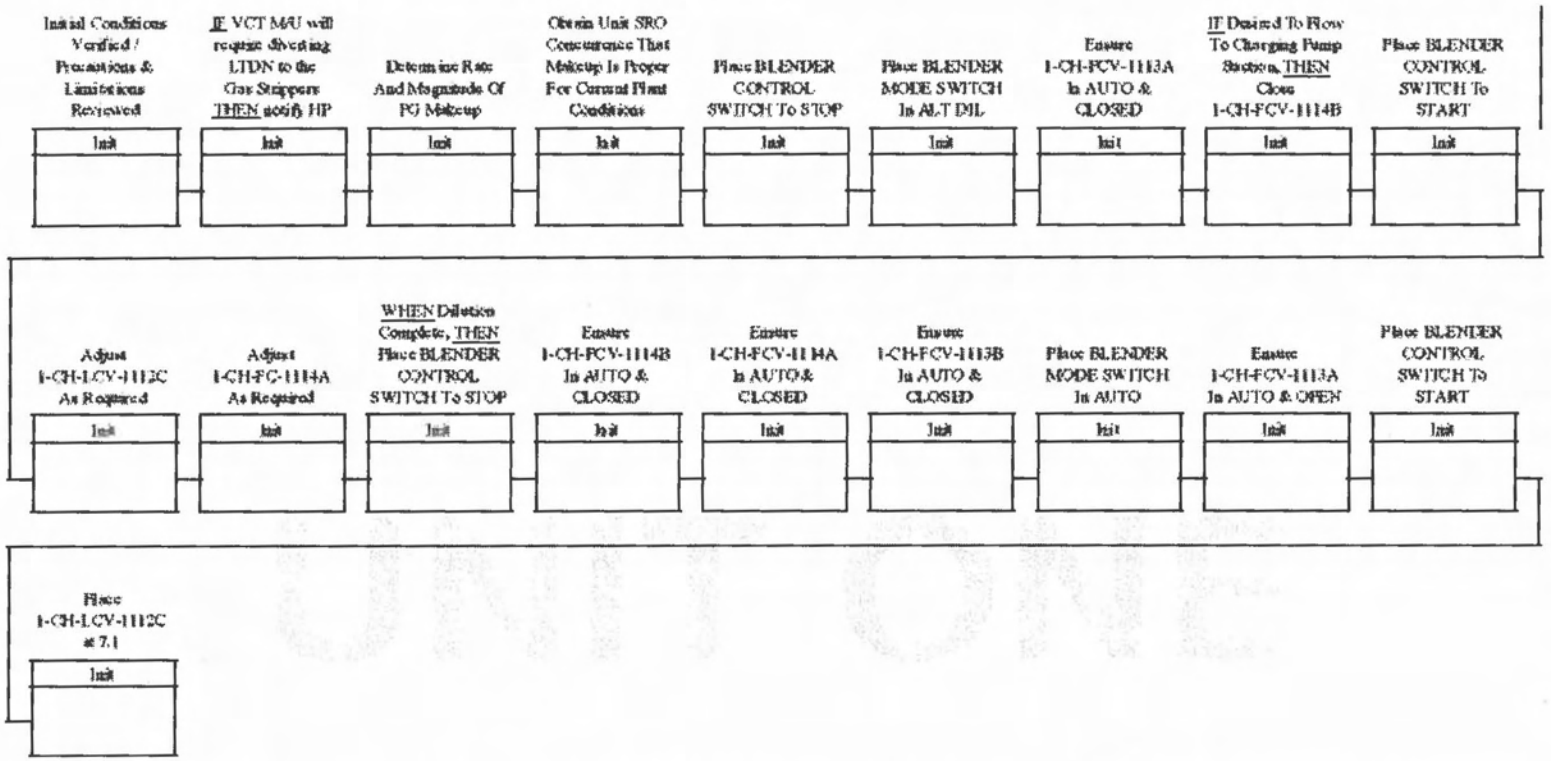
PLACING THE BLENDER IN THE ALTERNATE DILUTION MODE OF OPERATION

CONTINUOUS USE

PURPOSE - To provide instructions for placing the blender in the alternate dilution mode of operation.

INITIAL CONDITIONS IF Unit 1 is in Mode 3, 4, 5, or 6, THEN 1-LOG-2A, RCS Makeup Log, has been initiated.

PRECAUTIONS AND LIMITATIONS -
To minimize the risk of an unexpected RCS boron dilution, closely monitor blender Boric Acid and/or PG flows to ensure that the desired flows are maintained.
Peer checking is required for the performance of this procedure.
For large dilutions (>1000 gallons) make at least two distinct dilutions. Prior to making the second dilution wait an adequate time to ensure proper mixing then obtain and analyze a boron sample to confirm expected results from the first dilution.



Completed By: _____ Peer Check By: _____ Reviewed By: _____

Date: _____ Date: _____ Date: _____

Dominion
North Anna Power Station

PLACING THE BLENDER IN THE DILUTION MODE OF OPERATION
CONTINUOUS USE

PURPOSE - To provide instructions for placing the blender in the dilution mode of operation.

INITIAL CONDITIONS IF Unit 1 is in Mode 3, 4, 5, or 6, THEN 1-LOG-2A, RCS Makeup Log, has been initiated.

PRECAUTIONS AND LIMITATIONS - To minimize the risk of an unexpected RCS boron dilution, closely monitor blender Boric Acid and/or PG flows to ensure that the desired flows are maintained.
Peer checking is required for the performance of this procedure.
For large dilutions (>1000 gallons) make at least two distinct dilutions. Prior to making the second dilution wait an adequate time to ensure proper mixing then obtain and analyze a boron sample to confirm expected results from the first dilution.

Initial Conditions Verified / Precautions & Limitations Reviewed	IF VCT MU will require diverting LTDN to the Gas Strippers, THEN notify HP	Determine Rate And Magnitude Of PG Makeup	Obtain Unit SRO Concurrence That Makeup Is Proper For Current Plant Conditions	Place BLENDER CONTROL SWITCH To STOP	Place BLENDER MODE SWITCH In DILUTE	Ensure 1-CH-FCV-1113A In AUTO & CLOSED	Place BLENDER CONTROL SWITCH To START
Init	Init	Init	Init	Init	Init	Init	Init

Adjust 1-CH-LCV-1112C As Required	Adjust 1-CH-FC-1114A As Required	WHEN Dilution Complete, THEN Place BLENDER CONTROL SWITCH To STOP	Ensure 1-CH-FCV-1114B In AUTO & CLOSED	Ensure 1-CH-FCV-1114A In AUTO & CLOSED	Ensure 1-CH-FCV-1113B In AUTO & CLOSED	Place BLENDER MODE SWITCH In AUTO	Ensure 1-CH-FCV-1113A In AUTO & OPEN
Init	Init	Init	Init	Init	Init	Init	Init

Place BLENDER CONTROL SWITCH To START	Place 1-CH-LCV-1112C at 7.1
Init	Init

Completed By: _____ Peer Check By: _____ Reviewed By: _____

Date: _____ Date: _____ Date: _____

STEP	ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED

NOTE: A previously-completed action does not have to be repeated, unless directed by the Unit SRO.

1.___ VERIFY BOTH AC EMERGENCY BUSSES - ENERGIZED

Do the following as directed by Unit SRO:

☐ a) IF no AC Emergency Bus is energized, THEN immediately restore power to at least one AC Emergency Bus.

☐ IF power cannot be restored, THEN GO TO 1-ECA-0.0, LOSS OF ALL AC POWER, Step 1.

☐ b) Try to restore power to de-energized AC Emergency Bus using 0-AP-10, LOSS OF ELECTRICAL POWER, as time permits.

☐ Continue with Step 2.

STEP	ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
2. ___	CHECK SI STATUS:	
	a) Check if SI is actuated: ☐ • Low-Head SI Pumps - RUNNING ☐ • Any SI First-Out Annunciator - LIT	a) Check if SI is required as indicated by any of the following: ☐ • Low PRZR pressure ☐ • High Containment pressure ☐ • Steamline differential pressure • High steamflow with either: ☐ • Lo-Lo Tave OR ☐ • Low steam pressure ☐ IF SI required, THEN GO TO Step 2b. ☐ IF SI is NOT required, THEN GO TO Step 9.
	☐ b) As directed by unit SRO, manually actuate SI	

STEP	ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
3.	VERIFY FEEDWATER ISOLATION:	☐ Perform Main Feedwater isolation as determined by Unit SRO.
	☐ • Main Feed Reg Valves - CLOSED	
	☐ • Main Feed Reg Bypass Valves - CLOSED	
	☐ • Main Feed MOVs - CLOSED	
	☐ • Standby Main Feed Pumps in PTL	
	☐ • Main Feed Pumps - TRIPPED	
	☐ • Main Feed Pump Discharge MOVs - CLOSED	
	☐ • Steam Generator Blowdown Trip Valves - CLOSED	
4.	VERIFY PHASE A ISOLATION:	
	☐ a) Verify Panel "K"-H7, CONTAINMENT ISOLATION PHASE A - LIT	☐ a) As directed by Unit SRO, manually initiate Phase A Isolation.
	☐ b) Attachment 5, VERIFICATION OF PHASE A ISOLATION of 1-E-0, REACTOR TRIP OR SAFETY INJECTION - PERFORMED	☐ b) Inform Unit SRO that Attachment 5 of 1-E-0 should be initiated as time and personnel availability permits.
5.	VERIFY SI PUMPS - RUNNING:	☐ As directed by Unit SRO, manually start pumps.
	☐ • Charging Pumps - RUNNING	
	☐ • Low-Head SI Pumps - RUNNING	
6.	VERIFY FOUR SERVICE WATER PUMPS - RUNNING	☐ As directed by Unit SRO, manually start pumps.
		☐ IF less than 4 Service Water Pumps are running, THEN ensure Unit 2 Operator initiates 0-AP-47, UNIT OPERATION DURING OPPOSITE UNIT EMERGENCY.

STEP	ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
7. ___	CHECK IF MAIN STEAMLINES SHOULD BE ISOLATED:	
	a) Check the following:	☐ a) GO TO Step 9.
☐	• Annunciator Panel "D" E-3 - LIT OR	
☐	• Containment pressure - HAS EXCEEDED 18 PSIA	
☐	b) Verify MSTVs and Bypass Valves - CLOSED	☐ b) As directed by Unit SRO, manually close valves.
8. ___	CHECK IF CDA IS REQUIRED:	
☐	a) Containment pressure - HAS EXCEEDED 28 PSIA	☐ a) GO TO Step 9.
☐	b) Verify Panel "K" H-6, CDA INITIATED - LIT	☐ b) As directed by Unit SRO, manually actuate CDA.
	c) Verify CC Pumps - TRIPPED	☐ c) As directed by Unit SRO, stop CC Pumps.
☐	• 1-CC-P-1A	
☐	• 1-CC-P-1B	
☐	d) Verify all RCPs - STOPPED	☐ d) As directed by Unit SRO, stop all RCPs.
	e) Verify QS Pumps - RUNNING	☐ e) As directed by Unit SRO, manually start QS Pumps.
☐	• 1-QS-P-1A	
☐	• 1-QS-P-1B	

(STEP 8 CONTINUED ON NEXT PAGE)

STEP	ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
8.	CHECK IF CDA IS REQUIRED: (Continued)	
	f) Verify QS Pump Discharge MOVs - OPEN	☐ f) As directed by Unit SRO, manually open valves.
☐	• 1-QS-MOV-101A	
☐	• 1-QS-MOV-101B	
☐	g) On the Unit 1 Ventilation Panel, verify 1-SW-TV-101A&B SERVICE WATER SUPPLY & RETURN TO RECIRC AIR FANS - SWITCH IN CLOSE POSITION	☐ g) Place switch in CLOSE.
☐	h) Verify ATTACHMENT 2, VERIFICATION OF PHASE B ISOLATION of 1-E-0, REACTOR TRIP OR SAFETY INJECTION - PERFORMED	☐ h) Inform Unit SRO that Attachment 2 of 1-E-0 should be initiated as time and personnel availability permits.
9.___	INFORM UNIT SRO THAT APPLICABLE ACTIONS OF 1-E-0 HAVE BEEN VERIFIED FOR 1-FR-S.1	

- END -

Facility: North Anna Scenario No.: 2 Op-Test No.: 1

Examiners: Mark Bates
Edwin Lea
Bruno Caballero
Mark Riches

Operators: _____

Initial Conditions: Unit at 100% power MOL. The letdown rad monitor is OOS and 1-FW-P-2 (terry turbine) was just returned to service last shift. 2-CC-P-1A is tagged out for seal work.

Turnover: Maintain 100% power and support maintenance on 2-CC-P-1A

Event No.	Malf. No.	Event Type*	Event Description
1	SW0104	C (B) (S) TS (S)	SW pump trips
2	RD07	I (R) (S)	Uncontrolled inward rod motion
3		R (R) (S) N (B)	Loss of condenser vacuum due to loss of air ejector loop seal. Will need to ramp unit back.
3a	FW0801	I (B) (S)	During ramp will lose error signal to "A" MFRV
4	CH2201 CH2101	C (R) (S) TS (S)	Running charging pump degrades, auto-start defeated on standby pump, discharge check valve will stick on degraded pump
5	RC04	TS (S)	RCS leak
6	RC0101	M (All)	SBLOCA (No auto Safety Injection. BIT inlets do not open automatically.)
7	SI08	I (All)	Auto SI will not actuate when required
8		C (B) (S)	BIT inlets will not open automatically
			Scenario can be terminated after crew enters 1-E-1.
			(Events 7 and 8 occur during event 6 and are numbered only for use on Forms 301-5 and 301-6)

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

DOMINION

NORTH ANNA POWER STATION

INITIAL LICENSED OPERATOR EXAMINATION

SIMULATOR EXAMINATION GUIDE
SCENARIO NRC 2

EVENT	DESCRIPTION
1.	SW pump trips
2.	Uncontrolled inward rod motion
3/3a.	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, 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.

Pre-job Brief for Scenario NRC-2

Unit Status: 2893 MWth
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-RM-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.

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. A rough log should be maintained to aid in making reports and to help during briefs.

3. Respond to what you see. In the unlikely event that the simulator fails such that illogical indications result, the session will be terminated and the crew informed.

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-RM-128, Letdown radiation monitor, is OOS. 2-CC-P-1A is tagged out for seal maintenance. 1-FWP-2 was returned to service last shift, PMT was SAT. 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) • Annunciators J-D8 and J-B3 illuminate • "B" SW header pressure and flow decrease		
	BOP identifies annunciators J-D8, SWPP 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 references Technical Specification 3.7.8 and determines that action "A" applies, which allows 72 hours to verify SW throttled.	
	NOTE: The next event will occur after the US refers to technical specifications, or as directed by the lead evaluator.	

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.	
CT 1	**Crew takes action to stop rod motion and stabilize the unit.** • **RO places rod control in MANUAL.** • RO verifies rod motion stopped.	**Critical Task** ***Before Lo-lo insertion limits**
	RO verifies 1-RC-TI-1408A is normal.	
	Crew verifies control rods above the lo-lo insertion limit.	
	RO checks RCS Tave within limits on attachment 2 and adjusts as directed by the US.	
	RO checks PRZR pressure stable or trending to 2235 psig.	
	RO checks PRZR level stable.	
	Crew checks controls rods above the lo insertion limit.	
	Crew maintains stable plant conditions: • Tave • PRZR pressure • PRZR level.	
	US notifies I&C to investigate failure.	
	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.	

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
	NOTE: The next event will occur after the crew has stabilized the plant, or as directed by the lead evaluator.	

EVENT 3/3a: 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) • Condenser vacuum worsens • Annunciator A-G1 alarms if vacuum reaches setpoint • Annunciator F-F1 alarms • "A" MFRV will not control in auto		
	NOTE: The following condenser vacuum limits/setpoints apply: **G-F3 (Vacuum pre-trip) < 25"HgV (~5" HgA)** **A-G1 (Loss of C-9) > 4"HgA** **E-D2 (Turbine trip) 20"-23"HgV (6.9-9.8"HgA) AND ASO pressure < 45 psig** **Monitor > 5.5"HgA – Trip reactor**	
	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)	

EVENT 3/3a: 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
	NOTE: During the ramp the BOP will identify the failure of the "A" MFRV to automatically control SG level at program. Annunciator F-F1 will alarm when level is ±5% from program. This valve will need to be adjusted in manual during the ramp.	**Event 3a**
	BOP verifies air ejector lineup.	
	BOP verifies gland steam operation.	
	Crew dispatches watchstander to perform local actions.	
	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.	
	RO controls RCS temperature with blender or control rods.	
	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.	
	NOTE: Once the crew has stabilized the unit the next event can occur.	

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) • Charging flow initially decreases • Charging pump discharge pressure decreases • Temperature increases on 1-SWTI-103A • Annunciators C-B6 and C-C6 illuminate • 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		
	RO identifies degrading conditions on 1-CH-P-1A	
	RO identifies annunciator C-B6, CH-P-1A-B-C LUBE OIL HI TEMP.	
	NOTE: Report from the field will be that 1-CH-P-1A is making a lot of noise.	
	US directs starting of 1-CH-P-1B or 1-CH-P-1C	
	US directs stopping of 1-CH-P-1A	
	Crew identifies loss of charging flow	
	NOTE: The crew may isolate letdown based on AR instructions. If so, step 6 will restore letdown.	
	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.	
CT 2	**Crew closes discharge MOVs for the previously running pump ("A").** • **1-CH-MOV-1286A** • **1-CH-MOV-1287A**	**Critical Task**
	RO verifies charging conditions returning to normal.	

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
	US reviews Technical Specification 3.5.2 Condition A for having only one operable HHSI pump. Have 72 hours to restore 2 trains to operable. (This is only applicable if 1-CH-P-1B was started since 1-CH-P-1C is only operable when running).	
	NOTE: Crew may discuss starting the "C" pump on the 1H bus (if not initially started).	
	US reports failures and requests WR, CR, and management notifications be made.	
	NOTE: Crew should also discuss an entry into TS 3.0.3, which was applicable from the time the "B" or "C" Charging pump was started until the "A" discharge MOVs were closed.	
	NOTE: Once the US has referred to Tech Specs or as directed by the Lead Evaluator, the next event will occur.	

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) • 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		
	NOTE: Any of the following indications may be identified first.	
	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.	**AP-16**
	RO verifies primary parameters under operator control.	
	NOTE: Crew may isolate letdown at this time.	
	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.	

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 references Technical Specification 3.4.13A - 4 hours to restore leakage to within limits (or will have to shutdown per Condition B).	
	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.	**AP-5 steps for 1-RM-RMS-160 alarm**
	A primary leak rate calculation is initiated.	
	HP is requested to take containment sump samples.	
	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.	

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) • Pressurizer level and pressure rapidly decrease • Containment pressure slowly increases • SI does not automatically actuate, if required • BIT inlet valves do not open automatically		
	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.	
	NOTE: An SI will be required on low pressurizer pressure (1780 psig). The crew may manually initiate SI before an auto signal is generated.	
CT 3	**Crew manually actuates SI prior to exiting 1-E-0:** • **RO/BOP manually actuate SI.**	**Critical Task** **SI will not automatically actuate.**
	BOP verifies feedwater isolation: • MFRVs closed • MFRBVs closed • Main feed MOVs closed • Standby MFP in PTL • Main feed pumps tripped • MFP discharge MOVS closed • SG BD TVs closed.	
	RO/BOP manually initiate phase A isolation.	
	BOP verifies AFW pumps running.	
	NOTE: Crew may have previously held a focused briefed and started 1-CH-P-1C.	

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 verifies SI pumps running. (NO)	
	Crew starts 1-CH-P-1C	
	BOP verifies all SW pumps running. (NO)	
	Crew directs Unit 2 to enter 0-AP-47.	
	Crew checks if MS should be isolated. (YES)	
	Crew verifies/closes MSTVs.	
	*Crew checks if CDA required. (NO)	
	NOTE: The following is a continuous action step and actions will be performed when containment pressure has exceeded 20 psia.	
	*Crew checks if QS is required. Crew manually starts QS: • QS discharge valves are opened • QS pumps are started • CAT outlet valves are opened	
	NOTE: Crew may have aligned BIT using CAP #2 which states: <u>IF</u> SI is actuated <u>AND</u> High-Head Cold Leg SI flow in <u>NOT</u> indicated, <u>THEN</u> initiate attachment 6.	
	Crew verifies SI flow. (NO)	
	US directs initiation of attachment 6.	
	NOTE: Attachment 6 and Continuous Action Page are attached to back of scenario.	

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
CT 4	**Crew manually aligns the BIT prior to exiting E-0:** • RO verifies charging pump line-up • BOP verifies BIT recirc valves closed. • BOP verifies BIT outlet valves open. • **BOP manually opens 1-SI-MOV-1867A OR 1867B.**	**Critical Task** **Attachment 6 steps**
	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.	
	NOTE: The RCPs may have already been stopped using CAP #3.	
CT 5	**Crew stops all RCPs during a SBLOCA.** RO checks RCS subcooling <25°F [85°F]. **Crew checks at least one charging pump running and flowing to the RCS.** **RO stops all RCPs.**	**Critical Task**
	NOTE: Crew may have already closed HHSI pump recircs per Cap #4.	
CT 6	**Crew takes action to prevent HHSI pump runout.** RO checks RCS pressure < 1275 psig [1475 psig]. **RO/BOP closes charging pump recirc valves.** v/v #'s MOV-CH-1275A, B, C	**Critical Task** NAF-94045 ET Rev Ø, Chg Pump Mini Flow Recirc Chg Criteria
	BOP checks SGs not faulted. (YES)	
	BOP checks SGs not ruptured. (YES)	
	Crew checks if RCS is intact inside containment. (NO)	

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
	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: • RO resets SI, Phase A • Crew verifies IA trip valves open • RO resets AMSAC • Crew checks SG Blowdown, AE, Main steamline, and terry turbine exhaust radiation monitors normal • BOP checks SG levels • Crew initiates attachment to place BD rad monitors in service • BOP opens SG surface sample trip valves and informs chemistry.	
	NOTE: The scenario may be terminated after the crew checks secondary radiation, or as directed by the lead evaluator.	

REFERENCES

PROCEDURE	REV.
Abnormal Procedure 0-AP-12, "Loss of Service Water."	33
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:	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, PDIT 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	**Malfunction:** RM0207, Severity = -1
Failure of BIT inlets to open on SI	**Switch Override (SI):** (Keeps valves from opening on SI) MOV867A_CLOSE=ON MOV867B_CLOSE=ON Setup 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	**Malfunction:** SI08
1-CH-P-1B will not auto-start	**Switch Override:** CHP1B_ASTP = OFF

SCENARIO EVENTS

EVENT	MALFUNCTION/ OVERRIDE/ COMMUNICATIONS
1) Loss of service water	**Malfunction:** SW0104, Trigger = 1 **NOTE: When sent to pump can report that 2-SW-P-1A looks normal and 1-SW-P-1B is running normally.** **NOTE: When sent to breaker for 2-SW-P-1A (25H5) can report an overcurrent trip.** **NOTE: The next event will occur after the US refers to technical specifications, or as directed by the lead evaluator.**
2) Rod Insertion.	**Malfunction:** RD07, Delay time = 5, Trigger = 2 **NOTE: The next event will occur after the crew has stabilized the plant, or as directed by the lead evaluator.**
3) Loss of Condenser Vacuum Failure of level signal to "A" MFRV	**Malfunction:** CN0901, Delay time = 5, Ramp = 120, Severity = 100, Trigger = 3 **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.)** **Malfunction:** FW0801, Delay time = 5, Trigger = 3 **NOTE: Allow the crew to stabilize the unit before proceeding with next event, or as directed by the Lead Evaluator.**

EVENT	MALFUNCTION/ OVERRIDE/ COMMUNICATIONS
4) Degradation of 1-CH-P-1A with check valve failure	**Malfunctions:** CH2201, Delay time = 5, Ramp = 120, Severity = 50, Trigger = 4 CH2101, Delay time = 5, Trigger = 4 **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.** **NOTE: If asked to check on 1-CH-P-1B (C), can report that the pump appears to running satisfactorily, with no seal leakage.** **NOTE: Once the US has referred to Tech Specs or as directed by the Lead Evaluator, the next event will occur.**
5) RCS leak	**Malfunction:** RC04, Delay time = 5, Ramp = 300, Severity = 10, Trigger = 5 (Thwbrtot ~20754) **NOTE: If asked about whether to ramp or make containment entry, ask for recommendation. Can either agree with US, or say you will get back with them.)** **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.**
6) SBLOCA	**Malfunction:** RC0101, Delay time = 5, Ramp = 30, Severity = 0.3, Trigger = 6 **NOTE: The scenario may be terminated after the crew checks secondary radiation, or as directed by the lead evaluator.**

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:

None

Conditions:

Prior to control rod lo-lo insertion limit.

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 D-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 1-SI-MOV-1867A OR 1867B

Feedback:

HHSI flow to the cold legs is indicated.

WOG Reference:

E-0 I-Background.

Conditions:

Prior to transitioning out of E-0.

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 uncovery 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
- Annunciator F-F1 alarms
- "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-SWTI-103A
- Annunciators C-B6 and C-G6 illuminate
- 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

CONTINUOUS ACTION PAGE FOR 1-E-0

1. ADVERSE CONTAINMENT CRITERIA

   IF either of the following conditions exist, THEN use setpoints in brackets:

   ☐ • 20 psia Containment pressure, OR

   ☐ • Containment radiation has reached or exceeded 1.0E5 R/hr (70% on High Range Recorder).

2. SI FLOW CRITERIA

   ☐ IF SI is actuated AND High-Head Cold Leg SI flow is NOT indicated, THEN initiate ATTACHMENT 6, MANUAL VERIFICATION OF SI FLOWPATH.

3. RCP TRIP CRITERIA

   IF both conditions listed below exist, THEN trip all RCPs:

   ☐ • Charging Pumps - AT LEAST ONE RUNNING AND FLOWING TO RCS, AND

   ☐ • RCS subcooling based on Core Exit TCs - LESS THAN 25°F [85°F].

4. CHARGING PUMP RECIRC PATH CRITERIA

   ☐ • IF RCS pressure decreases to less than 1275 psig [1475 psig] AND RCPs tripped, THEN close Charging Pump Recirc Valves.

   ☐ • IF RCS pressure increases to 2000 psig, THEN open Charging Pump Recirc Valves.

5. ECST LEVEL CRITERIA

   ☐ WHEN the ECST level decreases to 40%, THEN initiate 1-AP-22.5. LOSS OF EMERGENCY CONDENSATE STORAGE TANK 1-CN-TK-1.

6. CDA ACTUATION CRITERIA

   IF Containment pressure exceeds 28 psia, THEN do the following:

   ☐ a. Manually actuate CDA.

   ☐ b. Ensure CC Pumps STOPPED.

   ☐ c. Stop all RCPs.

   ☐ d. Ensure QS Pumps RUNNING.

   ☐ e. Ensure QS Pump Discharge MOVs OPEN.

   ☐ f. Initiate ATTACHMENT 2, VERIFICATION OF PHASE B ISOLATION.

   ☐ g. Initiate ATTACHMENT 3, PRIMARY PLANT VENTILATION ALIGNMENT.

7. CONTAINMENT RECIRC MODE CRITERIA

   ☐ To prevent possible radioactive release from the RWST, VCT level should be maintained greater than 12%.

8. RCP CRITERIA

   ☐ Seal injection flow should be maintained to all RCPs.

9. REACTIVITY CONTROL CRITERIA

   ☐ An Operator should be sent to locally close and lock 1-CH-217, PG to Blender Isolation Valve.

STEP	ACTION/ EXPECTED RESPONSE	RESPONSE NOT OBTAINED
1. ___	OPEN CHARGING PUMP SUCTION FROM RWST ISOLATION VALVES:	☐ Locally open at least one valve.
	☐ • 1-CH-MOV-1115B ☐ • 1-CH-MOV-1115D	☐ WHEN at least one valve is open, THEN GO TO Step 2.
2. ___	CLOSE CHARGING PUMP SUCTION FROM VCT ISOLATION VALVES:	☐ Locally close at least one valve before continuing with Step 3.
	☐ • 1-CH-MOV-1115C ☐ • 1-CH-MOV-1115E	
3. ___	CLOSE AT LEAST ONE NORMAL CHARGING ISOLATION VALVE:	☐ Place 1-CH-FCV-1122 in MANUAL and close.
	☐ • 1-CH-MOV-1289A ☐ • 1-CH-MOV-1289B	
4. ___	CLOSE BIT RECIRC VALVES:	IF both of the following valves will NOT close, THEN locally close 1-SI-71, BIT Outlet Hdr To Boric Acid Tank Isol Valve:
	☐ • 1-SI-TV-1884A ☐ • 1-SI-TV-1884B ☐ • 1-SI-TV-1884C	☐ • 1-SI-TV-1884A ☐ • 1-SI-TV-1884B ☐ Continue with Step 7.

STEP	ACTION/ EXPECTED RESPONSE	RESPONSE NOT OBTAINED
5. ___	OPEN AT LEAST ONE BIT OUTLET VALVE: ☐ • 1-SI-MOV-1867C ☐ • 1-SI-MOV-1867D	☐ Locally open at least one valve while continuing with Step 7.
6. ___	OPEN AT LEAST ONE BIT INLET VALVE: ☐ • 1-SI-MOV-1867A ☐ • 1-SI-MOV-1867B	☐ Locally open at least one valve while continuing with Step 7.
7. ___	VERIFY CHARGING PUMPS - RUNNING	☐ Manually start pumps.

STEP	ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
8. ___	VERIFY COLD LEG SI FLOW - INDICATED: ☐ • 1-SI-FI-1943 ☐ • 1-SI-FI-1943-1 ☐ • 1-SI-FI-1961 (NQ) ☐ • 1-SI-FI-1962 (NQ) ☐ • 1-SI-FI-1963 (NQ)	IF Cold Leg SI flow is NOT indicated, THEN do the following: ☐ a) Turn on control power to AND open 1-SI-MOV-1836, SI COLD LEG INJECTION ALTERNATE HDR ISOLATION. b) IF 1-SI-MOV-1836 will NOT open, THEN turn on control power to AND open one of the following valves (Key Required): ☐ • 1-SI-MOV-1869B, SI Hot Leg Injection Normal Header Isolation ☐ • 1-SI-MOV-1869A, SI Hot Leg Injection Alternate Header Isolation ☐ c) Continue attempts to align SI flow through the BIT while continuing with this procedure. IF SI flow through the BIT is established, THEN ensure the following valves are closed AND turn off control power: ☐ • 1-SI-MOV-1836 ☐ • 1-SI-MOV-1869B ☐ • 1-SI-MOV-1869A
9. ___	RETURN TO PROCEDURE AND STEP IN EFFECT	

- END -

Facility: North Anna Scenario No.: 3 Op-Test No.: 1

Examiners: Mark Bates
Edwin Lea
Bruno Caballero
Mark Riches

Operators: _____
_____
_____

Initial Conditions: Unit at 100% power MOL. The letdown rad monitor OOS and1-FW-P-2 (terry turbine) was just returned to service last shift. 2-CC-P-1A is tagged for seal maintenance.

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

Event No.	Malf. No.	Event Type*	Event Description
1		C (B) (S)	BC pump trips and standby pump does not auto-start
2	RC1501	I (R) (S)	Tavg unit fails high causing rods to step in
3		C (B) (S)	Running IA compressor trips with no auto-start of standby compressor
4	RC0803	I (R) (S) TS (S)	Selected pressurizer level channel fails low, letdown isolates
4a		N (R) (S)	Return letdown to service
5		R (R) (S) C (B) TS (S)	SG PORV fails partially open, unit is ramped back
6	FW2201	C (All)	Running feed pump trips with no auto-start of standby pump, unit must be tripped. (No auto reactor trip.)
7	FW2101 FW2102 FW2103	M (All)	Main feed suction lines all break
8	FW1102 FW1402	C (All)	Terry turbine will trip on overspeed and can't immediately be reset, discharge line break on 1-FW-P-3B and 1-FW-P-3A will degrade – FR-H.1
9	RD32	I (All)	No auto reactor trip will occur when required
			Terminate scenario when feed flow has been restored from the Terry Turbine
			(Event 9 occurs during event 6 and is numbered only for use on Forms 301-5 and 301-6.)

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

DOMINION

NORTH ANNA POWER STATION

INITIAL LICENSED OPERATOR EXAMINATION

SIMULATOR EXAMINATION GUIDE
SCENARIO NRC 3

EVENT	DESCRIPTION
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 PCRV 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 suctions will break
8.	Terry turbine will trip on overspeed, discharge line break on one MDAFW pump and the other will degrade, ending in an H1 scenario

Scenario Recapitulation:

Malfunctions after EOP entry	**2** (Main feed line break, AFW pumps not available)
Total Malfunctions	**8** (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 PCRV fails open, main feed pump trips/standby pump does not auto-start, main feed line break, AFW pumps not available)
Abnormal Events	**6** (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 PCRV fails open, main feed pump trips/standby pump does not auto-start)
Major Transients	**1** (Main feed line suction break)
EOPs Entered	**2** (ES-0.1, FR-H1)
EOP Contingencies	**1** (FR-H1)
Critical Tasks	**6**

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-FWP-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-FWP-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.

"B" MDAFW pump discharge line will break in the MSVH and no flow will reach the SG. The "A" 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-FWP-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.

Pre-job Brief for Scenario NRC-3

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-RM-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.

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. A rough log should be maintained to aid in making reports and to help during briefs.

3. Respond to what you see. In the unlikely event that the simulator fails such that illogical indications result, the session will be terminated and the crew informed.

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-RM-128, is OOS. 2-CC-P-1A is tagged out. 1-FWP-2, terry turbine, was returned to service last shift, PMT was SAT. 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) • 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		
	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.	
	NOTE: When sent to investigate, the operator will report that there is an overcurrent trip on the breaker for 1-BC-P-1A.	
	NOTE: The next event can occur once the crew has restored BC or at the discretion of the lead evaluator.	

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) • Rods stepping in at maximum speed • Annunciators B-A7 and B-A8 are illuminated • Status light M-E4 illuminates		
	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.	
CT 1	**Crew takes action to stop rod motion and stabilize the unit:** **RO places rod control in MANUAL.** RO verifies rod motion stopped.	**Critical Task** *Prior to rod lo-lo insertion limit
	RO verifies that 1-RC-TI-1408 is normal. (NO)	
	Crew initiates action of AR B-A7, while continuing.	**See actions below**
	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.	
	NOTE: The following actions are IAW annunciators B-A7.	

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 places PRZR level control in MANUAL and controls PRZR level. Can use 1-CH-FCV-1122 and/or 1-RC-LCV-1459G	
	RO transfers condenser steam dumps to steam pressure mode. • Both Steam Dump Interlock switches to OFF/RESET • Steam Dump Controller to Manual • Mode Selector to STEAM PRESS • Ensure steam dump demand is zero • Steam Dump Controller to auto • Steam Dump Interlock switches to ON	
	US informs Work Control Center of failure and requests assistance, WR, and CR	
	NOTE: If the US requests permission to withdraw rods to restore temperature, it will be given.	
	NOTE: The next event will occur after the crew has stabilized the plant, or as directed by the lead evaluator.	

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) • Annunciator 1J-D2 illuminates • IA pressure drops • 1-IA-C-1 will not start automatically, if required • Annunciators J-E8 and F-F8 illuminate		
	RO/BOP identifies annunciator J-D2, INST AIR COMPR/DRYER TROUBLE.	
	NOTE: Crew may not enter AP-28 until low air pressure alarms come in.	
	US directs entry into 1-AP-28.	
	NOTE: 1-IA-C-1 will not automatically start, but can be started in HAND.	
CT 2	**Crew starts all available air compressors.** • **BOP starts 1-IA-C-1, 1-IA-C-2A, and 1-IA-C-2B.**	**Critical Task** *Prior to IA pressure decreasing to 70 psig
	Crew verifies instrument air pressure > 70 psig.	
	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 report that there are only 2 things between the air receiver and the compressor, 2-IA-6, which is a check valve, and 2-IA-7, which is a manual isolation. He will ask for guidance.	Print containing these components is FM-82B sheet 2 of 4.
	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.	

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
	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.	
	NOTE: The next event will occur after instrument air pressure is returned to normal, or as directed by the lead evaluator.	

EVENT 4/4a: 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) • Annunciators B-F8, B-G7, and B-E2 are illuminated • 1-RC-LI-1461 fails low • Letdown isolates		
	RO identifies annunciators B-F8, PZR LO LEVEL and B-G7, PZR LO LVL HTRS OFF-LETDOWN ISOL.	
	NOTE: Identification of failure may not occur at this time.	
	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 (459/460).	
	RO verifies letdown in service. (NO)	

EVENT 4/4a: 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
CT 3	**Crew returns letdown to service using attachment of 1-AP-3:** • RO establishes at least 25 gpm of charging • RO opens 1-CH-LCV-1460A and 1460B • RO puts 1-CH-PCV-1145 in manual • RO fully opens 1-CH-PCV-1145 • RO opens 1-CH-HCV-1200B • RO adjusts 1-CH-PCV-1145 to maintain 300 psig • RO places 1-CH-PCV-1145 in Auto.	**Critical Task** Normal Event *Prior to a PRZR hi level reactor trip
	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 references Technical Specifications: 3.3.1 (Function 9 Condition L - 72 hours to place channel in trip) TS 3.3.3 (Function 13 – Info action).	
	US/SS make notifications about failed channel.	

EVENT 4/4a: 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
	NOTE: When the crew reestablishes letdown and the US has reviewed TS, then the next event will occur.	

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) • Reactor power slowly increases. • Megawatts slowly decrease.		
	RO/BOP identifies increase in reactor power/decrease in MW	
	US directs crew to enter 1-AP-38.	
	RO verifies all steam dumps closed.	
	NOTE: Crew may identify "B" PORV open from PCS alarm and PNID screen.	
	NOTE: BOP may place "B" PORV in manual and press the "Down" button.	
	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 ≤ 100%	
	Crew dispatches operators to check for the source of steam	
	NOTE: The operator will report that the "B" steam generator PORV is open.	
	Crew directs the operator to locally close the "B" SG PORV.	
	NOTE: The field operator will report that the PORV handwheel is bound and he cannot close the valve.	
	Crew directs operator to isolate PORV using 1-MS-59.	
	Crew checks power level reduced to the power level before the event started.	
	Crew stops ramp.	
	BOP places turbine in IMP-IN, if required.	

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
	BOP checks main generator output.	
	BOP checks all steamflow indications normal.	
	BOP checks turbine control in operator auto.	
	Crew checks plant steamsystems: SG PORVs SG safeties MSR inlet FCVs AS PCV.	
	US consults Technical Specification 3.7.4 Condition A and determines that the PORV is inoperable and must be returned to operable within 7 days .	
	Crew references Reactivity admin (OP-AP-300), as time permits.	
	NOTE: US may request permission to restore reactor power.	
	NOTE: The next event will occur after the crew has stabilized the unit, or at the direction of the lead evaluator.	

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) • 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		
	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.	
	NOTE: The next event will be initiated when the reactor is tripped.	

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) • 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, G-G8 illuminate • Main feed pump suction pressure rapidly decreases • Standby main Condensate pump starts • Various turbine building sump alarms illuminate		
	NOTE: The crew may manually trip the reactor before getting a first out on SG low level with steam flow/feed flow mismatch. The reactor will not automatically trip when required.	
CT 4	**RO/BOP trip the reactor.**	**Critical Task**
	BOP verifies/trips turbine.	
	RO verifies AC emergency busses energized.	
	BOP identifies annunciator 1F-B6, MAIN FD PUMPS SUCT HDR LO PRESS.	
	NOTE: G-C8 is the turbine building flooding alarm.	
	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.	
	NOTE: Crew may use 0-AP-39.1 for Turbine Building Flooding to direct securing of secondary 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
	US directs BOP to secure main feed, condensate and heater drain pumps.	
	BOP secures main feed, condensate, and heater drain pumps.	
	NOTE: The terry turbine will trip 2 minutes after starting.	
	NOTE: The next event can occur once secondary pumps have been stopped, or as directed by the lead evaluator.	

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) • Annunciators F-D8 illuminates • No flow indicated to "A" SG • Flow from 1-FWP-3B is not reaching the "B" SG; WR level decreasing • 1-FWP-3A degrades and flow drops to zero		
	NOTE: A break will occur on "B" AFW pump discharge line in the MSVH, and the "A" AFW pump will degrade after starting.	
	*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.	
	NOTE: Once H.1 is entered, a security officer, or any operator sent to the vicinity of the MSVH, will report that water and steam are issuing out the door.	
	Crew identifies that "B" SG WR level is not increasing.	
	Crew identifies that 1-FWP-3A 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-FWP-3A and the terry turbine.	
	NOTE: Operator will report "A" AFW pump does not sound right, mechanics suspect internal damage. The terry turbine trip valve is closed.	

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
	NOTE: The operator instructed to reset the overspeed trip valve will report that the he can't get it to stay reset.	
	Crew tries to establish AFW flow to at least one SG • BOP checks SG Blowdown and sample isolation valves closed • Crew reviews control room indications to determine loss of AFW flow • Crew determines that they cannot start an AFW pump from the MCR	
	Crew determines that they do not have adequate AFW flow.	
CT 5	**Crew stops reactor coolant pumps to conserve SG inventory and delay need for bleed and feed.** • **RO stops all reactor coolant pumps.**	**Critical Task** *Prior to meeting bleed and feed criteria
	Crew dispatches an operator with AP-22 series procedures.	
	Crew attempts to establish Main Feed flow to the SGs: • Crew determines that there are no condensate pumps running.	
	BOP checks SG wide range levels in 2/3 SGs less the 14% (NO)	This is bleed and feed criteria
	US returns to step 1.	
	NOTE: The operator dispatched to reset the overspeed trip valve will now inform the crew that 1-FW-P-2 has been reset.	
CT 6	**Crew establishes adequate AFW flow to SG(s).** • **BOP establishes adequate AFW flow as indicated by core-exit TCs decreasing and SG wide-range level increasing. (may be <340 gpm.)**	**Critical Task** *Prior to meeting bleed and feed criteria
	Crew verifies core-exit TCs decreasing and "A" SG WR level increasing.	

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
	US directs transition to 1-ES-0.1.	
	NOTE: An SI may occur on delta P if AFW flow is not throttled to "A" SG.	
	NOTE: The scenario may be terminated once the crew has established adequate AFW flow, or at the discretion of the lead evaluator.	

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:	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, PDIT 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	**Switch override:** FWP1B1_ASTOP = OFF FWP1B2_ASTOP = OFF
Failure of auto reactor trip	**Malfunction:** RD32
Letdown rad monitor failure	**Malfunction:** RM0207, Severity = -1
Failure of 1-IA-C-1 to auto-start	**Switch override:** IAC1_AUTO, Override = OFF

SCENARIO EVENTS

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

EVENT	MALFUNCTION/ OVERRIDE/ COMMUNICATIONS
2) Median/ select Tave failure	**Malfunction:** RC1501, Delay time = 5, Ramp = 5, Severity = 1, Trigger = 2 **NOTE: If the US requests permission to withdraw rods to restore temperature, it can be given. (Always ask for a recommendation and then concur with it.)** **NOTE: The next event will occur after the crew has stabilized the plant, or as directed by the lead evaluator.**
3) Loss of instrument air	**Remote function:** U2_IAC1_FAULT = TRUE, Trigger = 3 **Malfunction:** CA0402, Delay time = 8, Ramp = 10, Severity = 10, Trigger = 3 **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 report that there are only 2 things between the air receiver and the compressor, 2-IA-6, which is a check valve, and 2-IA-7, which is a manual isolation. Ask what they would like you to do.** **NOTE: If sent to check 2-IA-TV-211 can report it either open or closed (opens when IA pressure at the dryer is <90 psig). If open report was made, can later report that reset was pressed when so directed.** **NOTE: When told to close 2- IA-7, wait 1 minute then delete malfunction CA0402 and report that leak is isolated.** **NOTE: The next event will occur after instrument air pressure is returned to normal, or as directed by the lead evaluator.**
4) PRZR level Ch I, LT-461 fails low	**Malfunction:** RC0803, Delay time =5, Ramp = 30, Severity = -1, Trigger = 4 **NOTE: When the crew reestablishes letdown and identifies the correct MOP and TS action, then the next event will occur.**

EVENT	MALFUNCTION/ OVERRIDE/ COMMUNICATIONS
5) Stuck open SG PORV	**Remote function:** MSPCV101B_K, Delay time = 5, Ramp = 5, Value = 100, Trigger = 5 **NOTE: Approximately two minutes after crew dispatches an operator to the MSVH, report that the "B" steam generator PORV is open.** **NOTE: When asked to close the valve using the handwheel report back after several minutes that the handwheel is bound and you cannot operate it.** **When directed to isolate the PORV then close 1-MS-59 over 70 seconds using PNID.** **NOTE: The next event will occur after the crew has stabilized the unit, or at the direction of the lead evaluator.**
6) Trip of "A" MFP	**Malfunction:** FW0401, Delay time = 5, Ramp = 60, Severity = 100, Trigger = 6 **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.** **NOTE: The next event will occur when the reactor is tripped.**

EVENT	MALFUNCTION/ OVERRIDE/ COMMUNICATIONS
7) Loss of MFW	**Malfunctions:** FW2101, 2102, 2103, Delay time = 5, Ramp = 0, Severity = 100, Trigger = 7 **Alarm overrides:** 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 V1AD8_W Delay time = 30, Override = ON, Trigger = 7 **Set up trigger 7 to occur when the reactor is tripped.** RX_RTA_52 .EQ 0 **NOTE: The following trips the Terry Turbine on overspeed 2 minutes after the reactor is tripped:** **Remote function:** MSTV115 = 0, Delay time = 120, Trigger = 10 **Set up trigger 10 to actuate on reactor trip breaker being open.** RX_RTA_52 .EQ 0 --- **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.** **NOTE: Operator will report the terry turbine trip valve is closed.** **NOTE: When the operator is instructed to reset the overspeed trip valve: Report that the valve will not stay reset and request assistance.** **NOTE: The next event will occur after the crew secures CN and HP pumps, or as directed by the lead evaluator.**

EVENT	MALFUNCTION/ OVERRIDE/ COMMUNICATIONS
8) Loss of heat sink	**Malfunction:** FW402, Delay time = 5, Severity = 30, Ramp = 30, Trigger = 8 FW102, Delay time = 10, Severity = 30, Ramp = 120, Trigger = 8 **NOTE: Operator will report "A" AFW pump is noisy. If sent, mechanics can report suspected impeller damage.** **NOTE: Once operators have determined that they have a loss of heat sink and have entered H.1, someone can report that steam and water are coming out the door of the MSVH.** **NOTE: Watch SG WR levels, reset terry turbine before feed and bleed criteria are met.** **NOTE: After the crew has looped back to step 1 of 1-FR-H.1, reset overspeed trip valve using remote function:** **MSTV115 = 100, Ramp = 30** **NOTE: The operator dispatched to reset the overspeed trip valve will inform the crew that 1-FW-P-2 has been reset.** **NOTE: The scenario may be terminated once the crew has established adequate AFW flow, or at the discretion of the lead evaluator.**

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/T-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 1-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 Rod lo-lo insertion limit.

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 1-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.

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 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.

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 uncovery. 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-FWP-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, C-G8 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-FWP-3B is not reaching the "B" SG; WR level decreasing • 1-FWP-3A degrades and flow drops to zero

Facility: North Anna Scenario No.: 4 Op-Test No.: 1

Examiners: Mark Bates
Edwin Lea
Bruno Caballero
Mark Riches

Operators:

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&C verifies proper operation due to a prior problem.

Turnover: Shift orders are to ramp unit to 100% power.

Event No.	Malf. No.	Event Type*	Event Description
1		R (R) (S) N (B)	Commence ramping unit to 100% power
2	RC29	C (R) (S) TS (S)	Master pressure controller fails high causing PORV and sprays to open
3	FW0106	I (B) (S) TS (S)	Failure of "B" SG channel III level transmitter
4	NI0104	I (R)(S)	N-44 failure
4a		N (R) (S)	N-44 is placed in trip
5	EL09	C (B) (S)	Main Generator voltage regulator fails
6	RC2402	C (All)	"B" SGTL increasing until reactor trip is required. (Turbine does not trip automatically.)
6a	RC1201	C (R) (S)	Seal leak on "A" RCP after reactor trip
7	RC2402	M (All)	"B" SGTR after unit stabilized from trip
8	TU03	C (B) (S)	Turbine does not trip automatically
			Terminate scenario once crew completes cooldown in E-3
			(Event 8 occurs during event 6 and is numbered only for use on Forms 301-5 and 301-6.)

* (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

EVENT	DESCRIPTION
1.	Commence ramping unit to 100% power
2.	Master pressure controller fails high causing PORV and sprays to open
3.	"B" SG channel III level transmitter fails low
4/4a.	N-44 fails and is placed in trip
5.	Main Generator voltage regulator fails
6 6a	"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	**2** (Failure of turbine to trip automatically, RCP seal failure)
Total Malfunctions	**8** (Master pressure controller fails high, SG level channel fails low, N-44 fails, MG VR fails, SGTL requiring reactor trip, SGTR, failure of turbine to trip automatically, RCP seal failure)
Abnormal Events	**5** (Master pressure controller fails high, SG level channel fails low, N-44 fails, MG VR fails, SGTL requiring reactor trip)
Major Transients	**1** (SGTR)
EOPs Entered	**2** (ES-0.1, E-3)
EOP Contingencies	**0**
Critical Tasks	**5**

SCENARIO DURATION

120 minutes

SIMULATOR EXAMINATION SCENARIO SUMMARY
SCENARIO NRC 4

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 ramp has been observed, 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 should review Technical Specification 3.3.1. After N-44 has been placed in trip, the next event will 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 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 manually using the pushbuttons. Following a transition to ES-0.1, "Reactor Trip Response," 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."

Next 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." The crew will cooldown the RCS to the required temperature using E-3. At this time the scenario can be terminated.

Pre-job Brief for Scenario NRC-4

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-RM-128, is OOS. 2-CC-P-1A is tagged out for seal maintenance. 1-FW-P-2, terry turbine, was tagged out during outage and has just been returned to service. Control rods are in manual while the instrument shop verifies proper operation due to a previous failure. I&C is 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%.

Ramp Directions

Reactor engineering estimates it will take approximately 6500 gallons of PG to return the unit to 100% power.

Approximate rod positions:

160 steps at 50% power
178 steps at 75% power
202 steps at 90% power

AFD limits: 50% power -27 / +20
100% power -12 / +6

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. A rough log should be maintained to aid in making reports and to help during briefs.

3. Respond to what you see. In the unlikely event that the simulator fails such that illogical indications result, the session will be terminated and the crew informed.

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-RM-128, is OOS. 2-CC-P-1A is tagged out for seal maintenance. 1-FWP-2, terry turbine, was tagged out during outage and has just been returned to service. Control rods are in manual while the instrument shop verifies proper operation due to a previous failure. I&C is 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) • Reactor power increases • Turbine power increases • Tavg/Tref increase • Generator output increases		
	NOTE: The crew may raise primary temperature prior to ramping the turbine.	
	BOP adjusts limiter position, as required.	
	BOP verifies/sets desired ramp rate (.3% per minute).	
	BOP increases turbine setter to desired position.	
	BOP presses GO on turbine.	
	BOP monitors turbine ramp.	
	RO starts a dilution when required.	Dilution OOPs included at back of scenario
	RO withdraws control rods to maintain Tave within 1.5°F of Tref with rods above insertion limits.	
	NOTE: The next event can occur once the crew has ramped approximately 5% as determined by the lead evaluator.	

EVENT 2: 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) • Annunciator B-E6 illuminates • Master pressure controller fails high • 1-RC-PCV-1455C indicates open • RCS pressure decreases		
	NOTE: The crew should stop the ramp and dilution once immediate actions have been completed. Note that primary temperature will continue to increase until all the dilution water has made it to the reactor.	
	Crew identifies annunciator B-E6, PRZR PRESS CONT HI OUTPUT.	
	US directs crew to enter 1-AP-44.	
	RO verifies PRZR PORVs closed. (NO)	
CT 1	**Crew stops RCS pressure decrease:** • **RO closes 1-RC-PCV-1455C.** • RO checks master pressure controller controlling properly. (NO) • **RO places master pressure controller to manual and adjusts to stabilize and restore pressure.**	**Critical Task** Prior to a reactor trip on low pressure
	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.	

EVENT 2: 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
	RO verifies RCS pressure normal and adjusts sprays or heaters, as required.	
	US refers to Technical Specifications: 3.4.1A – DNB 2 hours to restore pressure to within COLR limits (>2205 psig) 3.4.13A (RCS Leakage) – 4 hours to restore leakage to within limits _____ TS 3.4.11. Determines that PORV is operable.	
	NOTE: WCC will inform the crew during this time that rods may be returned to AUTO. (This will restore auto temperature control and set up for Event 4.)	
	Crew evaluates malfunction and requests a work request and condition report be submitted.	
	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.	

EVENT 3: 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) • Annunciators F-F2 and F-B2 are illuminated • "B" Channel III SG level indicator is reading off-scale low • "B" MFRV is ramping open		
	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: • RO verifies operable pressurizer level channel selected • RO verifies letdown in service • RO verifies pressurizer level control in AUTO • RO verifies control group heaters are not tripped.	
	Crew verifies both turbine first stage pressure channels normal.	
	Crew verifies operable channels selected for SGWLC.	
	Crew verifies that no other instrumentation has failed.	

EVENT 3: 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
	US references technical specifications: 3.3.1 Functions 14 and 15, Condition E – 72 hours to place channel in trip 3.3.2 Functions 5b and 6b, Condition D – 72 hours to place channel in trip --- 3.3.3 (Function 15) Info action	
	Crew identifies 1-MOP-55.76.	
	US informs Work Control Center of failure and requests WR, CR, and craft assistance.	
	NOTE: The next event will occur after the crew has identified the appropriate MOP, or at the direction of the lead evaluator.	

EVENT 4: 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) • N-44 indicates > 120% • Control rods step in at maximum speed • RCS pressure and TAVE decrease		
	NOTE: Verify control rods are in AUTO before this event.	
	RO identifies control rods stepping in.	
	RO identifies N-44 failed high.	
	US directs entry into 1-AP-4.3.	
CT 2	**Crew stops control rod movement due to N-44 failure.** • Crew verifies power not increasing. • **RO places rod control in MANUAL.** • BOP verifies bypass MFRVs in manual.	**Critical Task** *Prior to rod lo-lo insertion limit
	Crew verifies three power-range instruments operable.	
	Crew verifies unit in mode 1.	
	Crew verifies 1-hour permissives for Tech Spec 3.3.1: • Function 18b - P-7 permissive. P-C2 NOT LIT since >10% power • Function 18c - P-8 permissive. P-F1 will be LIT since <30 % power • Function 18d - P-10 permissive. P-D2 will be LIT since >10%	

EVENT 4: 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
	RO places N-44 in trip. • N-44 is selected on Comparator Channel Defeat • N-44 is defeated on Rod Stop Bypass • N-44 is defeated on Upper section • N-44 is defeated on Lower section • Control power fuses are removed.	Normal event
	Crew verifies/selects N-43 on the N-16 panel.	
	Crew checks reactor power greater than 5% and removes computer points from scan.	
	Crew notifies chemistry N-44 input to CLCMS is unreliable.	
	US reviews Technical Specifications: 3.3.1 Functions 2a, Condition D and 3a and 3b, Condition E, require channel to be placed in trip within 72 hours. _____ QPTR will be required once per 12 hours when power is >50% Info action only.	
	Crew verifies N-44 placed in trip within 72 hours.	
	RO verifies Tave and Tref matched within 1.5°F.	
	NOTE: If asked about method for restoring Tave/Tref, booth will ask for suggestion and agree with whatever suggested.	
	Crew adjusts Tave/Tref, as required.	
	NOTE: Crew may leave control rods in manual. Booth will agree with whatever they recommend.	

EVENT 4: 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 determines if rod control should be placed in AUTO	
	US reports failure to Work Control Center and requests WR, CR, and craft assistance.	
	NOTE: The next event will occur after the crew places N-44 in trip, or as directed by the lead evaluator.	

EVENT 5: 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) • Annunciators K-B4 and K-C7, and K-C1 illuminate • Generator output voltage increases		
	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 CMOC of the failure and to initiate WR and CR	
	NOTE: The next event will occur after the crew has stabilized the plant, or at the direction of the lead evaluator.	

EVENT 6/6a: Given that the unit is at power and indications exist of a SG tube leak and a #1 seal failure on an RCP, 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," 1-E-0, "Reactor Trip or Safety Injection," and 1-AP-33.1, "RCP Seal Failure."		
TIME	EXPECTED ACTION	INSTRUCTOR REMARKS
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		
	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.	
	NOTE: US may not immediately break off an operator to address 1-AP-5. AP-24 steps are on following page.	
	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.	**AP-5 steps**
	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 slightly elevated.	
	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 6/6a: Given that the unit is at power and indications exist of a SG tube leak and a #1 seal failure on an RCP, 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," 1-E-0, "Reactor Trip or Safety Injection," and 1-AP-33.1, "RCP Seal Failure."		
TIME	EXPECTED ACTION	INSTRUCTOR REMARKS
	Crew checks if reactor should be tripped: • Valid indication of high radiation on a secondary radiation monitor AND ANY of the following: • Noticeably increased charging flow • Increase in VCT makeup frequency • Unexpected SG level increase • Unexpected feed flow decrease.	**AP-24**
	Crew identifies reflash on annunciator K-G6, N-16 RAD DET.	
	Crew identifies all N-16 RM indications increasing.	
	NOTE: AP-24 steps are continued on page 17.	
	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.	**Turbine will not trip automatically**
	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	

EVENT 6/6a: Given that the unit is at power and indications exist of a SG tube leak and a #1 seal failure on an RCP, 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," 1-E-0, "Reactor Trip or Safety Injection," and 1-AP-33.1, "RCP Seal Failure."		
TIME	EXPECTED ACTION	INSTRUCTOR REMARKS
	NOTE: After AFW flow has been adjusted, "A" RCP will seal leak will be inserted, it has a 3-minute time delay.	
	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.	These alarms start the 5-minute timer for CT 3
	RO identifies "A" RCP seal leakoff flow is pegged high.	
	US directs crew to enter 1-AP-33.1.	
	Crew determines RCP must be tripped: Checks seal delta P <200 psid OR BOTH of the following Seal leakoff flow >5.9 gpm AND C-G7 LIT and VALID based on: • Seal return temperature • Lower radial bearing temperature • Parameters on other RCPs • Thermal barrier temperature • Seal delta P • RCP vibes/current • Delta T between Seal Return and lower radial bearing • Change in RCS mass flow balance parameters: PRZR level decrease, Charging flow increase.	

EVENT 6/6a: Given that the unit is at power and indications exist of a SG tube leak and a #1 seal failure on an RCP, 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," 1-E-0, "Reactor Trip or Safety Injection," and 1-AP-33.1, "RCP Seal Failure."		
TIME	EXPECTED ACTION	INSTRUCTOR REMARKS
CT 3	**Crew isolates affected Reactor Coolant Pump seal leakoff** • Crew trips "A" RCP. • Crew closes 1-CH-HCV-1303A, #1 seal leakoff valve once the "A" RCP indicates stopped. • Crew closes spray valve 1-RC-PCV-1455A	**Critical Task** *RCP should be tripped and seal leakoff valve should be closed within five minutes of initial seal failure.
	US reports seal failure to Work Control Center and requests WR, CR, and craft assistance.	
	US announces continuation of ES-0.1.	
	NOTE: The following steps are from 1-AP-24. The US may assign one of the operators to continue in this procedure while directing the other operator in the EOPs.	
	NOTE: The crew may not have identified which SG was leaking before the reactor trip. This may take HP assistance with surveys or samples.	
	Identify ruptured SG Checks SG NR level increases High radiation on SG steamline RMs (170/171/172 located behind LW panel) High radiation on SG blowdown RMs (122/123/124) High activity on any SG sample Local contact readings.	**AP-24 steps**
	Places "B" SG PORV setpoint at 1005 psig and verifies it is closed.	
	Closes "B" MSTV.	
	Initiates attachment for MSVH	
	Verifies SG Blowdown TVs are closed.	

EVENT 6/6a: Given that the unit is at power and indications exist of a SG tube leak and a #1 seal failure on an RCP, 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," 1-E-0, "Reactor Trip or Safety Injection," and 1-AP-33.1, "RCP Seal Failure."		
TIME	EXPECTED ACTION	INSTRUCTOR REMARKS
	Monitors "B" SG level and isolates AFW flow when level is >11%	
	Determines that air ejectors do not need to be diverted to containment.	
	Directs securing high capacity BD and has turbine building sump pumps stopped.	
	Contacts HP for turbine sump pumping requirements.	
	Has aux steam transferred to Unit 2.	
	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.	

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) • "B" SG level increases unexpectedly • Pressurizer level and pressure decreases unexpectedly		
	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.	
	NOTE: 1-AP-24 is no longer applicable once SI has been actuated.	
	Crew manually actuates SI.	
	BOP verifies feedwater isolation: • MFRVs closed • MFRBVs closed • Main feed MOVs closed • Standby MFP in PTL • Main feed pumps tripped • MFP discharge MOVS closed • SG BD TVs closed.	
	Crew verifies phase A isolation: • Manually initiates Phase A • Initiates Attachment to verify isolation.	
	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.	

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 RCS average temperature.	
	RO checks pressurizer PORVs and spray valves. • PORVs closed • Spray valves closed • At least one PORV block valve open.	
	RO checks RCP trip and charging pump recirc criteria: Subcooling < 25°F. (NO)	
	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: Subcooling < 25°F. (NO)	**E-3 steps**
	Crew identifies "B" SG as the ruptured SG	
	NOTE: Crew may have closed 1-FW-MOV-100B earlier in the scenario. SG level >11%.	

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
CT 4	**Crew isolates ruptured SG by performing/directing the following:** • BOP adjusts "B" SG PORV setpoint at 1050 PSIG • BOP checks "B" SG PORV closed • **Crew initiates attachment for MSVH isolation local actions** • RO checks decay heat release valve closed • BOP verifies "B" SG blowdown valves closed • **BOP closes "B" SG MSTV and bypass valve** • **BOP closes FW-MOV-100B when "B" SG level >11%.**	**Critical Task** * Must be done before a transitions to 1-ECA-3.1, SGTR with Loss of Reactor Coolant, Subcooled Recovery Desired, becomes necessary
	Crew initiates attachment for turbine building actions.	
	*RO checks PRZR PORVs and block valves. • Power available to PORV block valves • PORVs closed • At least one PORV block valve open.	
	*BOP checks intact SG levels: • Level in at least one SG >11% • Control level between 23 and 50%	
	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: • Crew removes fuses from AE RM • RO resets phase A • Crew places Condenser AE divert to containment SI reset switches to RESET • Crew verifies valve alignment: 1-SV-TV-102-1 open, 1-SV-TV-103 open, and 1-SV-TV-102-2 closed. • Crew opens steam supply to air ejectors, 1-AS-FCV-100A and 100B.	
	BOP establishes IA to containment: • Verifies an air compressor is supplying IA • Verifies 1-IA-TV-102A and 102B are open.	
	Crew verifies flow from "B" SG isolated: • Procedure step 3 complete • Attachment 7 complete through step 3 • Ruptured SG pressure >350 psig.	
	NOTE: Either or both of the following SI signals may need to be blocked at this or a subsequent time. This is a continuous action step.	

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 interlock blocks and blocks SI signals when required. Check PRZR pressure less than 1950 psig IF so then: Verify P-G4 is LIT, if NOT then: Place both Low PRZR pressure SI block switch in BLOCK Verify P-G4 LIT ELSE Check P-F3 LIT IF so then: Check P-G3 LIT, is NOT then: Place both High Steam Flow SI block switches in BLOCK Verify P-G3 LIT ELSE Continue with next step.	
	NOTE: If steam dumps are available the RO will need to transfer to Steam Pressure mode (and go to BYP INTK if P-F4 LIT). These steps are attached to back of scenario.	
CT 5	**Crew initiates RCS cooldown:** • Crew determines required CETC temperature based on ruptured SG pressure. • **RO/BOP dumps steam.** • RO verifies CETCs < required temperature. • RO/BOP stop dumping steam	**Critical Task** *Crew must maintain adequate subcooling to avoid transition to 1-ECA-3.1
	NOTE: Scenario may be terminated after crew completes cooldown, or as directed by the Lead Evaluator.	

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-26, "Failure of Main Generator Voltage Regulator High."	9
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), PDIT 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	**Malfunction:** RM0207, Severity = -1
Failure of auto turbine trip	**Malfunction:** TU03

SCENARIO EVENTS

EVENT	MALFUNCTION/ OVERRIDE/ COMMUNICATIONS
1) Unit ramp	**NOTE: The next event will occur once the crew has ramped approximately 5%.**
2) PRZR master pressure controller failure	**Malfunction:** RC29, Delay time = 5, Ramp = 5, Severity = 2, Trigger = 2 **NOTE: WCC will inform the crew during this time that rods may be returned to AUTO.** **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.**

EVENT	MALFUNCTION/OVERRIDE/COMMUNICATIONS
3) "B" SG level transmitter failure	**Malfunction:** FW0106, Delay time = 5, Ramp = 5, Stop = -1, Trigger = 3 **NOTE: The next event will occur after the crew has reviewed TS, or at the direction of the lead evaluator.**
4) Power-range channel IV failure	**NOTE: Verify control rods have been returned to AUTO before inserting this event.** **Malfunction:** NI0204, Delay time = 5, Ramp = 0, Severity = 1, Trigger = 4 **NOTE: If asked about method for restoring Tave/Tref, ask for suggestion and agree with whatever is suggested.** **NOTE: The next event will occur after the crew stabilizes unit and places N-44 in trip, or as directed by the lead evaluator.**
5) MG VR Failure	**Malfunction:** EL09, Delay time = 5, Ramp = 35, Severity = 50, Trigger = 5 **NOTE: If called, can report that no abnormalities can be seen at the VR panel.** **NOTE: The next event will occur after the crew stabilizes the plant, or as directed by the lead evaluator.**

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

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-GP-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 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 3 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 4 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 rod lo-lo insertion limit.

EVENT 5 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 6 PERFORMANCE OBJECTIVES

EVENT GOAL: Given that the unit is at power and indications exist of a SG tube leak and a #1 seal failure on an RCP, 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," 1-E-0, "Reactor Trip or Safety Injection," and 1-AP-33.1, "RCP Seal Failure."

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-FWMOV-100B.

Feedback:

Indication of:

* stable or increasing pressure in the ruptured SG
* decreasing or zero feedwater flowrate 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 steamflow 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 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 3: 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 4: 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 5: 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 6: Given that the unit is at power and indications exist of a SG tube leak and a #1 seal failure on an RCP, 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," 1-E-0, "Reactor Trip or Safety Injection," and 1-AP-33.1, "RCP Seal Failure."
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

Dominion
North Anna Power Station

PLACING THE BLENDER IN THE DILUTION MODE OF OPERATION

CONTINUOUS USE

PURPOSE - To provide instructions for placing the blender in the dilution mode of operation.

INITIAL CONDITIONS IF Unit 1 is in Mode 3, 4, 5, or 6, THEN 1-LOG-2A, RCS Makeup Log, has been initiated.

PRECAUTIONS AND LIMITATIONS - To minimize the risk of an unexpected RCS boron dilution, closely monitor blender Boric Acid and/or PG flows to ensure that the desired flows are maintained.
Peer checking is required for the performance of this procedure.
For large dilutions (>1000 gallons) make at least two distinct dilutions. Prior to making the second dilution wait an adequate time to ensure proper mixing then obtain and analyze a boron sample to confirm expected results from the first dilution.

Initial Conditions Verified / Precautions & Limitations Reviewed	IF VCT MU will require diverting LTDN to the Gas Strippers, THEN notify HP	Determine Rate And Magnitude Of PG Makeup	Obtain Unit SRO Concurrence That Makeup Is Proper For Current Plant Conditions	Place BLENDER CONTROL SWITCH To STOP	Place BLENDER MODE SWITCH In DILUTE	Ensure 1-CH-FCV-1113A In AUTO & CLOSED	Place BLENDER CONTROL SWITCH To START
Init	Init	Init	Init	Init	Init	Init	Init

Adjust 1-CH-LCV-1112C As Required	Adjust 1-CH-FC-1114A As Required	WHEN Dilution Complete, THEN Place BLENDER CONTROL SWITCH To STOP	Ensure 1-CH-FCV-1114B In AUTO & CLOSED	Ensure 1-CH-FCV-1114A In AUTO & CLOSED	Ensure 1-CH-FCV-1113B In AUTO & CLOSED	Place BLENDER MODE SWITCH In AUTO	Ensure 1-CH-FCV-1113A In AUTO & OPEN
Init	Init	Init	Init	Init	Init	Init	Init

Place BLENDER CONTROL SWITCH To START	Place 1-CH-LCV-1112C at 7.1
Init	Init

Completed By: _____ Peer Check By: _____ Reviewed By: _____

Date: _____ Date: _____ Date: _____

Dominion
North Anna Power Station

PLACING THE BLENDER IN THE ALTERNATE DILUTION MODE OF OPERATION

CONTINUOUS USE

PURPOSE - To provide instructions for placing the blender in the alternate dilution mode of operation.

INITIAL CONDITIONS IF Unit 1 is in Mode 3, 4, 5, or 6, THEN 1-LOG-2A, RCS Makeup Log, has been initiated.

PRECAUTIONS AND LIMITATIONS - To minimize the risk of an unexpected RCS boron dilution, closely monitor blender Boric Acid and/or PG flows to ensure that the desired flows are maintained.
Peer checking is required for the performance of this procedure.
For large dilutions (>1000 gallons) make at least two distinct dilutions. Prior to making the second dilution wait an adequate time to ensure proper mixing then obtain and analyze a boron sample to confirm expected results from the first dilution.

Initial Conditions Verified / Precautions & Limitations Reviewed	IF VCT MU will require directing LTDN to the Gas Strippers THEN notify HP	Determine Rate And Magnitude Of PG Makeup	Obtain Unit SRO Concurrence That Makeup Is Proper For Current Plant Condition	Place BLENDER CONTROL SWITCH To STOP	Place BLENDER MODE SWITCH In ALT DIL	Ensure 1-CH-FCV-1113A In AUTO & CLOSED	IF Desired To Flow To Charging Pump Suction, THEN Close 1-CH-FCV-1114B	Place BLENDER CONTROL SWITCH To START
Init	Init	Init	Init	Init	Init	Init	Init	Init

Adjust 1-CH-LCV-1112C As Required	Adjust 1-CH-FC-1114A As Required	WHEN Dilution Complete, THEN Place BLENDER CONTROL SWITCH To STOP	Ensure 1-CH-FCV-1114B In AUTO & CLOSED	Ensure 1-CH-FCV-1114A In AUTO & CLOSED	Ensure 1-CH-FCV-1113B In AUTO & CLOSED	Place BLENDER MODE SWITCH In AUTO	Ensure 1-CH-FCV-1113A In AUTO & OPEN	Place BLENDER CONTROL SWITCH To START
Init	Init	Init	Init	Init	Init	Init	Init	Init

Place 1-CH-LCV-1112C at 7.1
Init

Completed By: _____ Peer Check By: _____ Reviewed By: _____

Date: _____ Date: _____ Date: _____

STEP	ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
13.	INITIATE RCS COOLDOWN: (Continued)	
☐	b) Verify Condenser Steam Dumps - AVAILABLE	b) Manually or locally dump steam from intact SGs at maximum controllable rate using:
	1) Transfer Condenser Steam Dump to Steam Pressure Mode:	☐ • SG PORVs OR • Decay Heat Release Valve:
☐	a. Put both Steam Dump Interlock switches to OFF/RESET	a. Locally open isolation valve(s) for NON-RUPTURED SG(s) to Decay Heat Release Valve:
☐	b. Put Steam Dump Controller to MANUAL	☐ • 1-MS-19, A Steam Line to 1-MS-HCV-104 Non-Return Valve
☐	c. Put Mode Selector switch to STEAM PRESS	☐ • 1-MS-58, B Steam Line to 1-MS-HCV-104 Non-Return Valve
☐	d. Verify or reduce Steam Dump demand to zero	☐ • 1-MS-96, C Steam Line to 1-MS-HCV-104 Non-Return Valve
☐	e. Put both Interlock switches to ON	☐ b. Locally open 1-MS-20, Decay Heat Release Valve Upstream Isolation Valve.
		☐ c. Open 1-MS-HCV-104, Decay Heat Release Valve.

(STEP 13 CONTINUED ON NEXT PAGE)

STEP	ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
13.	INITIATE RCS COOLDOWN: (Continued)	
		IF no intact SG is available, THEN do the following:
		☐ • Use faulted SG
		OR
		☐ • GO TO 1-ECA-3.1, SGTR WITH LOSS OF REACTOR COOLANT - SUBCOOLED RECOVERY DESIRED, STEP 1.
	☐ 2) Verify Panel P-F4, STM DUMP COOLDOWN VLV AVAILABLE - LIT	☐ 2) Momentarily place both Steam Dump Intlk Switches in BYP INTK, as required during cooldown.
		☐ Verify Panel P-F4 - LIT.
	☐ 3) Raise Steam Dump Controller demand and Dump steam to Condenser from intact SGs at maximum controllable rate	
	☐ c) Core exit TCs - LESS THAN REQUIRED TEMPERATURE	☐ c) Continue RCS cooldown.
		☐ Do NOT proceed with Step 13d until core exit TCs less than required temperature.
	☐ d) Stop RCS cooldown	
	☐ e) Maintain core exit TCs - LESS THAN REQUIRED TEMPERATURE	