

FINAL

Facility: North Anna

Scenario No.: 3

Op-Test No.: 1

Examiners: Edwin Lea
Richard Baldwin
Mark Riches

Operators: _____

Initial Conditions: Unit at 100% power MOL. 1-FW-P-3A was tagged last shift for motor bearing replacement.

Turnover: Ramp unit down, perform TVFT, and then return unit to 100% power.

Event No.	Mal. No.	Event Type*	Event Description
1		R (R) (S) N (B)	Ramp unit down for turbine valve freedom test
2	RC0803	I (R) (S) TS (S)	Pressurizer level instrument 1461 fails high
3	CC0201	C (B)	Running CC pump trips with failure of standby pump to auto-start
4	CH1602	C (R) (S)	Running charging pump trips and the standby pump fails to auto start
4a		N (R) (S)	Restore letdown
5	MS0101	I (B) (S) TS (S)	"A" Steam flow channel III fails high causing MFRV to open
6	FW0501 RD32/38	M (All)	"A" MFRV fails closed with failure of reactor to trip automatically or manually.
7		C (All)	Emergency borate valve won't open. BIT must be injected.
8	TU03	C (B) (S)	Turbine will not trip automatically or manually
			Scenario may be stopped once crew transitions from 1-FR-S.1 back to 1-E-0 and verifies immediate actions.
			(Events 7-8 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

FINALFacility: North AnnaScenario No.: 1Op-Test No.: 1Examiners: Edwin Lea
Richard Baldwin
Mark RichesOperators: _____

Initial Conditions: Reactor is at approximately 52% power MOL ramping up. Unit was returned to power yesterday following main turbine work, and cleared chemistry hold 1 hour ago. 1-FW-P-3A was tagged last shift for motor bearing replacement. Rod control is currently in manual while the instrument shop troubleshoots a problem with auto rod control.

Turnover: Continue to ramp unit to 100% using manual rod control until auto rod control is available. Support maintenance on 1-FW-P-3A.

Event No.	Malf. No.	Event Type*	Event Description
1		N (B) R (R) (S)	Ramp unit up using normal ramping OP
2	TU1101	C (B) (S)	EHC pump trips and standby pump doesn't auto-start
3	RC1901 RC0701	I/C(R) (S) TS (S)	Pressurizer pressure transmitter failure causes PORV to open and it sticks open. Operator must isolate using block valve.
4		C (B) (S)	Running BC pump trips. Standby pump does not auto start.
5	RC04	TS (S)	RCS leak in containment
6	BC0302	C (ALL)	Remaining BC pump will develop impeller damage requiring a reactor trip
7	RC0101	M (ALL)	RCS leak worsens to SBLOCA
8	SI1303 SI1304	C (B)	Phase A does not occur automatically
9		C (R) (S)	"C" RCP cannot be stopped with switch
			Scenario may be ended when the crew has transitioned to 1-E-1 or transitions to 1- E-1 from 1-FR-C.2
			(Events 8-9 occur during event 7 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 2010 NRC RUN 1

SIMULATOR EXAMINATION GUIDE

<u>EVENT</u>	<u>DESCRIPTION</u>
1.	Ramp unit up using normal ramping OP
2.	Running EHC pump trips/standby doesn't auto-start
3.	Pressurizer pressure transmitter failure (causes PORV to open and stick)
4.	Running BC pump trips/standby doesn't auto-start
5.	RCS leak in containment
6.	Remaining BC pump develops impeller damage
7.	RCS leak worsens to SBLOCA

Scenario Recapitulation:

Malfunctions after EOP entry	3	SBLOCA, Phase A does automatically occur, "B" RCP cannot be tripped with switch
Total Malfunctions	8	Running EHC pump trips/standby doesn't auto-start, pressurizer pressure transmitter failure, running BC pump trips/standby doesn't auto-start, RCS leak in containment, BC pump develops impeller damage, SBLOCA, Phase A does automatically occur, "A" RCP cannot be tripped with switch
Abnormal Events	5	Running EHC pump trips/standby doesn't auto-start, pressurizer pressure transmitter failure, running BC pump trips/standby doesn't auto-start, RCS leak in containment, BC pump develops impeller damage
Major Transients	1	SBLOCA
EOPs Entered	2	ES-0.1, E-1
EOP Contingencies	(1)	Possible entry into 1-FR-C.2
Critical Tasks	4	

SCENARIO DURATION

120 Minutes

SIMULATOR EXAMINATION SCENARIO SUMMARY
SCENARIO 2010 NRC RUN 1

Reactor is at approximately 52% power MOL ramping up. Unit was returned to power yesterday following main turbine work, and cleared chemistry hold 1 hour ago. Rods are in manual due to a problem with auto rod control. 1-FW-P-3A was tagged last shift for motor bearing replacement. Shift orders are to continue to ramp to 100% power and support the maintenance on 1-FW-P-3A.

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

The running EHC pump will trip and the standby pump will not auto-start. The crew will be expected to respond IAW the AR for low EHC system pressure and start the standby EHC pump. At this time the crew will be informed that the problem with auto rod control had been repaired and rods can be placed in auto at their discretion. Once the standby EHC pump is running, the next event can occur.

Pressurizer pressure transmitter, 1-RC-PT-1444, will fail high resulting in a pressurizer PORV, 1-RC-PCV-1455C, opening and sticking open. The crew will enter 1-AP-44 "Loss of Reactor Coolant System Pressure," and the RO will attempt to manually close the PORV and then close the block valve. Once the crew has stabilized the plant the Unit Supervisor (US) will refer to technical specifications. Once Tech Specs have been reviewed, the next event can occur.

The running 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 BOP will determine that the standby bearing cooling pump did not automatically start, and start 1-BC-P-1B. Once the BC System has been restored, the next event can occur.

An RCS leak will occur and the crew should identify the leak by observing increasing containment sump and radiation levels. The leak will increase to approximately 30 gpm. The crew will be expected to respond IAW 1-AP-16, "Increasing Primary Plant Leakage." The US will consult TS 3.4.13. Due to the reduced power level, the crew may consider making a containment entry to look for the leak. The crew may also decide, due to the size of the leak, to ramp the unit off-line.

Next, the remaining BC pump will develop impeller damage and will degrade. The crew will re-enter 1-AP-19, "Loss of Bearing Cooling Water," and trip the unit due to no BC pumps delivering water. After immediate actions of 1-E-0, "Reactor Trip or Safety Injection," are complete, the crew will perform actions in 1-AP-19 and secure equipment cooled by BC. Eventually a transition will be made to 1-ES-0.1, "Reactor Trip Response," where the crew will throttle Auxiliary Feedwater. At this time the next event will occur.

The RCS leak will worsen to the point where SI is desired. The crew will re-enter 1-E-0 and initiate safety injection. RCS subcooling will require the tripping of the RCPs. When the RO attempts to trip "C" RCP it will not trip and the crew will either have to open the feeder breaker for "C" SS bus, or dispatch an operator to locally trip the breaker for "C" RCP. Phase A isolation will not occur automatically and will have to be manually initiated. The crew will transition to 1-E-1, "Loss of Reactor or Secondary Coolant." (1-FR-C.2, Response to Degraded Core Cooling, may be applicable.) Once safety injection has been reset in 1-E-1, (or the crew has transitioned from 1-FR-C.2 to 1-E-1), the scenario may be terminated.

SCENARIO TURNOVER SHEET

Read the following to the crew:

Purpose: This examination is intended to evaluate the crew's performance of various tasks associated with the 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 52% power. Unit was returned to power yesterday following main turbine work, and cleared chemistry hold 1 hour ago. RCS boron is 1217 ppm and core age is 9000 MWD/MTU. Aux steam is on unit 2.

Unit 2 is at 100% power.

Equipment Status:

Rods are in manual due to a problem with auto rod control. 1-FW-P-3A was tagged last shift for motor bearing replacement. Maintenance rule window is green.

Shift Orders:

Continue to ramp to 100% power and support the maintenance on 1-FW-P-3A.

EVENT 1: Given that the unit is at approximately 50% power and the crew has been instructed to increase power, the crew will ramp the unit up in accordance with 1-OP-2.1, "Unit Startup from Mode 2 to Mode 1."

TIME	EXPECTED ACTION	INSTRUCTOR REMARKS
	SPD Verified: _____ (Initials) <ul style="list-style-type: none"> • Reactor power increases • Turbine power increases • Tavg/Tref increase • Generator megawatts increase 	
	NOTE: The crew may raise primary temperature prior to ramping the turbine.	
	BOP verifies/sets desired ramp rate (.3% per minute).	
	BOP adjusts limiter position, as required.	
	BOP increases turbine setter to desired position.	
	BOP presses GO on turbine.	
	BOP monitors turbine ramp.	
	RO starts a dilution when required.	
	RO withdraws control rods to maintain Tave within 1.5°F of Tref with rods above insertion limits.	
	NOTE: The next event can occur once the crew has ramped a sufficient amount, or as determined by the lead evaluator.	

EVENT 2: Given that an EHC pump has tripped and the backup EHC pump has not auto-started, the crew will respond in accordance with the Annunciate Response (AR) for annunciator T-B4.

TIME	EXPECTED ACTION	INSTRUCTOR REMARKS
	SPD Verified: _____ (Initials) <ul style="list-style-type: none"> • Annunciators K-F5 and T-B4 will illuminate • "A" EHC pump trips • "B" EHC pump does not auto-start 	
	BOP identifies K-F5, TURB SUPERV PANEL TROUBLE.	
	Crew identifies T-B4, EH FLUID RESERVOIR LOW- PRESSURE.	
	NOTE: Crew should stop the ramp.	
	BOP identifies no EHC pump running.	
	US directs BOP to start the standby EHC pump, 1-TM-P-4.	
	BOP manually starts 1-TM-P-4.	
	NOTE: If the crew dispatches an operator to look at EHC pumps, the operator will report that 1-TM-P-3 is unusually hot, and 1-TM-P-4 appears normal.	
	US requests Work Control Center supervisor to make notifications of the failure and initiate WR and CR.	
	NOTE: At this time call and tell crew that the instrument techs have replaced a blown fuse in rod control. Rods may be placed back in AUTO at the crew's discretion.	
	NOTE: The next event can occur after the backup EHC pump is running.	

EVENT 3: Given the plant is in Mode 1 and a failed Pressurizer Pressure Transmitter causes a PORV to open, the crew will respond in accordance with 1-AP-44, "Loss of Reactor Coolant System Pressure."

TIME	EXPECTED ACTION	INSTRUCTOR REMARKS
	SPD Verified: _____ (Initials) <ul style="list-style-type: none"> • Annunciators B-H2, B-F7, and C-D1 illuminate • 1-RC-PI-1444 indicates high pressure • Master pressure controller goes to max output • 1-RC-PCV-1455C opens and will not close • Both spray valves open • RCS pressure decreases 	
	RO identifies annunciator C-D1, PRESSURIZER SAFETY OR PORV OPEN.	
	RO identifies annunciator B-F7, PZR HI-LO PRESS.	
	NOTE: Identification of channel failure may not happen at this time.	
	RO identifies pressurizer pressure channel PT-1444 failed high.	
	US directs crew to perform immediate actions of 1-AP-44.	
	RO checks PRZR PORVs closed. (NO)	IA
CT1	Crew takes manual control of RCS pressure: <ul style="list-style-type: none"> • RO attempts to close 1-RC-PCV-1455C • RO closes 1-RC-MOV-1536 • RO checks master pressure controller controlling properly • RO places master pressure controller in manual and reduces output (OR manually closes 1-RC-PCV-1455A and 1455B). 	IA *Prior to reactor trip on low pressurizer pressure at 1870 psig
	RO verifies spray valves are closed.	IA
	RO verifies all PRZR heaters are energized	
	RO checks 1-CH-HCV-1311 closed.	
	Crew checks PRZR safeties closed.	

EVENT 3: Given the plant is in Mode 1 and a failed Pressurizer Pressure Transmitter causes a PORV to open, the crew will respond in accordance with 1-AP-44, "Loss of Reactor Coolant System Pressure."

TIME	EXPECTED ACTION	INSTRUCTOR REMARKS
	RO verifies all PORVS closed or isolated.	
	RO checks RCS pressure is stable or increasing.	
	RO checks RCS pressure is normal and adjusts heaters and sprays as required to restore.	
	US refers to TS: 3.4.1A - DNB -2 hours to restore, if pressure dropped < 2205 psig 3.4.11C – PORV - 1 hour to remove power from block valve and 72 hours to restore to normal 3.4.13A – RCS leakage (during time PORV was open and unisolated) - 4 hours to return to within limits.	
	US requests Work Control Center supervisor to make notifications of the failure, and to submit WRs and CRs.	
	NOTE: The next event may occur once unit parameters have stabilized and T.S. have been reviewed.	Good time to allow a brief while the plant stabilizes.

EVENT 4: Given the plant is in Mode 1 and the running bearing cooling water pump has tripped with no start of the standby pump, the crew will respond in accordance with 1-AP-19, "Loss of Bearing Cooling Water."		
TIME	EXPECTED ACTION	INSTRUCTOR REMARKS
SPD Verified: _____ (Initials) <ul style="list-style-type: none"> • Annunciators F-F4 and F-E4 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 perform immediate actions of 1-AP-19: BOP checks one BC pump running with normal amps (NO) 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.	Normally in tower-to-tower
	Crew verifies that BC system is operating normally: <ul style="list-style-type: none"> • System intact • Tower level normal • Tower fans running. 	
	Crew monitors main generator temperatures: <ul style="list-style-type: none"> • Annunciator T-C1 not lit • Annunciator K-B7 not lit • Dispatches operator to verify local temperatures at leads bus ducting are < 120°C. 	
	Crew dispatches operator to check equipment supplied by BC: Main feed pumps, Condensate pumps, EHC, VP, HP heater drain pumps, LP heater drain pumps.	
	US reports loss of BC pump and failure of standby pump to auto-start to Work Control Center and requests assistance, WR and CR.	

EVENT 4: Given the plant is in Mode 1 and the running bearing cooling water pump has tripped with no start of the standby pump, the crew will respond in accordance with 1-AP-19, "Loss of Bearing Cooling Water."

TIME	EXPECTED ACTION	INSTRUCTOR REMARKS
	NOTE: When sent to investigate, the operator will report that the "B" pump is running fine and 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 5: Given that the unit is at power and indications exist of an RCS leak greater than technical specification limits, the crew will be expected to respond in accordance with 1-AP-16, "Increasing Primary Plant Leakage."

TIME	EXPECTED ACTION	INSTRUCTOR REMARKS
	SPD Verified: _____ (Initials) <ul style="list-style-type: none"> • Charging flow increases • Containment sump level increases • Containment radiation increases • Annunciator K-D2 illuminates 	
	Crew identifies any of the following: charging flow increasing <ul style="list-style-type: none"> • VCT level decreasing • Containment sump level increasing, or • Radiation levels increasing. 	
	US directs entry into 1-AP-16.	
	Crew verifies unit in mode 1.	
	*RO verifies primary parameters under operator control: <ul style="list-style-type: none"> • PRZR level • RCS subcooling • VCT level. (YES) 	
	RO checks 1-CH-LCV-1115A not diverted.	
	RO verifies letdown in service with normal indications for: <ul style="list-style-type: none"> • Letdown flow • Non-regen HX outlet temperature • Regen HX outlet temperature • VCT temperature • VCT pressure • Auxiliary building General and Central radiation levels • Vent stack A radiation level. 	
	RO checks for normal excess letdown temperature and pressure.	
	RO checks charging system parameters normal: <ul style="list-style-type: none"> • Charging pump discharge pressure • Charging flow • Regen HX outlet temperature • RCP seal injection flow • Auxiliary building sump level. 	

EVENT 5: Given that the unit is at power and indications exist of an RCS leak greater than technical specification limits, the crew will be expected to respond in accordance with 1-AP-16, "Increasing Primary Plant Leakage."

TIME	EXPECTED ACTION	INSTRUCTOR REMARKS
	Crew checks containment conditions normal: <ul style="list-style-type: none"> • Containment sump pumping rate • Containment temperature • Containment pressure • Containment radiation. 	
	NOTE: US will direct 1-AP-5 entry for containment radiation indications. Steps are on following page.	
	Crew determines that containment sump pumping rate has increased and radiation levels are high.	
	US initiates attachment 3 for AB walkdown.	
	Crew checks Safeguards area parameters: <ul style="list-style-type: none"> • No valve pit sump alarm • No safeguards sump alarm • Vent stack B radiation level normal • Safeguards area exhaust fan ambient temperature. 	
	Crew dispatches operator to check safeguards area for leakage, as applicable.	
	RO verifies 1-CH-FCV-1122 in AUTO.	
	Crew checks chemistry not sampling and all sample system trip valves closed.	
	Crew checks no CVCS manipulation in progress involving ion exchangers or filters.	
	RO checks RCP thermal barrier flows normal on 1-CC-FI-116, 116B, and 116C.	
	Crew checks for activities that could affect leakage such as valve alignments, PTs, or maintenance.	

EVENT 5: Given that the unit is at power and indications exist of an RCS leak greater than technical specification limits, the crew will be expected to respond in accordance with 1-AP-16, "Increasing Primary Plant Leakage."

TIME	EXPECTED ACTION	INSTRUCTOR REMARKS
	Crew checks other parameters are normal: <ul style="list-style-type: none"> • CC head tank • RHR heat exchanger temperature and flow PRT temperature, level, and pressure • PORV and safety valve tailpipe temperatures • RCP seal leakoff flows • Containment pressure and temperature • CC HX rad monitor trend. 	
	Crew checks SG radiation monitors have no increasing trend: <ul style="list-style-type: none"> • N-16s • SG blowdown RMs • Air ejectors RM. 	
	Crew uses multi-sampler points for: <ul style="list-style-type: none"> • Auxiliary building central • Auxiliary building general • Safeguards To verify radiation levels.	
	Crew checks containment radiation levels normal on 1-RM-RMS-159/160.	
	Crew checks whether containment sump and PDTT pumping frequencies are stable.	
	Crew starts an RCS leakrate PT.	
	BOP proceeds to attachment 5 of 1-AP-5: <ul style="list-style-type: none"> • Contacts HP for appropriate sampling • Informs US to refer to EALs When hi-hi alarm comes in: <ul style="list-style-type: none"> • Starts an RCS leakrate, when possible • Asks for containment sump sample • Verifies AP-16 initiated. 	AP-5 steps
	Crew performs flow balance and determines approximate leakrate.	
	US refers to Tech. Spec. 3.4.13A and determines that leakage must be reduced to within limits in 4 hours.	

EVENT 5: Given that the unit is at power and indications exist of an RCS leak greater than technical specification limits, the crew will be expected to respond in accordance with 1-AP-16, "Increasing Primary Plant Leakage."

TIME	EXPECTED ACTION	INSTRUCTOR REMARKS
	US directs crew to commence unit shutdown or commences preparations for a containment entry.	NOTE: If consulted, the OMOC will concur with the decision made by the crew to either ramp off-line, or make a containment entry to look for the leak.
	NOTE: The next event may occur once the crew has either started preparations for a ramp or for a containment entry.	

EVENT 6: Given that the unit is at power and a total loss of bearing cooling occurs, the crew will be expected to respond in accordance with 1-AP-19, "Loss of Bearing Cooling Water," 1-E-0, "Reactor Trip or Safety Injection," and 1-ES-0.1, "Reactor Trip Response."

TIME	EXPECTED ACTION	INSTRUCTOR REMARKS
SPD Verified: _____ (Initials) <ul style="list-style-type: none"> • Annunciator F-E4 illuminates • 1-BC-P-1B amps decrease (later amps will increase) • Later, annunciators K-F5 and T-C1 illuminate if unit not tripped 		
	BOP identifies annunciators F-E4, BC WTR DISCHG HDR LO PRESS.	
	BOP identifies decreasing amps on 1-BC-P-1B.	
	US directs crew to perform immediate actions of 1-AP-19: <ul style="list-style-type: none"> • BOP checks one BC pump running with normal amps (NO) • BOP verifies at least one BC pump running normally (NO) • Crew determines BC cannot be restored and a reactor trip is required. 	
	NOTE: If sent, operator will report that 1-BC-P-1B is making a loud noise and he recommends securing it.	
	US directs crew to enter 1-E-0, while continuing with 1-AP-19.	
	Crew manually trips the reactor.	IA
	BOP verifies turbine trip.	IA
	RO verifies AC emergency busses energized.	IA
	Crew checks if safety injection has actuated or is required. (NO)	IA
	US directs crew to transition to 1-ES-0.1.	
	NOTE: The following steps are from 1-ES-0.1. Crew may perform steps from 1-AP-19 at this time (see below.) Procedures may be performed concurrently.	
	US holds transient brief.	
	Crew checks RCS temperature.	ES-0.1 steps

EVENT 6: Given that the unit is at power and a total loss of bearing cooling occurs, the crew will be expected to respond in accordance with 1-AP-19, "Loss of Bearing Cooling Water," 1-E-0, "Reactor Trip or Safety Injection," and 1-ES-0.1, "Reactor Trip Response."

TIME	EXPECTED ACTION	INSTRUCTOR REMARKS
	Crew throttles aux feedwater flow.	
	RO verifies charging in service.	
	NOTE: The following actions are from 1-AP-19.	
	Crew verifies all available auxiliary feedwater pumps are running. (NO)	AP-19 steps
	Crew initiates 1-AP-22.2 to align AFW.	
	Crew feeds steam generators to maintain levels between 23 and 50%.	
	Crew secures components cooled by bearing cooling: <ul style="list-style-type: none"> • Main Feed pumps • HP heater drain pumps • LP heater drain pumps • Main Condensate pumps • Station Vacuum Priming pumps • EHC pumps • Notifies chemistry to secure the On-line chemistry monitoring system. 	
	Crew closes 1-AS-FCV-100A and 100B.	
	Crew directs securing of air ejectors using OP.	
	Crew monitors turbine speed until it is < 1000 rpm and then opens condenser vacuum breaker.	
	NOTE: Crew may start lining up to feed "C" SG using 1-AP-22.2. This could also be done at a later time.	
	BOP checks MWF in service. (NO)	AP-22.3 steps
	BOP stops all but one RCP and initiates attempts to restore MFW.	
	BOP checks Turbine driven AFW pump running.	
	BOP checks 1-FW-P-3B running.	
	BOP checks ECST level is greater than 40%.	

EVENT 6: Given that the unit is at power and a total loss of bearing cooling occurs, the crew will be expected to respond in accordance with 1-AP-19, "Loss of Bearing Cooling Water," 1-E-0, "Reactor Trip or Safety Injection," and 1-ES-0.1, "Reactor Trip Response."

TIME	EXPECTED ACTION	INSTRUCTOR REMARKS
	BOP initiates attachment to align either the HCV or MOV header to feed SGs. (See attached.)	
	NOTE: The next event can occur once AFW has been throttled and components cooled by BC secured.	

EVENT 7: Given that the unit has been tripped and a SBLOCA has occurred, the crew will be expected to respond in accordance with 1-E-0, "Reactor Trip or Safety Injection," and 1-E-1, "Loss of Reactor or Secondary Coolant."

TIME	EXPECTED ACTION	INSTRUCTOR REMARKS
SPD Verified: _____ (Initials) <ul style="list-style-type: none"> • RCS pressure and level decrease • Containment sump level increases more rapidly • Annunciator J-A6 illuminates, if not previously lit • Phase A does not actuate automatically • "C" RCP will not stop using switch 		
	Crew identifies that the RCS leak has worsened.	
	NOTE: Crew may first maximize charging and isolate letdown per a continuous action step in 1-AP-16. This will not stop the pressurizer level decrease.	
	US directs crew to initiate safety injection and return to E-0.	ES-0.1 CAP attached
	RO and BOP manually initiate safety injection.	
	Crew verifies reactor trip.	
	Crew verifies turbine trip.	
	Crew verifies emergency busses energized.	
	Crew checks if SI has occurred or is necessary. (YES)	
	Crew manually initiates safety injection.	
	NOTE: CAP item 4 applies once CAP item 3 is complete.	
	RO reports that CAP items 3 – RCP Trip Criteria, (4 – Charging Pump Recirc Path Criteria) and (possibly) item 1 - Adverse Containment apply.	E-0 CAP attached
	US directs RO to perform CAP item(s) 3(4).	
	NOTE: 1-RC-P-1C cannot be stopped using the benchboard switch.	

EVENT 7: Given that the unit has been tripped and a SBLOCA has occurred, the crew will be expected to 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
CT2	<p>Crew stops all RCPs:</p> <ul style="list-style-type: none"> • RO checks at least one charging pump running and flowing to RCS • RO checks RCS subcooling < 25°F [85°F] • RO stops A and B RCPs • BOP opens breaker for "C" SS bus OR dispatches operator to open breaker for "C" RCP. 	When directed by procedure
CT3	<p>Crew takes action to prevent HHSI pump runout by performing the following:</p> <ul style="list-style-type: none"> • Verifies RCS pressure < 1275 psig [1475 psig] AND RCPs tripped • RO closes all charging pump recirc valves. 	When all criteria are met or completion of transfer to recirculation mode, whichever comes first.
	US holds transient brief.	
	NOTE: Since FRs are applicable, 1-FR-C.2 may be entered at any time. See steps on next page.	
	US initiates attachment 4 – Equipment Verification (Attachment 5 - Verification of SI and Phase A Isolation will be directed by attachment 4).	See attached
CT4	<p>Crew actuates Phase "A" isolation Crew manually initiates both trains of Phase "A".</p>	Per attachment 4
	RO verifies HHSI flow.	
	Crew checks RCS pressure 225 psig [450 psig] and verifies LHSI pumps are flowing if required.	
	Crew verifies AFW flow indicated and > 340 GPM until NR level > 11% [22%] in any SG.	
	<p>RO checks RCS average temperature:</p> <ul style="list-style-type: none"> • Stable or trending to 547°F if controlling on steam dumps OR • Stable or trending to 551°F if controlling on PORVs. 	

EVENT 7: Given that the unit has been tripped and a SBLOCA has occurred, the crew will be expected to 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 adjusts AFW flow, as required.	
	NOTE: When CDA setpoint reached (2/4 containment pressures >27.75 psia), the crew will do CAP item 6 or perform the following steps per attachment 4.	E-0 CAP attached
	Crew performs the following upon CDA actuation: <ul style="list-style-type: none"> • Manually actuates CDA • Ensures CC pumps are stopped • Stops all RCPs • Ensures QS pumps are running • Ensures QS pump discharge MOVs are open • Initiates attachments 2 – Verification of Phase B Isolation and attachment 3 – Primary Plant Ventilation Alignment when directed by attachment 4. 	
	*RO checks PRZR PORVs closed, spray valves closed or controlling pressure, and at least one PORV block valve open.	
	*RO checks RCP trip and charging pump recirc criteria: <ul style="list-style-type: none"> • RO checks RCS subcooling < 25°F [85°F] • RO checks at least one charging pump running and flowing to RCS • RO verifies RCPs are stopped • Verifies RCS pressure < 1275 psig [1475 psig] • RO verifies charging pump recirc valves closed. 	
	BOP checks SGs not faulted: All SG pressures > 80 psig and under control of operator. (YES)	
	BOP checks SGs not ruptured: No SG level increasing in an uncontrolled manner. (YES)	
	Crew checks if RCS is intact inside containment: Containment pressure normal. (NO)	

EVENT 7: Given that the unit has been tripped and a SBLOCA has occurred, the crew will be expected to 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 proper valve alignment: <ul style="list-style-type: none"> • RWST suctions 1-CH-MOV-1115B and 1115D open • VCT suctions 1-CH-MOV-115C and 1115E closed • Normal charging isolations 1-CH-MOV 1289A and 1289B closed • BIT recircs 1-SI-TV-1884A, 1884B, and 1884C closed • BIT outlets 1-SI-MOV-1867C and 1867D open • BIT inlets 1-SI-MOV-1867A and 1867B open • LHSI suctions from RWST 1-SI-MOV-1862A and 1862B open • LHSI discharges to HHSI 1-SI-MOV 1863A and 1863B closed • LHSI pump discharges 1- SI-MOV-1864A and 1864B open. 	FR-C.2 steps
	Crew verifies SI flow indicated: <ul style="list-style-type: none"> • HHSI flow on 1-SI-FI-1943 and 1943-1 • LHSI flow on 1-SI-FI-1945 and 1946 - if RCS pressure < 225 psig [450 psig] 	
	Crew checks RCS vent paths: <ul style="list-style-type: none"> • Power to PORV block valves available • PORVs closed • At least one PORV block valve open • Reactor vent valves closed • Pressurizer vent valves closed. 	
	Crew checks at least one RCP running. (NO)	
	NOTE: RVLIS should now indicate >48%.	
	Crew checks core cooling: RVLIS full range >48% CETCs less than 700°F.	
	Crew returns to procedure and step in effect.	
	NOTE: The scenario may be terminated once C.2 is complete, or as directed by lead evaluator.	

EVENT 7: Given that the unit has been tripped and a SBLOCA has occurred, the crew will be expected to 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.	
	US holds transient brief.	
	RO checks RCP trip and charging pump recirc criteria.	E-1 steps
	BOP checks SGs not faulted. (YES)	
	BOP checks intact SG levels.	
	Crew checks secondary radiation: <ul style="list-style-type: none"> • RO resets SI, and Phase A 	
	NOTE: The scenario may be terminated after the crew exits C.2 or when crew resets SI in E-1.	

REFERENCES

PROCEDURE	REV.
Operating Procedure 1-OP-2.1, "Unit Startup from Mode 2 to Mode 1."	95
Abnormal Procedure 1-AP-44, "Loss of Reactor Coolant System Pressure."	19
Abnormal Procedure 1-AP-16, "Increasing Primary Plant Leakage."	26
Abnormal Procedure 1-AP-19, "Loss of Bearing Cooling Water."	16
Emergency Procedure 1-E-0, "Reactor Trip or Safety Injection."	42
Emergency Procedure 1-E-1, "Loss of Reactor or Secondary Coolant."	24
Emergency Procedure 1-ES-0.1, "Reactor Trip Response."	28
Functional Restoration Procedure 1-FR-C.2, "Response to Degraded Core Cooling."	11
Station Annunciator Response Procedures.	N/A
Guide and Reference Document PI-AA-5000, "Human Performance."	3
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
2010 NRC RUN 1

Initial conditions

1. Recall IC 187
2. Ensure Tave (555-565), Tref, PDTT level, and VCT level are selected on trend recorders.
3. Rack out 1-FW-P-3A breaker and close manual discharge valve.
4. Place red sticker on 1-FW-P-3A.
5. Set D bank rods at 154.
6. Reactivity plan available.
7. Designate 1J as the protected train. Don't forget to lower the sign on the Safeguards panel.

PRELOADS PRIOR TO SCENARIO START

CONDITION	MALFUNCTION/OVERRIDE/ETC.
Auto start failure of EHC pump	Switch override: TMP4_ASTP = Off
PRZR PORV 1455C sticks when opened	Malfunction: RC1901
Failure of standby BC pump to auto-start	Remote function: BCP_AUTO_DEFEAT = T

CONDITION	MALFUNCTION/OVERRIDE/ETC.
Failure of Auto Phase A	<p>Malfunctions: SI1303, SI1304 Set up triggers to delete these malfunctions if either Phase A switch is turned:</p> <p>Trigger 10 PHASEA_ISO1_INIT .EQ. 1 DMF SI1303</p> <p>Trigger 11 PHASEA_ISO2_INIT .EQ. 1 DMF SI1304</p> <p>Trigger 12 PHASEA_ISO1_INIT .EQ. 1 DMF SI1304</p> <p>Trigger 13 PHASEA_ISO2_INIT .EQ. 1 DMF SI1303</p>
Failure of "C" RCP breaker to open	<p>Switch overrides: RCP1C_START, Override = ON RCP1C_STOP, Override = OFF RCP1C_LOCK, Override = OFF</p>

SCENARIO EVENTS

EVENT	MALFUNCTION/OVERRIDE/COMMUNICATIONS
1) Unit Ramp	<p>NOTE: The next event will occur once the crew has ramped a sufficient amount.</p>

EVENT	MALFUNCTION/OVERRIDE/COMMUNICATIONS
2) EHC pump trip	<p>Malfunction: TU1101, Delay time = 5, Trigger = 2</p> <p>NOTE: If the crew dispatches an operator to look at EHC pumps, the operator will report that 1-TM-P-3 is unusually hot, and 1-TM-P-4 appears normal.</p> <p>NOTE: At this time call and tell crew that the instrument techs have replaced a blown fuse in rod control. Rods may be placed back in AUTO at the crew's discretion.</p> <p>NOTE: The next event will occur after the backup EHC pump is running, or at the direction of the lead evaluator.</p>
3) PT 1444 fails high	<p>Malfunction: RC0701, Delay time = 5, Ramp = 1, Stop = 1, Trigger = 3</p> <p>NOTE: When directed to de-energize 1-RC-MOV-1536, use trigger 15. (Breaker # is 1H1-2S F3)</p> <p>MOV Control: RCMOV536_RACKIN = RACKOUT, Trigger = 15</p> <p>NOTE: The next event may occur once T.S. have been reviewed, or at the discretion of the lead evaluator.</p>
4) Loss of "A" BC pump	<p>Remote functions: BCP1A_PROTECT = T, Delay time = 5, Trigger = 4</p> <p>NOTE: When sent to investigate, the operator will report that there is an overcurrent drop on the breaker for "A" BC pump. "B" pump is running fine.</p> <p>NOTE: When sent to check local temperatures, can report they are about 80°C. (This will take 10-15 minutes to do. Must get ladder and strobe light.)</p> <p>NOTE: The next event will occur once BC is restored, or at the discretion of the lead evaluator.</p>

EVENT	MALFUNCTION/OVERRIDE/COMMUNICATIONS
5) RCS leak	<p>Malfunction: RC04, Delay time = 5, Ramp = 300, Severity = 5, Trigger = 5</p> <p>Leak is approximately 30 gpm.</p> <p>NOTE: If consulted, the OMOC will concur with the decision made by the crew to either ramp off-line, or make a containment entry to look for the leak.</p> <p>NOTE: The next event may occur once the crew has either started preparations for a ramp or for a containment.</p>
6) Loss of BC due to impeller damage on remaining pump	<p>Malfunction: BC0302, Delay time = 5, Ramp = 60, Severity = 100, Trigger = 6</p> <p>NOTE: If sent, operator will report that 1-BC-P-1B is making a loud noise and he recommends securing it.</p> <p>NOTE: If crew takes 1-BC-P-1A out of PTL, then change BCP1A_PROTECT back to TRUE.</p> <p>NOTE: The next event can occur once AFW has been throttled and components cooled by BC secured.</p>
7) SBLOCA	<p>Malfunction: RC0101, Delay time = 5, Ramp = 180, Severity = 0.8, Trigger = 7 On trigger screen for trigger 7: DMF RC04</p> <p>NOTE: When sent to locally trip "B" RCP: Update RCP1B_LOCK to ON</p> <p>NOTE: The scenario may be terminated after the crew exits 1-FR-C.2 or after resetting SI in 1-E-1.</p>

ATTACHMENT 2
SCENARIO PERFORMANCE OBJECTIVES

SIMULATOR REQUALIFICATION EXAMINATION

TERMINAL PERFORMANCE OBJECTIVE

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

GENERIC PERFORMANCE OBJECTIVES

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

EVENT 1 PERFORMANCE OBJECTIVES

EVENT GOAL: Given that the unit is at approximately 50% power and the crew has been instructed to increase power, the crew will ramp the unit up in accordance with 1-OP-2.1, "Unit Startup from Mode 2 to Mode 1."

NORTH ANNA SPECIFIC TASKS:

R705 Dilute the RCS using the blender.

CRITICAL TASK:

N/A

EVENT 2 PERFORMANCE OBJECTIVES

EVENT GOAL: Given that an EHC pump has tripped and the backup EHC pump has not auto-started, the crew will respond in accordance with the Annunciate Response (AR) for annunciator T-B4.

NORTH ANNA SPECIFIC TASKS:

None

CRITICAL TASK:

N/A

EVENT 3 PERFORMANCE OBJECTIVES

EVENT GOAL: Given the plant is in Mode 1 and a failed Pressurizer Pressure Transmitter causes a PORV to open, 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

CRITICAL TASK:

See Next page

T Statement:

Crew stops RCS pressure decrease.

Safety Significance:

Failure to close the PORV or block MOV 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 or block MOV. Therefore, failure to close the PORV or MOV 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 open, and RCS pressure indication decreasing.

Performance Indicator:

RO manually closes 1-RC-PCV-1456 or 1-RC-MOV-1535

Feedback:

RCS pressure decrease stopped.

WOG Reference:

E-O -- M Background

Conditions:

Prior to receiving an automatic reactor trip on low pressure.

EVENT 4 PERFORMANCE OBJECTIVES

EVENT GOAL: Given the plant is in Mode 1 and the running bearing cooling water pump has tripped with no start of the standby pump, 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 5 PERFORMANCE OBJECTIVES

EVENT GOAL: Given that the unit is at power and indications exist of an RCS leak greater than technical specification limits, the crew will be expected to respond in accordance with 1-AP-16, "Increasing 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 total loss of bearing cooling occurs, the crew will be expected to respond in accordance with 1-AP-19, "Loss of Bearing Cooling Water," 1-E-0, "Reactor Trip or Safety Injection," and 1-ES-0.1, "Reactor Trip Response."

NORTH ANNA SPECIFIC TASKS:

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

CRITICAL TASK:

N/A

EVENT 7 PERFORMANCE OBJECTIVES

EVENT GOAL: Given that the unit has been tripped and a SBLOCA has occurred, the crew will be expected to 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
R727 Perform the phase A isolation verification following a safety injection actuation

CRITICAL TASK:

See following pages

CT Statement:

Crew stops Reactor Coolant Pumps.

Safety Significance:

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

Cues:

Indication of:

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

Performance Indicator:

RO/BOP places control switch(es) for "A" and "B" RCPs in STOP.
AND
RO/BOP stop "C" RCP by either:
Opening feeder breaker for "C" SS bus OR
Dispatching operator to open breaker locally

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:

When all criteria are met OR completion of transfer to recirculation mode, whichever comes first.

CT Statement:

Crew actuates Phase "A" isolation.

Safety Significance:

Failure to close at least one containment isolation valve on each phase "A" penetration constitutes "mis-operation or incorrect crew performance which leads to degradation of any barrier to fission product release." In this case, the containment barrier is needlessly left in a degraded condition.

Cues:

Indication that SI is required, but not actuated; absence of annunciation that Phase "A" isolation is actuated; indication that phase "A" containment isolation valves are open.

Performance Indicator:

Crew manually actuates Phase "A" containment isolation.

Feedback:

Containment isolation valves close.
Containment phase "A" isolation alarm.

WOG Reference:

E-0 -- O Background

Conditions:

Prior to completion of step requiring its performance.

ATTACHMENT 3

SIMULATOR PERFORMANCE DATASHEET

Scenario Performance Datasheet

EVENT 1: Given that the unit is at approximately 50% 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 2: Given that an EHC pump has tripped and the backup EHC pump has not auto-started, the crew will respond in accordance with the Annunciate Response (AR) for annunciator T-B4.

SPD Verified: _____ (Initials)

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

EVENT 3: Given the plant is in Mode 1 and a failed Pressurizer Pressure Transmitter causes a PORV to open, the crew will respond in accordance with 1-AP-44, "Loss of Reactor Coolant System Pressure."

SPD Verified: _____ (Initials)

- Annunciators B-H2, B-F7, and C-D1 illuminate
- 1-RC-PI-1444 indicates high pressure
- Master pressure controller goes to max output
- 1-RC-PCV-1455C opens and will not close
- Both spray valves open
- RCS pressure decreases

EVENT 4: Given the plant is in Mode 1 and the running bearing cooling water pump has tripped with no start of the standby pump, the crew will respond in accordance with 1-AP-19, "Loss of Bearing Cooling Water."

SPD Verified: _____ (Initials)

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

Scenario Performance Datasheet

EVENT 5: Given that the unit is at power and indications exist of an RCS leak greater than technical specification limits, the crew will be expected to respond in accordance with 1-AP-16, "Increasing Primary Plant Leakage."

SPD Verified: _____ (Initials)

- Charging flow increases
- Containment sump level increases
- Containment radiation increases
- Annunciator K-D2 illuminates

EVENT 6: Given that the unit is at power and a total loss of bearing cooling occurs, the crew will be expected to respond in accordance with 1-AP-19, "Loss of Bearing Cooling Water," 1-E-0, "Reactor Trip or Safety Injection," and 1-ES-0.1, "Reactor Trip Response."

SPD Verified: _____ (Initials)

- Annunciator F-E4 illuminates
- 1-BC-P-1B amps decrease (later amps will increase)
- Later, annunciators K-F5 and T-C1 illuminate if unit not tripped
-

EVENT 7: Given that the unit has been tripped and a SBLOCA has occurred, the crew will be expected to 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)

- RCS pressure and level decrease
- Containment sump level increases more rapidly
- Annunciator J-A6 illuminates, if not previously lit
- Phase A does not actuate automatically
- "C" RCP will not stop using switch

DOMINION
NORTH ANNA POWER STATION

INITIAL LICENSED OPERATOR EXAMINATION
SIMULATOR EXAMINATION GUIDE
SCENARIO 2010 NRC RUN 2

SIMULATOR EXAMINATION GUIDE

<u>EVENT</u>	<u>DESCRIPTION</u>
1.	HLD divert fails open on "B" HP heater drain pump/Condensate pump won't auto-start
2.	N-44 fails high
2a.	N-44 is placed in trip
3.	Selected feed flow channel fails low on "B" SG
4.	Crew ramps down per system operator
4a.	Control rods fail to move in automatic during ramp
5.	Feed line breaks on "B" SG

Scenario Recapitulation:

Malfunctions after EOP entry	3	Safety injection fails to actuate automatically, BOP SI switch fails to actuate SI, terry turbine fails to start automatically
Total Malfunctions	7	HLD divert fails open on "B" HP heater drain pump/Condensate pump will not auto-start, N-44 fails high, selected feed flow channel fails low on "B" SG, control rods fail to move in automatic during ramp, safety injection fails to actuate automatically, BOP SI switch fails top actuate SI, terry turbine fails to start automatically
Abnormal Events	3	HLD divert fails open on "B" HP heater drain pump/Condensate pump will not auto-start, N-44 fails high, selected feed flow channel fails low on "B" SG
Major Transients	1	Feed line breaks on "B" SG
EOPs Entered	2	1-E-2, 1-ES-1.1
EOP Contingencies	0	
Critical Tasks	4	

SCENARIO DURATION

90 Minutes

SIMULATOR EXAMINATION SCENARIO SUMMARY

SCENARIO 2010 NRC RUN 2

The scenario begins with the unit at 100% power. All equipment is available except for AFW pump, 1-FW-P-3A, which was tagged out last shift for motor bearing replacement. Shift orders are to maintain current plant conditions and support maintenance on "A" AFW pump.

After the crew takes the shift, the high-level divert on 1-SD-TK-1B will fail open and "B" HP heater drain pump will trip. The standby Condensate pump will not start automatically when required. The crew will enter 1-AP-31, "Loss of Main Feedwater," and start the standby ("B") Condensate pump manually. The crew may also enter 1-AP-38, "Excessive Load Increase," and ramp the turbine back due to power being slightly high because of the colder feedwater. An operator will be dispatched to investigate and will report back that 1-SD-LCV-107B is failed open due to the setpoint dial being loose. When directed the operator will either "fix" the setpoint dial or isolate the HLD. Once the unit is stabilized, the next event can occur.

Power Range Instrument, N-44, will fail high. Control rods will step in. The RO will recognize the failure and place rods in manual per the immediate actions of 1-AP-4.3, "Malfunction of Nuclear Instrumentation (Power Range)." The crew will place the instrument in trip (Normal event) and the US will review applicable TS. Once the crew has discussed returning temperature to normal, the next event can occur.

The selected feed flow channel (III) will fail low on "B" SG. The crew will enter 1-AP-3, "Loss of Vital Instrumentation," and place the MFRV in manual to control SG level. The AP will swap the selected channels and allow the MFRV to be returned to auto. Once the MOP has been identified and TS reviewed, the next event may occur.

A call will come in from the MOC requesting that Unit 1 at North Anna be ramped to 80% power over the next 30 minutes. The crew will ramp using 1-OP-2.2, "Unit Operation from Mode 1 to Mode 2." Rods will fail to move in automatic and will have to be inserted in manual. Once an acceptable power decrease has occurred, the next event may be implemented.

A feed line break will occur on "B" SG inside containment. The crew will diagnose and enter 1-E-0, "Reactor Trip or Safety Injection." Safety Injection will not actuate automatically. The SI switch on the BOP side will not cause SI to actuate (only the RO switch will work). The steam-driven auxiliary feedwater pump, 1-FW-P-2, will not start automatically. The crew will continue through 1-E-0 and transition to 1-E-2, "Faulted Steam Generator Isolation." Once the generator is isolated the crew will transition to 1-ES-1.1, "SI Termination," and terminate safety injection. At this time the scenario can be stopped.

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 100% power. RCS boron is 1017 ppm and core age is 9000 MWD/MTU. Aux steam is on unit 2.

Unit 2 is at 100% power.

Equipment Status:

1-FW-P-3A was tagged out last shift for motor bearing replacement. Maintenance rule window is green.

Shift Orders:

Maintain current plant conditions and support maintenance on 1-FW-P-3A.

EVENT 1: Given that a High Pressure Heater Drain Tank high-level divert has failed open, the crew will be expected to respond in accordance with 1-AP-31, "Loss of Main Feedwater," and 1-AP-38, "Excessive Load Increase."

TIME	EXPECTED ACTION	INSTRUCTOR REMARKS
	SPD Verified: _____ (Initials) <ul style="list-style-type: none"> • Annunciator Q-E4 illuminates • 1-SD-P-1B trips as indicated by amber light lit • Reactor power increases slightly • Main feed pump suction pressure decreases • Standby condensate pump does not auto-start 	
	NOTE: PCS will indicate opening of 2B high-level divert.	
	Crew identifies annunciator Q-E4, 2 ND PT HTR DR RECVR TK B HI-LO LEVEL.	
	BOP identifies level decreasing in "B" HP heater drain tank.	
	BOP identifies trip of 1-SD-P-1B.	
	US directs entry into 1-AP-31.	
	BOP verifies power > 70%.	
	BOP verifies 2 main feed pump running.	
	BOP checks main feed pump suction pressure > 300 psig and stable. (NO)	
	NOTE: Auto start is defeated for standby condensate pump.	
	BOP starts "B" condensate pump.	
	Watchstander is dispatched to investigate cause for trip of "B" HP.	
	NOTE: Crew may not ramp unit down since indicated power increase is small. In this case AP-38 will not be entered.	
	Crew identifies increase in reactor power.	
	US directs entry into AP-38.	
	RO verifies steam dumps closed.	AP-38
	BOP verifies SG PORVs indicate closed.	

EVENT 1: Given that a High Pressure Heater Drain Tank high-level divert has failed open, the crew will be expected to respond in accordance with 1-AP-31, "Loss of Main Feedwater," and 1-AP-38, "Excessive Load Increase."

TIME	EXPECTED ACTION	INSTRUCTOR REMARKS
	BOP verifies main turbine load is normal.	
	BOP checks reactor power \leq 100% and stable. (NO)	
	Crew ramps turbine down in operator auto until power indicates \leq 100% by lowering setter and pressing GO.	
	RO verifies proper rod operation.	
	RO energizes additional pressurizer heaters to maintain RCS pressure.	
	Crew checks reactor power reduced to pre-event level.	
	NOTE: Watchstander will report 1-SD-LCV-107B partially open with dial for setpoint loose.	
	Crew instructs isolation of 1-SD-LCV-107B using either controller or manual isolation.	
	BOP places turbine load control in IMP-IN by matching reference and setting and depressing IMP-IN pushbutton.	AP-38 steps continued
	RO maintains rods above lo/lo-lo limit and AFD in spec.	
	BOP checks main generator output stable.	
	RO checks Tave on program with Tref and restores to program as required.	
	Crew checks steam flow channel indications are normal. (1-MS-FI-1474, 1475, 1484, 1485, 1494, 1495)	
	BOP checks turbine in operator auto.	
	Crew checks plant steam systems: <ul style="list-style-type: none"> • SG PORVS closed • SG safety valves closed • MSR inlets normal (1-MS-FCV-104 A,B,C,D) • MS to AS PCV normal (1-AS-PCV-105) • Plant steam systems intact. 	

EVENT 1: Given that a High Pressure Heater Drain Tank high-level divert has failed open, the crew will be expected to respond in accordance with 1-AP-31, "Loss of Main Feedwater," and 1-AP-38, "Excessive Load Increase."

TIME	EXPECTED ACTION	INSTRUCTOR REMARKS
	Crew checks for RCS dilution as indicated by improper demin operations, improper operation of 1-CC-TV-106, or PG water leakby.	
	Crew verifies cause of load increase is corrected.	
	NOTE: The next event can occur once the unit is stable and 1-SD-LCV-107B has been returned to service or isolated, or at the discretion of the lead evaluator.	

EVENT 2/2a: Given that the unit is at power and power-range channel N-44 has failed high, the crew will respond in accordance with 1-AP-4.3, "Malfunction of Nuclear Instrumentation (Power Range)."

TIME	EXPECTED ACTION	INSTRUCTOR REMARKS
	SPD Verified: _____ (Initials) <ul style="list-style-type: none"> • N-44 indicates > 120% • Control rods step in at maximum speed • RCS pressure and T_{AVE} decrease 	
	RO identifies control rods stepping in.	
	RO identifies N-44 failed high.	
	US directs entry into 1-AP-4.3.	
CT 1	Crew stops control rod movement due to N-44 failure. <ul style="list-style-type: none"> • Crew verifies power not increasing. • RO places rod control in MANUAL. • BOP verifies FRV B/P valves in MANUAL. 	Critical Task *Prior to rod lo-lo insertion limit (Immediate actions)
	Crew verifies three power-range instruments operable.	
	Crew verifies unit in mode 1.	
	Crew verifies 1-hour permissives for Tech Spec 3.3.1: <ul style="list-style-type: none"> • Function 18b - P-7 permissive. P-G2 NOT LIT since >10% power • Function 18d - P-10 permissive. P-D2 will be LIT since >10%. • Function 18c - P-8 permissive. P-F1 will be NOT LIT since >30 % power 	
	RO verifies T _{AVE} and T _{REF} matched within 1.5°F. If NO, Crew discusses/restores Tave to within ±0.5°F of Tref, if required.	
	Crew maintains control rods above the insertion limit and the AFD monitor annunciator clear.	

EVENT 2/2a: Given that the unit is at power and power-range channel N-44 has failed high, the crew will respond in accordance with 1-AP-4.3, "Malfunction of Nuclear Instrumentation (Power Range)."

TIME	EXPECTED ACTION	INSTRUCTOR REMARKS
2a	RO places N-44 in trip: <ul style="list-style-type: none"> • 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 selects N-43 on the N-16 panel.	
	Crew notifies chemistry N-44 input to OLCMS is unreliable.	
	Crew all power ranges for failure.	
	Crew checks reactor power greater than 5% and removes computer points from scan for N-44.	
	US reviews Technical Specifications: 3.3.1 Functions 2a, Condition D and 3a/3b, Condition E, require channel to be placed in trip within 72 hours. (Functions 18b, 18c, and 18d are 1-hour permissives which were verified previously.)	
	Crew verifies permissives were checked and N-44 was placed in trip within 72 hours.	
	Crew determines if rod control should be placed in AUTO.	
	NOTE: Rods need to be in auto for event 4. If crew is withdrawing rods, consider waiting until they are back in auto before continuing.	
	NOTE: The next event will occur after the crew places N-44 in trip and TS are reviewed, or as directed by the lead evaluator.	

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

TIME	EXPECTED ACTION	INSTRUCTOR REMARKS
	SPD Verified: _____ (Initials) <ul style="list-style-type: none"> • Annunciators F-F2 and F-D2 illuminate • "B" MFRV ramps open • "B" SG Channel III feed flow(1-FW-FI-1487) is down scale low 	
	BOP identifies annunciators F-D2, STM GEN 1B FW < STM FLOW CH III-IV, and F-F2, SG 1B LEVEL ERROR, are illuminated.	
	US directs crew to perform immediate actions of 1-AP-3: <ul style="list-style-type: none"> • Crew verifies redundant channels normal • Crew identifies "B" SG feedwater flow channel III has failed low • BOP takes manual control of "B" SG water level • Crew verifies first stage pressure indications normal • Crew verifies pressurizer level indications are normal. 	
	RO verifies systems affected by PRZR level channels normal: <ul style="list-style-type: none"> • RO verifies operable pressurizer level channel selected • RO verifies emergency bus backup heaters are restored • RO verifies letdown in service • RO verifies pressurizer level control in AUTO • 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 3: Given that the unit is at power and a selected feed flow 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
	<p>Crew swaps to operable SGWLC channels.</p> <ul style="list-style-type: none"> • RO places control rods in manual • RO places steam dumps in either OFF or steam pressure mode • BOP checks all bypass MRFVs in manual • BOP places all MFRVs in manual • Crew selects channel IV on all feed flows, all steam flows, and for first stage pressure • Crew verifies all SG level channels are operable • BOP verifies steam generator levels are on program • BOP places MFRVs in Auto • RO verifies steam dumps are available 	
	<p>RO returns steam dumps to Tave mode:</p> <ul style="list-style-type: none"> • RO places steam dump interlock switches to OFF reset • RO places steam dump controller to manual • RO places mode selector switch to steam press • RO ensure steam dump demand is zero • RO places steam dump controller to auto • RO verifies steam dump demand is zero • RO places both interlock switches to on. 	
	<p>RO matches Tave and Tref as required, and returns rods to auto.</p>	
	<p>Crew verifies that "B" SG feedwater flow channel III is the only failed channel.</p>	
	<p>US directs RO to enter 1-MOP-55.78.</p>	
	<p>US reviews TS 3.3.1 Function 15 Condition E and determines that channel must be placed in trip within 72 hours.</p>	

EVENT 3: Given that the unit is at power and a selected feed flow 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: The next event may occur after the crew has swapped channels and the US has referred to tech specs, or as directed by the lead evaluator. Rods should be verified to be in AUTO before continuing.	

EVENT 4/4a: Given that the system operator has directed that Unit 1 reduce power, the crew will respond in accordance with 1-OP-2.2, "Unit Operation from Mode 1 to Mode 2," or 1-AP-2.2, "Fast Load Reduction."

TIME	EXPECTED ACTION	INSTRUCTOR REMARKS
SPD Verified: _____ (Initials) <ul style="list-style-type: none"> • Tave decreases • Turbine load and megawatts decrease • Rods fail to move in auto after initial insertion 		
<p>NOTE: A call will be received from the MOC requesting that North Anna Unit 1 reduce power to approximately 80% within the next 30 minutes due to the loss of a substation elsewhere on the grid. Unit 2 will also be reducing power to 80%.</p>		
US directs crew to prepare to ramp per 1-OP-2.2 or 1-AP-2.2.		
<p>NOTE: The following steps are from 1-AP-2.2, 1-OP-2.2 steps are included on following page.</p>		
RO initiates boration using either attachment 5 and/or standard ramp plan.		See attached GOP-8.3.4
BOP verifies/places turbine load control is in IMP-IN: <ul style="list-style-type: none"> • Match reference and setter • Depress IMP-IN button. 		
BOP initiates turbine load reduction per attachment 4 using OPER AUTO.		Attached
RO verifies rods in Auto.		
RO energizes pressurizer heaters, as required.		
<p>NOTE: Control rods will operate in AUTO the first time they are required to move automatically. After that auto rod control will be disabled and the RO will have to drive rods manually.</p>		
RO verifies proper rod insertion.		
RO identifies that control rods are not automatically inserting.		
RO places rods in manual and inserts them, as required.		

EVENT 4/4a: Given that the system operator has directed that Unit 1 reduce power, the crew will respond in accordance with 1-OP-2.2, "Unit Operation from Mode 1 to Mode 2," or 1-AP-2.2, "Fast Load Reduction."

TIME	EXPECTED ACTION	INSTRUCTOR REMARKS
	RO monitors steam dumps for proper operation.	
	RO maintains control rods above lo lo-lo limits and AFD in spec using boration and rods.	
	US initiates appropriate notifications and evaluates EPIPs.	
	NOTE: The following steps are from 1-OP-2.2.	
	RO locks on all available pressurizer heaters.	
	US makes notifications.	
	BOP prepares turbine for ramp: <ul style="list-style-type: none"> • Verifies/removes turbine from limiter • Transfers turbine to IMP-IN by matching reference and setter and pressing IMP-IN button. 	
	US gives attachment to BOP for turbine operations.	AP-2.2 attachment contains same info in a different order as OP-2.2 attachment
	BOP starts lowering turbine load at specified rate using attachment instructions.	
	RO borates, as required, to maintain rods within normal range.	See attached GOP-8.3.4
	NOTE: Control rods will operate in AUTO the first time they are required to move automatically. After that auto rod control will be disabled and the RO will have to drive rods manually.	
	RO identifies that control rods are not automatically inserting.	
	RO places rods in manual and inserts them, as required.	
	Crew directs operator to remove the LP heater drain pumps from service.	
	NOTE: The next event can occur once manual control rod operation has been initiated and a sufficient ramp has been observed.	

EVENT 5: Given that the unit is at power and a main feedline break has occurred in containment, the crew will be expected to respond in accordance with 1-E-0, "Reactor Trip or Safety Injection," 1-E-2, "Faulted SG Isolation," and 1-ES-1.1, "SI Termination."

TIME	EXPECTED ACTION	INSTRUCTOR REMARKS
	SPD Verified: _____ (Initials) <ul style="list-style-type: none"> • "B" SG pressure decreases • Containment sump level increases • Annunciators J-A6, F-F2, J-F2 illuminate • Containment pressure increases • Automatic SI does not occur • 1-FW-P-2 does not start automatically 	
	BOP identifies "B" SG level decreasing.	
	Crew identifies containment sump level increasing.	
	US directs crew to enter 1-E-0.	
	RO/BOP manually trip the reactor.	
	BOP verifies turbine trip.	
	RO verifies emergency busses are energized.	
	Crew identifies need to manually safety inject.	
CT 2	Crew manually initiates safety injection. RO manually actuates safety injection.	BOP switch will not work. RO must turn his/her switch
	NOTE: The crew may identify that 1-FW-P-2 did not auto-start and manually start it or they may wait for attachment 4 to start it.	
	RO checks no CAP items 1-6 apply.	CAP attached
	US holds transient brief.	
	US initiates attachment 4 – Equipment Verification (Attachment 5 - Verification of SI and Phase A Isolation will be directed by attachment 4) and attachment 7 – Faulted SG Isolation.	See attached. One operator will be directed to do attachment 4 (and 5) and the other will do attachment 7. The US will not be reading until the operator with attachment 7 is done and available.
	NOTE: Attachment 7 will cover CT 4 for isolating feed to the faulted SG.	

EVENT 5: Given that the unit is at power and a main feedline break has occurred in containment, the crew will be expected to respond in accordance with 1-E-0, "Reactor Trip or Safety Injection," 1-E-2, "Faulted SG Isolation," and 1-ES-1.1, "SI Termination."

TIME	EXPECTED ACTION	INSTRUCTOR REMARKS
	NOTE: If crew does not attempt to open the terry turbine trip valves they may enter 1-FR-H.1. They should then open the valves per H.1 and return to 1-E-0.	
CT 3	Crew manually opens 1-MS-TV-111A or 1-MS-TV-111B per attachment 4 or (1-E-0 step below for verifying AFW flow).	* Before RCS feed and bleed required
	RO verifies HHSI flow.	
	Crew checks RCS pressure 225 psig [450 psig]. (NO)	
	Crew verifies AFW flow indicated and > 340 GPM until NR level > 11% in any SG.	See CT 3
	RO checks RCS average temperature: <ul style="list-style-type: none"> • Stable or trending to 547°F if controlling on steam dumps OR • Stable or trending to 551°F if controlling on PORVs. 	
	RO checks PRZR PORVs closed, spray valves closed or controlling pressure, and at least one PORV block valve open.	
	RO checks RCP trip and charging pump recirc criteria: <ul style="list-style-type: none"> • RO checks RCS subcooling < 25°F [85°F] (NO) 	
	Crew checks SGs not faulted: All SG pressures > 80 psig and under control of operator. (NO)	
	US holds a transient brief.	
	Crew transitions to 1-E-2.	
	BOP closes MSTVs and bypass valves. (also done per E-0 attachment 7)	
	BOP checks pressures in all SGs.	
	Crew identifies faulted SG as "B."	

EVENT 5: Given that the unit is at power and a main feedline break has occurred in containment, the crew will be expected to respond in accordance with 1-E-0, "Reactor Trip or Safety Injection," 1-E-2, "Faulted SG Isolation," and 1-ES-1.1, "SI Termination."

TIME	EXPECTED ACTION	INSTRUCTOR REMARKS
	<p>NOTE: Crew will have already isolated "B" SG per attachment 7 of E-0. They will verify the attachment done and then continue with verifying the BD trip valves are closed.</p>	
<p>CT 4</p>	<p>Crew isolates the faulted SG.</p> <ul style="list-style-type: none"> • BOP verifies MFW isolated. • BOP closes 1-FW-MOV-100B. • BOP verifies 1-FW-HCV-100B closed. • BOP verifies "B" SG PORV closed. • BOP verifies all SG blowdown trip valves closed. • Crew dispatches an operator to locally close 1-MS-57 (attachment 1) • Crew dispatches an operator to verify closed 1-MS-58. 	<p>Critical Task *Prior to transition out of E-2</p>
	<p>BOP checks ECST level > 40%.</p>	
	<p>BOP verifies outside IA supplying containment.</p>	
	<p>Crew checks secondary radiation:</p> <ul style="list-style-type: none"> • RO resets SI, Phase A, and AMSAC • Crew checks last known SG blowdown radiation • Crew checks last known AE radiation • Crew checks MS line and Terry turbine radiation. 	
	<p>Crew checks if SI can be terminated:</p> <ul style="list-style-type: none"> • RCS pressure stable or increasing • Pressurizer level > 21% [26%]. (YES) 	
	<p>US directs crew to transition to 1-ES-1.1.</p>	
	<p>NOTE: Scenario can be terminated at this time at the discretion of the lead evaluator.</p>	
	<p>RO verifies/resets SI.</p>	
	<p>RO stops all but one charging pump and places in Auto.</p>	
	<p>Crew checks RCS pressure stable or increasing.</p>	

EVENT 5: Given that the unit is at power and a main feedline break has occurred in containment, the crew will be expected to respond in accordance with 1-E-0, "Reactor Trip or Safety Injection," 1-E-2, "Faulted SG Isolation," and 1-ES-1.1, "SI Termination."

TIME	EXPECTED ACTION	INSTRUCTOR REMARKS
	Crew isolates the BIT: <ul style="list-style-type: none"> • BOP checks LHSI suctions from containment sump are closed • RO verifies/opens 1-CH-MOV-1373 • RO verifies/opens CHP recirc valves • BOP closes BIT inlet valves • BOP closes BIT outlet valves • BOP verifies 1-SI-MOV-1836 and 1-SI-MOV-1869A and 1869B are 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-2.2, "Unit Operation from Mode 1 to Mode 2."	63
Abnormal Procedure 1-AP-2.2, "Fast Load Reduction."	19
Abnormal Procedure 1-AP-31, "Loss of Main Feedwater."	8
Abnormal Procedure 1-AP-38, "Excessive Load Increase."	16
Abnormal Procedure 1-AP-4.3, "Malfunction of Nuclear Instrumentation (Power Range)."	19
Abnormal Procedure 1-AP-3, "Loss of Vital Instrumentation."	24
Maintenance Operating Procedure 1-MOP-55.78, "Feed Flow Instrumentation."	7
Emergency Procedure 1-E-0, "Reactor Trip or Safety Injection."	42
Emergency Procedure 1-E-2, "Faulted Steam Generator Isolation."	12
Emergency Procedure 1-ES-1.1, "SI Termination."	21
Station Annunciator Response Procedures.	N/A
Guide and Reference Document PI-AA-5000, "Human Performance."	3
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
2010 NRC RUN 2

Initial conditions

1. Recall IC 188
2. Ensure Tave (575-585), Tref, PDDT level, and VCT level are selected on trend recorders.
3. Rack out breaker for 1-FW-P-3A and close manual discharge valve.
4. Place red sticker on 1-FW-P-3A.
5. Designate 1J as the protected train. Don't forget to lower sign on Safeguards panel.
6. Verify enough standard ramp plans (100 to 80% at 0.3%/min and 100 to 80% at 1%/min) are available to replace any that get written on.

PRELOADS PRIOR TO SCENARIO START

CONDITION	MALFUNCTION/OVERRIDE/ETC.
Auto-start failure of 1-CN-P-1B	Switch override: CNP1B_ASTOP = OFF
SI fails to automatically actuate	Malfunction: SI08
BOP SI switch does not work	Switch override: SAF_INJ2_INIT = OFF
Terry Turbine fails to automatically start	Remote function: FWP2_AUTO_DEFEAT = T

SCENARIO EVENTS

EVENT	MALFUNCTION/OVERRIDE/COMMUNICATIONS
1) 1-SD-LCV-107A failure	<p>Remote function: SDLCV107B_SETPT, Delay time = 5, Ramp = 30, Value = 1, Trigger = 1</p> <p>NOTE: If called to investigate, wait at least 3 minutes and report that 1-SD-LCV-107B is partially open and controller dial is loose.</p> <p>If operator or I&C is directed to fix this: Ramp setpoint to 35% over 120 seconds</p> <p>Report that you have adjusted dial, locked it in, and tank level is recovering. Adjust as necessary to keep alarms clear.</p> <p>NOTE: The next event will occur once the unit is stable and 1-SD-LCV-107B has been isolated, or at the discretion of the lead evaluator.</p>
2) Power-range channel IV failure	<p>Malfunction: NI0204, Delay time = 5, Severity = 1, Trigger = 2</p> <p>NOTE: If permission is requested to restore Tave/Tref to within 0.5°F by withdrawing control rods, etc, then grant permission by agreeing with whatever method they choose.</p> <p>NOTE: The next event will occur after the crew stabilizes unit and places N-44 in trip, or as directed by the lead evaluator.</p>
3) SG channel III feed flow fails low	<p>Malfunction: FW1203, Delay time = 5, Ramp = 30, Stop = -1, Trigger = 3</p> <p>NOTE: After the crew has swapped channels and the US has referred to TS-3.3.1, the next event may occur.</p>

EVENT	MALFUNCTION/OVERRIDE/COMMUNICATIONS
4) Unit ramp per system operator	<p>NOTE: Call as the MOC requesting that North Anna Unit 1 reduce power to 80% within the next 30 minutes due to the loss of a substation elsewhere on the grid. Unit 2 will also be reducing power to 80%. (Can tell them that you will call back with any additional information they ask for since you have other calls to make right now.)</p> <hr/> <p>NOTE: Insert the following malfunction once rods have moved once in auto.</p> <hr/> <p>Malfunction: RD14, Trigger = 4</p> <p>NOTE: The next event can occur once manual control rod operation has been initiated and a sufficient ramp has been observed.</p>
5) Feed line break in containment	<p>Malfunction: FW1602, Delay time = 5, Ramp = 300, Severity = 50, Trigger = 5</p> <p>NOTE: When dispatched, close 1-MS-57 using monitor, PNID, or the following trigger: MS_57, Delay = 30, Ramp = 30, Trigger = 11</p> <p>NOTE: Scenario can be terminated when crew terminates SI in ES-1.1, or at the discretion of the lead evaluator.</p>

ATTACHMENT 2
SCENARIO PERFORMANCE OBJECTIVES

SIMULATOR REQUALIFICATION EXAMINATION

TERMINAL PERFORMANCE OBJECTIVE

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

GENERIC PERFORMANCE OBJECTIVES

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

EVENT 1 PERFORMANCE OBJECTIVES

EVENT GOAL: Given that a High Pressure Heater Drain Tank high-level divert has failed open, the crew will be expected to respond in accordance with 1-AP-31, "Loss of Main Feedwater," and 1-AP-38, "Excessive Load Increase."

NORTH ANNA SPECIFIC TASKS:

R781 Respond to a loss of main feedwater.

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

CRITICAL TASK:

N/A

EVENT 2 PERFORMANCE OBJECTIVES

EVENT GOAL: Given that the unit is at power and power-range channel N-44 has failed high, 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:

N/A

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 3 PERFORMANCE OBJECTIVES

EVENT GOAL: Given that the unit is at power and a selected feed flow channel 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 system operator has directed that Unit 1 reduce power, the crew will respond in accordance with 1-OP-2.2, "Unit Operation from Mode 1 to Mode 2," or 1-AP-2.2, "Fast Load Reduction."

NORTH ANNA SPECIFIC TASKS:

R706 Borate the Reactor Coolant System using the blender.

CRITICAL TASK:

N/A

EVENT 5 PERFORMANCE OBJECTIVES

EVENT GOAL: Given that the unit is at power and a main feedline break has occurred in containment, the crew will be expected to respond in accordance with 1-E-0, "Reactor Trip or Safety Injection," 1-E-2, "Faulted SG Isolation," and 1-ES-1.1, "SI Termination."

NORTH ANNA SPECIFIC TASKS:

- R185 Perform the immediate operator actions in response to a reactor trip or safety injection
- R727 Perform the phase A isolation verification following a safety injection actuation
- R183 Identify and isolate a faulted steam generator.
- R189 Terminate safety injection.

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 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 establishes Feed Flow to at least one SG.

Safety Significance:

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

Cues:

*Indication that no AFW flow is available to a non-faulted SG

*Indication that 1-MS-TV-111A/111B did not open automatically when required

Performance Indicator:

BOP opens 1-MS-TV-111A or 111B to start terry turbine and establish flow to "A" SG

Feedback:

Indication of aux feedwater flow and rising SG level.

WOG Reference:

FR-H.1 Background

Conditions:

Prior to being required to perform RCS feed and bleed.

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:

- * "B" 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-100B to secure AFW flow to "A" steam generator.

Feedback:

AFW flow indication to "B" 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 a High Pressure Heater Drain Tank high-level divert has failed open, the crew will be expected to respond in accordance with 1-AP-31, "Loss of Main Feedwater," and 1-AP-38, "Excessive Load Increase."

SPD Verified: _____ (Initials)

- Annunciator Q-E4 illuminates
- 1-SD-P-1B trips as indicated by amber light lit
- Reactor power increases slightly
- Main feed pump suction pressure decreases
- Standby condensate pump does not auto-start

EVENT 2: Given that the unit is at power and power-range channel N-44 has failed high, 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 T_{AVE} decrease

EVENT 3: Given that the unit is at power and a selected feed flow channel 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-D2 illuminate
- "B" MFRV ramps open
- "B" SG Channel III feed flow(1-FW-FI-1487) is down scale low

EVENT 4: Given that the system operator has directed that Unit 1 reduce power, the crew will respond in accordance with 1-OP-2.2, "Unit Operation from Mode 1 to Mode 2," or 1-AP-2.2, "Fast Load Reduction."

SPD Verified: _____ (Initials)

- T_{ave} decreases
- Turbine load and megawatts decrease
- Rods fail to move in auto after initial insertion

EVENT 5: Given that the unit is at power and a main feedline break has occurred in containment, the crew will be expected to respond in accordance with 1-E-0, "Reactor Trip or Safety Injection," 1-E-2, "Faulted SG Isolation," and 1-ES-1.1, "SI Termination."

SPD Verified: _____ (Initials)

- "B" SG pressure decreases
- Containment sump level increases
- Annunciators J-A6, F-F2, J-F2 illuminate
- Containment pressure increases
- Automatic SI does not occur
- 1-FW-P-2 does not start automatically

DOMINION
NORTH ANNA POWER STATION

INITIAL LICENSED OPERATOR EXAMINATION
SIMULATOR EXAMINATION GUIDE
SCENARIO 2010 NRC RUN 3

SIMULATOR EXAMINATION GUIDE

<u>EVENT</u>	<u>DESCRIPTION</u>
1.	Ramp down in preparation for TVFT
2.	Selected pressurizer level instrument fails high
3.	Running CC pump trips/standby pump fails to auto-start
4.	Running charging pump trips/standby pump fails to auto-start
4a.	Restore letdown
5.	Selected "A" Steam flow channel fails high
6.	"A" MFRV fails closed/ATWS

Scenario Recapitulation:

Malfunctions after EOP entry	3	Reactor doesn't trip automatically or manually, turbine will not trip automatically, emergency borate valve thermals out
Total Malfunctions	8	Pressurizer level instrument fails high, running CC pump trips/standby pump fails to auto-start, running charging pump trips/standby pump fails to auto-start, selected "A" Steam flow channel fails high, "A" MFRV fails closed, reactor doesn't trip automatically or manually, turbine will not trip automatically, emergency borate valve thermals out
Abnormal Events	4	Pressurizer level instrument fails high, running CC pump trips/standby pump fails to auto-start, running charging pump trips/standby pump fails to auto-start, selected "A" Steam flow channel fails high
Major Transients	1	ATWS
EOPs Entered	1	1-FR-S.1
EOP Contingencies	1	1-FR-S.1
Critical Tasks	2	

SCENARIO DURATION

120 Minutes

SIMULATOR EXAMINATION SCENARIO SUMMARY

SCENARIO 2010 NRC RUN 3

The scenario will start with the unit at 100% power. 1-FW-P-3A was tagged out last shift for motor bearing replacement. Shift orders are to ramp down for a TVFT, perform the test, and return the unit to 100% power.

After the crew takes the unit, they will commence a unit power reduction in accordance with 1-PT-34.3, "Turbine Valve Freedom Test." Once a sufficient load reduction has been observed, the next event may occur.

One of the controlling pressurizer level channels will fail high. This will cause the charging flow control valve, 1-CH-FCV-1122, to ramp closed. With letdown still in service, pressurizer level will slowly decrease. The crew will enter 1-AP-3, "Loss of Vital Instrumentation," and take manual control of 1-CH-FCV-1122 and restore charging flow. The RO will swap to an operable channel of pressurizer level for control and return pressurizer level control to automatic. The crew will identify the correct MOP and the US will consult Tech Specs. At this time the next event can occur.

The running CC pump will trip and the standby pump will fail to auto-start. The crew will enter 1-AP-15, "Loss of Component Cooling Water," and start the standby pump. The US will consult Tech Specs (none applicable). At this time the next event can occur.

The running charging pump will trip and the standby pump will fail to auto-start. The crew may choose to start the pump that should have started automatically, if so then 1-CH-P-1B will not start manually. The crew will enter 1-AP-49, "Loss of Normal Charging." Once charging has been restored, the crew will proceed to restore letdown which isolated due to no running charging pumps. The US will review Tech Specs. At this time, the next event can occur.

The controlling steam flow channel on "A" SG will fail high, causing the "A" MFRV to open. The crew will enter 1-AP-3, "Loss of Vital Instrumentation," and eventually swap to an operable channel of steam flow. The crew will identify the applicable MOP and the US will review Tech Specs. At this time, the next event can occur.

The "A" MFRV will fail closed. A reactor trip will not occur either automatically or manually. The crew will enter 1-FR-S.1, "Response to Nuclear Power Generation/ATWS." The turbine will not trip and will have to be manually runback. (Note that automatic SI is also defeated to force the crew to manually align the BIT in the event that an automatic safety injection signal is generated on low pressurizer pressure.) When the crew tries to emergency borate, 1-SI-MOV-1350 will thermal out and the BIT will have to be injected. The crew will dispatch an operator to locally trip the reactor. Once the crew transitions back to 1-E-0 and verifies immediate operator actions, the scenario may be terminated.

SCENARIO TURNOVER SHEET

Read the following to the crew:

Purpose: This examination is intended to evaluate the crew's performance of various tasks associated with the 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 100% power. RCS boron is 1017 ppm and core age is 9000 MWD/MTU. Aux steam is on unit 2.

Unit 2 is at 100% power.

Equipment Status:

1-FW-P-3A was tagged out last shift for motor-bearing replacement. Maintenance rule window is green.

Shift Orders:

Ramp unit down for TVFT, perform the test, and return unit to 100% power.

EVENT 1: Given that the unit is at 100% power and a TVFT is to be performed, the crew will ramp the unit down in accordance with 1-PT-34.3, "Turbine Valve Freedom Test."		
TIME	EXPECTED ACTION	INSTRUCTOR REMARKS
SPD Verified: _____ (Initials) <ul style="list-style-type: none"> • Reactor power decreases • Turbine power decreases • Tavg/Tref decrease • Generator megawatts decrease 		
	US notifies the MOC that North Anna Unit 1 is reducing power for a TVFT, as required.	
	NOTE: Per the reactor engineer directions for the ramp, the RO will maintain Tave approximately 3 degrees higher than Tref using manual rod control. Directions are to ramp at 1% per min for the first 4 or 5%, then continue the ramp at 0.3% per minute.	
	BOP lowers Main Turbine load using Operator Auto.	Attachment 1 to 1-GOP-1.0 is attached. (Crew may choose to get attachment of 1-AP-2.2, or another similar attachment, for turbine operations. Steps are similar in all of these.)
	RO borates as required to maintain control rods in normal operating range.	No boration is required.
	BOP places turbine in IMP-IN: <ul style="list-style-type: none"> • Matches Reference and Setter • Pulses down VPL until light is lit • Pulses up VPL until light is not lit • Verifies tracking meter reads zero • Pushes IMP-IN button • Continues lowering turbine load. 	
	NOTE: The next event can occur once a sufficient reactivity manipulation has occurred.	

EVENT 2: Given that the unit is at power and a controlling channel of pressurizer level has failed high, the crew will be expected to respond in accordance with 1-AP-3, "Loss of Vital Instrumentation."

TIME	EXPECTED ACTION	INSTRUCTOR REMARKS
	SPD Verified: _____ (Initials) <ul style="list-style-type: none"> • Annunciators B-F6 and B-G6 illuminate • 1-RC-LI-1461 fails high • 1-RC-LCV-1459G output decreases • 1-CH-FCV-1122 ramps closed 	
	RO identifies annunciators B-F6, PRZ HI LEVEL CH I-II-III, and B-G6, PRZ HI LEVEL- BU HTRS ON.	
	RO identifies 1-RC-LI-1461 failed high.	
	US directs crew to perform immediate actions of 1-AP-3: <ul style="list-style-type: none"> • RO checks redundant instrumentation normal. • BOP checks SGWLC instrumentation normal. • BOP verifies turbine first stage pressure indications are normal. • RO checks pressurizer level indications normal. (NO) • RO places 1-CH-FCV-1122 in manual and increases charging flow to maintain pressurizer level. 	
	NOTE: US will direct crew to stop the unit ramp.	

EVENT 2: Given that the unit is at power and a controlling channel of pressurizer level has failed high, the crew will be expected to respond in accordance with 1-AP-3, "Loss of Vital Instrumentation."

TIME	EXPECTED ACTION	INSTRUCTOR REMARKS
	RO verifies systems affected by PRZR level channels normal: <ul style="list-style-type: none"> • RO selects operable pressurizer level channel 459/460 • RO verifies pressurizer level annunciators are proper for plant conditions • RO verifies emergency backup heaters are restored • RO verifies letdown in service • RO verifies pressurizer level control in AUTO (NO) • RO verifies/restores level to program • RO adjusts output of 1-RC-LCV-1459G, as required • RO places 1-CH-FCV-1122 in AUTO, when level restored • RO verifies control group heaters are not tripped. 	
	Crew verifies both turbine first stage pressure channels are normal.	
	Crew verifies operable channels selected for SGWLC instruments.	
	NOTE: If annunciator C-C6 illuminates, the crew will perform actions in the AR to return letdown through the demins. See attached AR.	
	Crew verifies that the pressurizer level channel is the only failed instrument.	
	Crew initiates 1-MOP-55.72.	
	NOTE: Crew may discuss rod control options at this time. If guidance is requested will ask what they want to do and agree with it.	
	US contacts WCC and requests WR, CR.	
	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).	

EVENT 2: Given that the unit is at power and a controlling channel of pressurizer level has failed high, the crew will be expected to respond in accordance with 1-AP-3, "Loss of Vital Instrumentation."

TIME	EXPECTED ACTION	INSTRUCTOR REMARKS
	NOTE: The next event can occur once the US has reviewed tech specs.	

EVENT 3: Given that the unit is at power and the running component cooling water pump has tripped, the crew will be expected to respond in accordance with 1-AP-15, "Loss of Component Cooling Water."

TIME	EXPECTED ACTION	INSTRUCTOR REMARKS
SPD Verified: _____ (Initials) <ul style="list-style-type: none"> • Annunciators G-F5, C-D1, C-D2, and C-D3 illuminate • "A" CC pump has no amps, breaker disagreement light • "B" CC pump did not auto-start 		
	RO/BOP identifies annunciator G-F5, COMP. COOL PP 1A AUTO TRIP.	
	BOP identifies "A" CC pump tripped and "B" not running.	
	US directs crew to enter 1-AP-15.	
	Crew checks CC head tank level stable or increasing.	
	BOP verifies at least one unit 1 CC pump running. (NO)	
	BOP starts "B" CC pump.	
	BOP checks CC pump amps.	
	BOP checks CC flow normal.	
	Crew directs operator to check SW to CC HX delta Ps.	
	Crew directs electricians and Safeguards watchstander to investigate "A" CC pump breaker. (An overcurrent drop on the breaker will be reported.)	
	Crew directs auxiliary building operator to investigate cause of CC pump trouble and to verify "B" CC pump is operating satisfactorily.	
	US evaluates TS 3.7.19 (no applicable actions).	
	US notifies the WCC of the failures and requests they submit WR, CR, and make notifications.	
	NOTE: The next event will occur once T.S. have been reviewed, or at the discretion of the lead evaluator.	

EVENT 4/4a: Given that the unit is at power and the running charging pump has tripped with no auto-start of the standby pump, the crew will respond in accordance with 1-AP-49, "Loss of Normal Charging."

TIME	EXPECTED ACTION	INSTRUCTOR REMARKS
	SPD Verified: _____ (Initials) <ul style="list-style-type: none"> • 1-CH-P-1A trips • 1-CH-P-1B does not start automatically or manually • Letdown isolates • Annunciators C-A5, C-C5, C-G6 illuminate • 1-CH-FCV-1122 demand goes to maximum 	
	RO identifies annunciator C-A5, CH PP1A 15H6 LOCKOUT, and C-C5, CH PP TO REGEN HX HI-LO FLOW.	
	NOTE: Crew may verify flowpath and attempt to start 1-CH-P-1B per the AR for C-A5, since it should have automatically started. The pump will not start in manual.	
	RO identifies that 1-CH-P-1A tripped and 1-CH-P-1B did not auto-start.	
	US directs crew to enter 1-AP-49.	
	RO checks charging pump for gas binding. (NO)	
	NOTE: If crew answers NO to the following question they will isolate letdown and continue with subsequent steps.	
	RO verifies charging pump manipulations in progress. (YES)	
	RO closes discharge MOVs for 1-CH-P-1A. (1-CH-MOV-1286A, 1287A)	
	RO checks running charging pump normal. (NO, none running.)	
	RO verifies letdown orifices closed (1-CH-HCV-1200A/B/C). RO closes letdown isolation valves (1-CH-LCV-1460A/B).	Letdown isolation.
	RO verifies VCT level is >12%.	
	RO checks charging pump suction from VCT are open (1-CH-MOV-1115C and 1115E).	

EVENT 4/4a: Given that the unit is at power and the running charging pump has tripped with no auto-start of the standby pump, the crew will respond in accordance with 1-AP-49, "Loss of Normal Charging."

TIME	EXPECTED ACTION	INSTRUCTOR REMARKS
	RO checks VCT pressure is >15 psig.	
	RO checks charging pump suction MOVs are open. (1-CH-MOV-1267A, 1267B, 1269A, 1269B, 1270A, 1270B)	
	RO checks charging pump discharge MOVs are open. (1-CH-MOV-1286A, 1287A, 1286B, 1287B, 1286C, 1287C)	
	RO checks charging line isolation valves are open. (1-CH-MOV-1289A, 1289B)	
	RO checks 1-CH-FCV-1122 has output demand indicated.	
	RO checks 1-CH-HCV-1310 is open.	
	RO checks charging parameters are normal: <ul style="list-style-type: none"> • 1-CH-PI-1121 >2300 psig • Charging pump motor amps stable (NO) • 1-CH-FI-1122 flow normal. (NO) 	
	RO closes 1-CH-FCV-1122.	
	Crew checks for piping rupture: <ul style="list-style-type: none"> • VCT and RWST level normal • Aux building sump level normal • No reports of piping ruptures • Applicable radiation monitor readings are normal for the following: <ul style="list-style-type: none"> 1-RM-RMS-154 (Aux building, 1-RM-RMS-156(Sample room), 1-GW-RI-178-3 and 178-1 (Process vents), 1-GW-RI-179-3 and 179-1 (Vent stack A), 1-VG-RM-105 points 4 and 6 (Multi-sampler particulate), and 1-GW-RM-106 points 4 and 6 (Multi-sampler gaseous) 	
	RO verifies running charging pump normal. (NO)	
	NOTE: If crew attempts to start 1-CH-P-1B it will not start.	

EVENT 4/4a: Given that the unit is at power and the running charging pump has tripped with no auto-start of the standby pump, the crew will respond in accordance with 1-AP-49, "Loss of Normal Charging."		
TIME	EXPECTED ACTION	INSTRUCTOR REMARKS
	RO starts standby charging pump, 1-CH-P-1C.	
	Crew refers to 1-OP-8.1 for make up to the RCS.	
	NOTE: Crew may open 1-CH-FCV-1122 and verify/establish charging flow.	
	RO verifies seal injection flow.	
	Crew determines if letdown should be placed in service. (YES)	
3a	<p>Crew restores letdown:</p> <ul style="list-style-type: none"> • RO establishes at least 25 gpm of charging • RO puts 1-CH-PCV-1145 in manual • RO fully opens 1-CH-PCV-1145 • BOP verifies 1-CH-TV-1204A and B are open • RO opens 1-CH-LCV-1460A and 1460B • RO opens 1-CH-HCV-1200B • RO adjusts 1-CH-PCV-1145 to maintain 300 psig • RO places 1-CH-PCV-1145 in Auto • RO places 1-CH-FCV-1122 in Auto, if desired (may adjust 1-RC-LCV-1459G) • RO maintains pressurizer pressure. 	Normal event
	<p>RO verifies charging parameters are normal:</p> <ul style="list-style-type: none"> • Discharge pressure • Charging flow • Charging pump motor amps. 	
	US directs WCC to submit WR, CR.	
	US reviews Technical Specifications: 3.5.2 Condition A for having only one operable HHSI pump. Have 72 hours to restore 2 trains to operable.	
	NOTE: Once letdown is restored and tech specs have been reviewed, the next event can occur.	

EVENT 5: Given that the unit is at power, and a steam flow channel has failed, the crew will be expected to respond in accordance with 1-AP-3, "Loss of Vital Instrumentation."

TIME	EXPECTED ACTION	INSTRUCTOR REMARKS
	SPD Verified: _____ (Initials) <ul style="list-style-type: none"> • Annunciators F-F2, F-G2, and F-D1 illuminate • Status light N-E7 illuminates • 1-MS-FI-1474 fails high • "A" MFRV demand increases • "A" SG feed flow and level increase 	
	BOP identifies annunciator F-F1, SG 1C LEVEL ERROR, and informs US.	
	Crew identifies "A" SG steam flow channel III failed high.	
	US directs crew to perform immediate actions of 1-AP-3: <ul style="list-style-type: none"> • Crew verifies redundant instrument channels normal • Crew verifies SG level control parameters normal (NO) • BOP places "A" MFRV in MANUAL and adjusts to control "A" SG level • Crew verifies turbine first-stage pressure channels normal • RO verifies PRZR level indications are normal. 	
	RO verifies systems affected by PRZR level channels normal.	
	Crew verifies both turbine first stage pressure channels normal.	
	Crew verifies operable channels selected for SGWLC. (NO)	

EVENT 5: Given that the unit is at power, and a steam flow 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
	Crew swaps SGWLC channels: <ul style="list-style-type: none"> • RO places rod control to MANUAL • RO turns steam dumps off or swaps to steam pressure mode as directed by the US • BOP places all MFRVs in MANUAL and verifies FRV B/Ps in MANUAL • Crew swaps all Steam flow/Feed flow and First-stage pressure channels to channel IV • BOP verifies CH III SG levels on program • BOP returns MFRVs to AUTOMATIC • RO returns steam dumps to T_{AVE} mode • RO returns rod control to AUTO, as required/desired. 	
	Crew refers to 1-MOP-55.77 for placing the failed channel in trip.	Pressurizer level channel already failed and MOP initiated.
	US refers to Technical Specifications: 3.3.1 Function 15 - Condition E 3.3.2 Functions 1f, 1g, 4d, and 4e - Condition D Determines the failed channel must be placed in trip within 72 hours.	
	NOTE: The next event can occur after the crew swaps channels and the US has reviewed Tech Specs.	

EVENT 6: Given that the unit is at power and a main feed reg valve has failed closed and a reactor trip does not occur automatically or manually, the crew will be expected to respond in accordance with 1-FR-S.1, "Response to Nuclear Power Generation/ATWS."

TIME	EXPECTED ACTION	INSTRUCTOR REMARKS
	SPD Verified: _____ (Initials) <ul style="list-style-type: none"> • Annunciator D-G2 illuminates • 1-FW-FCV-1488 indicates closed • Feed flow to "B" SG decreases • Reactor trip does not occur automatically or manually • SI will not occur automatically, if required 	
	Crew identifies annunciator D-G2, STM GEN 1B LO-LO LEVEL RX TRIP.	
	BOP identifies "B" MFRV closed.	
	Crew identifies that a reactor trip has not occurred.	
	US directs crew to enter 1-E-0.	
	RO/BOP attempt to trip reactor.	
	US directs crew to enter 1-FR-S.1.	
	BOP attempts to manually trip the turbine using pushbuttons. (NO)	
CT1	BOP manually trips turbine: <ul style="list-style-type: none"> • BOP places both EHC pumps in PTL • BOP manually run back turbine OR • BOP closes MSTV and bypass valves. 	

EVENT 6: Given that the unit is at power and a main feed reg valve has failed closed and a reactor trip does not occur automatically or manually, the crew will be expected to respond in accordance with 1-FR-S.1, "Response to Nuclear Power Generation/ATWS."

TIME	EXPECTED ACTION	INSTRUCTOR REMARKS
CT2	<p>Crew identifies the reactor did not trip and takes action to bring the reactor subcritical.</p> <ul style="list-style-type: none"> • RO verifies automatic rod insertion or manually inserts control rods • RO verifies control rods inserting in auto until rod speed <48 spm, then inserts rods in manual • (See turbine trip above) • BOP checks AFW pumps running • RO verifies at least one charging pump running • RO places 1-CH-P-2A in FAST • RO attempts to open 1-CH-MOV-1350 • RO verifies adequate negative reactivity insertion (NO) • RO opens charging pump suctions from RWST (1-CH-MOV-1115B and 1115D) • RO closes charging pump suctions from VCT (1-CH-MOV-1115C and 1115E) • BOP closes BIT recirc valves (1-SI-TV-1884A/B/C) • BOP opens at least one BIT outlet valve (1-SI-MOV-1867C or 1867D) • BOP opens at least one BIT inlet valve (1-SI-MOV-1867A or 1867B) • Crew closes 1-CH-HCV-1200B • Crew closes at least one letdown isolation valve (1-CH-LCV-1460A or 1460B) • RO closes at least one charging line isolation (1-CH-MOV-1289A and 1289B) • RO checks PRZR pressure < 2335. 	*Before exiting FR-S.1
	<p>NOTE: Crew may have already dispatched operator for local actions. Reactor will be tripped after the BIT is being injected.</p>	

EVENT 6: Given that the unit is at power and a main feed reg valve has failed closed and a reactor trip does not occur automatically or manually, the crew will be expected to respond in accordance with 1-FR-S.1, "Response to Nuclear Power Generation/ATWS."		
TIME	EXPECTED ACTION	INSTRUCTOR REMARKS
	Crew checks if following trips have occurred: <ul style="list-style-type: none"> • Reactor trip • Turbine trip. 	
	Crew dispatches operator to locally trip the reactor.	
	Crew checks if reactor is subcritical. (YES)	If no, (reactor not yet tripped) will continue in S.1 for several more steps.
	NOTE: Crew will initiate attachment 1 to establish normal charging and letdown.	See attached
	US directs transition to 1-E-0.	
	RO verifies reactor trip.	
	BOP verifies turbine trip.	
	RO verifies emergency busses are energized.	
	Crew verifies safety injection is not actuated or required.	
	NOTE: The scenario can be terminated at this time.	

REFERENCES

PROCEDURE	REV.
Periodic Test 1-PT-34.3, "Turbine Valve Freedom Test."	28
Operating Procedure 1-OP-8.1, "Chemical and Volume Control System."	53
Abnormal Procedure 1-AP-3, "Loss of Vital Instrumentation."	24
Abnormal Procedure 1-AP-15, "Loss of Component Cooling Water."	21
Abnormal Procedure 1-AP-49, "Loss of Normal Charging."	14
Maintenance Operating Procedure 1-MOP-55.72, "Pressurizer Level Instrumentation."	8
Maintenance Operating Procedure 1-MOP-55.77, "Steam Flow Instrumentation."	8
Functional Restoration Procedure 1-FR-S.1, "Response to Nuclear Power Generation/ATWS."	16
Emergency Procedure 1-E-0, "Reactor Trip or Safety Injection."	42
Station Annunciator Response Procedures.	N/A
Guide and Reference Document PI-AA-5000, "Human Performance."	3
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
2010 NRC RUN 3

Initial conditions

1. Recall IC 189
2. Ensure Tave (575-585), Tref, PDDT level, and VCT level are selected on trend recorders.
3. Verify 461/460 selected for pressurizer level control.
4. Rack out breaker for 1-FW-P-3A and close manual discharge valve.
5. Place sticker on 1-FW-P-3A.
6. Designate 1J as the protected train. Don't forget to lower sign on Safeguards panel.
7. Prepare a reactivity plan and fill out appropriate steps of 1-PT-34.3.

PRELOADS PRIOR TO SCENARIO START

CONDITION	MALFUNCTION/OVERRIDE/ETC.
1-CC-P-1B will not auto start	Remote function: CCP1B_Auto_Defeat = Auto Defeat
1-CH-P-1B will not start	Switch Override: CHP1B_STOP = ON
Failure of reactor trip either automatically or manually	Malfunctions: RD32 RD38 Remote function: AMSAC_DEFEAT = T
Failure of turbine to trip either automatically or manually	Malfunctions: TU02 TU03
Failure of auto Safety injection	Malfunction: SI08

CONDITION	MALFUNCTION/OVERRIDE/ETC.
Emergency borate MOV failure	<p>MOV control: CHMOV350_RACKIN, Remote value = RACKOUT, Trigger = 11</p> <p>Set up Trigger 11 as follows so that when valve starts to open it will "thermal out": CHMOV350 .GE. 0.1</p>

SCENARIO EVENTS

EVENT	MALFUNCTION/OVERRIDE/COMMUNICATIONS
1) Unit Ramp	<p>NOTE: Next event can occur once a sufficient reactivity manipulation has been observed.</p>
2) Pressurizer level channel failure	<p>Malfunction: RC0803, Delay time= 5, Ramp = 10, Severity = 1, Trigger = 2</p> <p>NOTE: If asked about rod/temp control options, ask what they want to do and agree with what they say. (Can call back if they want OMOG opinion/permission.)</p> <p>NOTE: The next event can occur once the US has reviewed tech specs.</p>
3) Loss of "A" CC pump	<p>Malfunction: CC0201, Delay time = 5, Trigger = 3</p> <p>NOTE: If sent to investigate: "A" pump looks fine locally, just no longer running. "B" pump looks good.</p> <p>Safeguards: There is an overcurrent drop on breaker for 1-CC-P-1A.</p> <p>NOTE: Can report CC HX delta Ps as either normal or approximately 4 psid on each HX. (Can report immediately as you looked at them when checking out pumps.)</p> <p>NOTE: The next event will occur once T.S. have been reviewed, or at the discretion of the lead evaluator.</p>

EVENT	MALFUNCTION/OVERRIDE/COMMUNICATIONS
4) "A" CHP trips on overcurrent	<p>Malfunction: CH1601, Delay time = 5, Trigger = 4</p> <p>NOTE: Once letdown is restored and tech specs have been reviewed, the next event can occur.</p>
5) "A" SG Steam flow fails high	<p>Malfunction: MS0101, Delay time = 5, Ramp = 10, Severity = 1, Trigger = 5</p> <p>NOTE: The next event will occur after the crew identifies the applicable MOP and the US has reviewed Tech Specs.</p>
6) Failure of "A" MFRV/ATWS(preloaded)	<p>Malfunction: FW0501, Delay time = 5, Trigger = 6</p> <p>NOTE: Use the following to open the reactor trip breakers ONLY AFTER the BIT is being injected:</p> <p>Remote functions: SP_RTA_BKR = F, Delay time = 10, Trigger = 10 SP_RTB_BKR = F, Delay time = 11, Trigger = 10</p> <p>NOTE: The scenario can be terminated once the crew has transitioned back to 1-E-0 and finished verifying the immediate actions.</p>

ATTACHMENT 2
SCENARIO PERFORMANCE OBJECTIVES

SIMULATOR REQUALIFICATION EXAMINATION

TERMINAL PERFORMANCE OBJECTIVE

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

GENERIC PERFORMANCE OBJECTIVES

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

EVENT 1 PERFORMANCE OBJECTIVES

EVENT GOAL: Given that the unit is at 100% power and a TVFT is to be performed, the crew will ramp the unit down in accordance with 1-PT-34.3, "Turbine Valve Freedom Test."

NORTH ANNA SPECIFIC TASKS:

None

CRITICAL TASK:

N/A

EVENT 2 PERFORMANCE OBJECTIVES

EVENT GOAL: Given that the unit is at power and a controlling channel of pressurizer level has failed high, 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

CRITICAL TASK:

N/A

EVENT 3 PERFORMANCE OBJECTIVES

EVENT GOAL: Given that the unit is at power and the running component cooling water pump has tripped, the crew will be expected to respond in accordance with 1-AP-15, "Loss of Component Cooling Water."

NORTH ANNA SPECIFIC TASKS:

R519 Respond to a loss of one or more component cooling water pumps

CRITICAL TASK:

N/A

EVENT 4 PERFORMANCE OBJECTIVES

EVENT GOAL: Given that the unit is at power and the running charging pump has tripped with no auto-start of the standby pump, the crew will respond in accordance with 1-AP-49, "Loss of Normal Charging."

NORTH ANNA SPECIFIC TASKS:

R572 Restore charging flow following a loss of normal charging.

CRITICAL TASK:

N/A

EVENT 5 PERFORMANCE OBJECTIVES

EVENT GOAL: Given that the unit is at power, and a steam flow channel 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 6 PERFORMANCE OBJECTIVES

EVENT GOAL: Given that the unit is at power and a main feed reg valve has failed closed and a reactor trip does not occur automatically or manually, the crew will be expected to respond in accordance with 1-FR-S.1, "Response to Nuclear Power Generation/ATWS."

NORTH ANNA SPECIFIC TASKS:

R224 Perform the immediate operator actions in response to a nuclear power generation/ATWS

CRITICAL TASK:

· N/A

CT Statement:

Crew identifies reactor did not trip, transition to 1-FR-S.1, 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 verifies control rods inserting in auto until rod speed less than manual, then inserts in manual

Crew injects BIT

- OR -

Crew dispatches operator to locally trip the reactor using attachment #3, Remote Reactor Trip.

Feedback:

- * Control rods moving in or fully inserted.
- * BIT injecting.
- * 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 manually trips the turbine in FR-S.1

Safety Significance:

Failure to trip the turbine during an ATWS event could 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, and indication that the turbine stop valves are fully open.

Performance Indicator:

BOP places both EHC pumps in PTL and/or manually runs back turbine OR close MSTVs and bypass valves.

Feedback:

Turbine stop valves closed.

WOG Reference:

FR-S.1 -- A Background

Conditions:

Within 30 seconds of recognizing ATWS condition exists.

ATTACHMENT 3
SIMULATOR PERFORMANCE DATASHEET

Scenario Performance Datasheet

EVENT 1: Given that the unit is at 100% power and a TVFT is to be performed, the crew will ramp the unit down in accordance with 1-PT-34.3, "Turbine Valve Freedom Test."

SPD Verified: _____ (Initials)

- Reactor power decreases
- Turbine power decreases
- Tavg/Tref decrease
- Generator megawatts decrease

EVENT 2: Given that the unit is at power and a controlling channel of pressurizer level has failed high, the crew will be expected to respond in accordance with 1-AP-3, "Loss of Vital Instrumentation."

SPD Verified: _____ (Initials)

- Annunciators B-F6 and B-G6 illuminate
- 1-RC-LI-1461 fails high
- 1-RC-LCV-1459G output decreases
- 1-CH-FCV-1122 ramps closed

EVENT 3: Given that the unit is at power and the running component cooling water pump has tripped, the crew will be expected to respond in accordance with 1-AP-15, "Loss of Component Cooling Water."

SPD Verified: _____ (Initials)

- Annunciators G-F5, C-D1, C-D2, and C-D3 illuminate
- "A" CC pump has no amps, breaker disagreement light
- "B" CC pump did not auto-start

EVENT 4: Given that the unit is at power and the running charging pump has tripped with no auto-start of the standby pump, the crew will respond in accordance with 1-AP-49, "Loss of Normal Charging."

SPD Verified: _____ (Initials)

- 1-CH-P-1A trips
- 1-CH-P-1B does not start automatically or manually
- Letdown isolates
- Annunciators C-A5, C-C5, C-G6 illuminate
- 1-CH-FCV-1122 demand goes to maximum

Scenario Performance Datasheet

EVENT 5: Given that the unit is at power, and a steam flow channel 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, F-G2, and F-D1 illuminate
- Status light N-E7 illuminates
- 1-MS-FI-1474 fails high
- "A" MFRV demand increases
- "A" SG feed flow and level increase

EVENT 6: Given that the unit is at power and a main feed reg valve has failed closed and a reactor trip does not occur automatically or manually, the crew will be expected to respond in accordance with 1-FR-S.1, "Response to Nuclear Power Generation/ATWS."

SPD Verified: _____ (Initials)

- Annunciator D-G2 illuminates
- 1-FW-FCV-1488 indicates closed
- Feed flow to "B" SG decreases
- Reactor trip does not occur automatically or manually
- SI will not occur automatically, if required

Appendix D Scenario Outline Form ES-D-1

FINAL

Facility: North Anna Scenario No.: 5 Op-Test No.: 1

Examiners: Edwin Lea Operators: _____
Richard Baldwin _____
Mark Riches _____

Initial Conditions: Unit is at approximately 100% power MOL. 1-FW-P-1B was tagged out last shift to replace the motor bearings.

Turnover: Shift orders are to maintain current conditions and support maintenance on 1-FW-P-1B.

Event No.	Malf. No.	Event Type*	Event Description
1	RC2002	C (R) (S)	1-RC-PCV-1455B spray valve fails open and must be closed with SOV
2	AS01	I (B)(S)	Aux steam pressure transmitter fails low
2a		R (R) (S) N (BOP) C (R) (S)	Power reduction due to failed open MS to AS PCV. Rods fail to insert automatically.
3	CH1202	I (R) (S)	Failure of 1-CH-LT-1112, VCT level transmitter - high
4	MS1705	I (B) (S) TS (S)	"C" SG pressure channel III fails high
5	SI16	TS (S)	RCS leak outside containment in Safeguards
6	SI16	M (All)	LOCA outside containment
7	SI0701 SI0702	C (All)	Failure of SI to actuate automatically or manually
8	SI1304	C (BOP)	Failure of Train B of Phase A
			Scenario may be terminated after crew has exited 1-ECA-1.2.
			(Events 7-8 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 2010 NRC RUN 5

SIMULATOR EXAMINATION GUIDE

<u>EVENT</u>	<u>DESCRIPTION</u>
1.	1-RC-PCV-1456B spray valve fails open and will not close with controller
2.	Aux steam pressure transmitter fails low
2a.	Power reduction due to AS pressure transmitter failure. Control rods fail to automatically insert.
3.	Failure of VCT level transmitter, 1-CH-LT-1112, high
4.	"C" SG Steam pressure channel III fails high
5.	RCS leak outside containment
6.	LOCA outside containment

Scenario Recapitulation:

Malfunctions after EOP entry	3	LOCA outside containment, failure of "B" train of Phase A, safety injection does not actuate automatically or manually
Total Malfunctions	8	PRZR spray valve fails open, Aux steam pressure transmitter fails low, VCT level transmitter high, "C" SG Steam pressure channel III fails high, RCS leak outside containment, LOCA outside containment, failure of "B" train of Phase A, safety injection does not actuate automatically or manually
Abnormal Events	5	PRZR spray valve fails open, Aux steam pressure transmitter fails low, VCT level transmitter high, "C" SG Steam pressure channel III fails high, RCS leak outside containment
Major Transients	1	LOCA outside containment
EOPs Entered	2	1-ECA-1.2, 1-E-1
EOP Contingencies	1	1-ECA-1.2
Critical Tasks	3	

SCENARIO DURATION

Minutes

SIMULATOR EXAMINATION SCENARIO SUMMARY

SCENARIO 2010 NRC RUN 5

The scenario begins with the unit at 100% power. 1-FW-P-1B was tagged out last shift to replace the motor bearings. Shift orders are to maintain current plant conditions and support maintenance on 1-FW-P-1B.

After the crew takes the shift, pressurizer spray valve 1-RC-PCV-1455B will fail open. The crew will enter 1-AP-44, "Loss of Reactor Coolant System Pressure," and attempt to close the spray valve. The valve will not close with the controller, but will close using the SOV. Once the crew has stabilized the plant and the US has reviewed tech specs the next event can occur.

The Auxiliary Steam pressure transmitter will fail low causing the main steam to aux steam PCV to fail open. Reactor power will increase and the crew will enter 1-AP-38, "Excessive Load Increase." Control rods will fail to automatically insert and the RO will have to control RCS temperature using manual rod control. Once the crew has placed 1-AS-PCV-105 in manual and closed it, the next event can occur.

At this time VCT Level transmitter 1-CH-LT-1112 will fail high. The crew will respond in accordance with the AR for VCT HI-LO LEVEL L-112, by placing 1-CH-LCV-1115A in manual and raising the output to 100% to stop diverting letdown to the stripper. The crew should discuss the loss of the RWST swapover on low VCT level. Once the crew has stopped the VCT divert the next event can occur.

Channel III of steam pressure on "C" SG will fail high. The crew will respond in accordance with 1-AP-3, "Loss of Vital Instrumentation," and take control of "C" MFRV. After swapping to an operable channel and reviewing TS, the next event may occur.

An RCS leak will start outside containment in the safeguards building. The crew will enter 1-AP-16, "Increasing Primary Plant Leakage," based on degrading primary plant conditions. Once the crew has determined that the leak is in Safeguards, the leak size will increase requiring a reactor trip. The crew will enter 1-E-0, "Reactor Trip or Safety Injection."

The leak size will continue to increase until a safety injection is required. Automatic safety injection will not occur and the crew will not be able to manually initiate safety injection. The "B" train of Phase A will also fail to actuate. The crew will need to take manual actions for these failures, including swapping to the RWST due to the earlier level transmitter failure. The crew will eventually transition to 1-ECA-1.2, "LOCA Outside Containment," and isolate the leak. The crew will transition to 1-E-1, "Loss of Reactor or Secondary Coolant." At this time the scenario can be terminated.

SCENARIO TURNOVER SHEET

Read the following to the crew:

Purpose: This examination is intended to evaluate the crew's performance of various tasks associated with the 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 100% power. RCS boron is 1017 ppm and core age is 9000 MWD/MTU. Aux steam is on unit 2.

Unit 2 is at 100% power.

Equipment Status:

1-FW-P-1B was tagged out last shift for motor bearing replacement. Maintenance rule window is green.

Shift Orders:

Maintain current plant conditions and support maintenance on 1-FW-P-1B.

EVENT 1: Given that the unit is at power and a PRZR spray valve has failed open, the crew will be expected to respond in accordance with 1-AP-44, "Loss of Reactor Coolant Pressure."		
TIME	EXPECTED ACTION	INSTRUCTOR REMARKS
	SPD Verified: _____ (Initials) <ul style="list-style-type: none"> • PRZR spray valve 1-RC-PCV-1455B has full open indication • Master pressure controller output decreases • PRZR pressure is decreases • Spray valve controller will not close valve • Annunciators B-F7 and B-H6 illuminate 	
	RO identifies annunciator B-F7, PRZ HI-LO PRESS and later B-H6, PRZ LO PRESS – BU HTRS ON.	
	RO identifies RCS pressure decreasing.	
	US directs crew to perform immediate actions of 1-AP-44: <ul style="list-style-type: none"> • RO checks PRZR PORVs closed (1-RC-PCV-1455C and 1456) • RO checks master pressure controller not failed • RO checks spray valves closed (1-RC-PCV-1455A and 1455B) • RO determines that 1-RC-PCV-1455B is open. 	
CT 1	Crew stops RCS pressure decrease: <ul style="list-style-type: none"> • RO attempts to manually close spray valve 1-RC-PCV-1455B • RO closes 1-RC-SOV-1455B (Remote Close SOV). 	*Prior to reaching an automatic reactor trip on low pressure Immediate action
	RO verifies all PRZR heaters are energized.	
	RO checks that 1-CH-HCV-1311, Aux spray valve, is closed.	
	RO checks PRZR safety valves closed and PORVs closed or isolated.	
	RO verifies RCS pressure stable or increasing.	
	RO verifies RCS pressure returned to normal.	
	US refers to TS 3.4.1 DNB, Action A (2 hour), if pressure went below 2205 psig. TS 3.4.11 and 3.4.13 are not applicable for this event.	

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

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

EVENT 2/2a: Given that the unit is at power and 1-AS-PT-105 has failed low, the crew will respond in accordance with 1-AP-38, "Excessive Load Increase."

TIME	EXPECTED ACTION	INSTRUCTOR REMARKS
	SPD Verified: _____ (Initials) <ul style="list-style-type: none"> • Reactor power increases • Tave decreases • Megawatts decrease • 1-AS-PI-105 indicates low • 1-AS-PCV-105 has 100% demand • Control rods don't insert automatically 	
	RO identifies that power is increasing and Tave is decreasing.	
	US directs crew to enter 1-AP-38.	
	RO verifies steam dumps closed. (1-MS-TCV-1408A – H)	
	BOP verifies SG PORVs indicate closed. (1-MS-PCV-101A-C)	
	Crew verifies main turbine load is normal and reactor power is $\leq 100\%$ and stable. (NO)	
	NOTE: It is possible that crew will start the ramp and then immediately close 1-AS-PCV-105.	
	BOP ramps turbine down to return power to previous level.	May use 1-GOP-1.0 attachment. Attached
	RO verifies proper auto rod control. (NO)	
	RO places rods in manual and controls Tave within 1.5°F of Tref.	
	RO energizes pressurizer heaters to maintain RCS pressure, as required.	
	BOP checks turbine load control: Crew verifies reactor power is reduced to the power level before the event started When power is returned to pre-event level BOP places turbine load control in IMP-IN by matching reference and setter and pressing the IMP-IN pushbutton.	
	*RO maintains rods above limits and AFD within limits using boration, as required.	
	Crew checks plant status – stable: <ul style="list-style-type: none"> • Main Generator output stable • Tave on program with Tref 	

EVENT 2/2a: Given that the unit is at power and 1-AS-PT-105 has failed low, the crew will respond in accordance with 1-AP-38, "Excessive Load Increase."		
TIME	EXPECTED ACTION	INSTRUCTOR REMARKS
	BOP checks steam flow channel indications are normal. (1-MS-FI-1474 and 1475, 1-MS-FI-1484 and 1485, 1-MS-FI-1494 and 1495.)	
	BOP checks turbine control in Operator Auto.	
	Crew checks plant steam systems: <ul style="list-style-type: none"> • SG PORVs closed on SPDS/Locally • Safety valves closed on SPDS/Locally • MSR inlet FCVs normal • 1-AS-PCV-105 operation normal (NO) • Plant steam systems intact. 	
	Crew identifies 1-AS-PCV-105 as being open and places it in manual and adjusts it.	
	Crew checks for RCS dilution due to demin operations, improper 1-CC-TCV-106 operation, or PG water leakby.	
	Crew verifies that cause of load increase is corrected.	
	RO checks steam dumps not in OFF/RESET.	
	US requests Work Control Center supervisor to inform the OMOC of the failures and initiate WRs and CRs.	
	NOTE: The next event may occur once the PCV is closed and power has been stabilized.	

EVENT 3: Given that the unit is at power and VCT level transmitter, 1-CH-LT-1112, has failed high, the crew will respond in accordance with the applicable annunciator response.

TIME	EXPECTED ACTION	INSTRUCTOR REMARKS
	SPD Verified: _____ (Initials) <ul style="list-style-type: none"> • Annunciator C-A4 illuminates • 1-CH-LI-1112 will indicate off-scale high • 1-CH-LCV-1112C output will go to zero • VCT level will decrease • "A" Stripper level will increase 	
	RO identifies annunciator C-A4, VCT HI-LO LEVEL L-112.	
	RO identifies 1-CH-LT-1112 is failed high and VCT is diverting to stripper.	
	US reads note in AR about 1-CH-LT-1112 failing high - loss of auto swapper capability on low VCT level, full divert to stripper.	
	RO places 1-CH-LCV-1112C in manual and raises output to 100%.	
	US reviews TS 3.4.13 (RCS leakage) which applied while letdown was diverting to the stripper.	
	US makes notifications about 1-CH-LT-1112 failure and requests instrument shop assistance along with WR, CR.	
	NOTE: The next event may occur once the letdown divert valve has been closed and crew has discussed loss of auto swapper capability to RWST on low VCT level, or at the discretion of the lead evaluator.	

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

TIME	EXPECTED ACTION	INSTRUCTOR REMARKS
	SPD Verified: _____ (Initials) <ul style="list-style-type: none"> • "C" SG steam pressure channel III fails high • "C" SG steam flow channel III indicates high • "C" MFRV ramps open • "C" SG level increases • Annunciators F-H1 and F-H2 illuminate • Status lights N-D3 and N-F3 illuminate 	
	BOP identifies annunciators F-H1, HI STM LINE DP SG 1A LO, and F-H2, HI STM LINE DP SG 1B LO.	
	US directs crew to perform immediate actions of 1-AP-3: BOP verifies redundant channels normal BOP checks SG water level control parameters BOP takes manual control of "C" SG water level Crew verifies first stage pressure indications normal RO verifies pressurizer level indications are normal.	
	Crew identifies "C" SG steam pressure channel III has failed along with "C" SG steam flow channel III.	
	RO verifies systems affected by PRZR level channels normal: <ul style="list-style-type: none"> • RO verifies operable pressurizer level channel selected • RO verifies emergency bus backup heaters are restored • RO verifies letdown in service • RO verifies pressurizer level control in AUTO • 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 4: Given that the unit is at power and a main steam pressure 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
	Crew swaps to operable SGWLC channels. <ul style="list-style-type: none"> • RO verifies control rods in manual • RO places steam dumps in either OFF or steam pressure mode • BOP checks all bypass MRFVs in manual • BOP places all MFRVs in manual • RO selects channel IV on all steam flow and feed flow channels and for first-stage pressure • 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: <ul style="list-style-type: none"> • RO places steam dump interlock switches to OFF reset • RO places steam dump controller to manual • RO places mode selector switch to steam press • RO ensure steam dump demand is zero • RO places steam dump controller to auto • RO verifies steam dump demand is zero • RO places both interlock switches to on. 	
	Crew verifies that "C" SG steam pressure channel III and "C" SG steam flow channel III are the only failed channels.	
	US reviews Tech Specs: 3.3.1 Function 15, Condition E 3.3.2 Functions 1e, f, g, 4d, and 4e Condition D. Determines that the channel must be placed in trip within 72 hours applies.	
	Crew identifies 1-MOP-55.77 and 1-MOP-55.79.	
	NOTE: After the crew has swapped channels and the US has referred to tech specs, the next event may occur.	

EVENT 5: Given that the unit is at power and indications exist of a leak outside containment, the crew will respond in accordance with 1-AP-16, "Increasing Primary Plant Leakage," and "1-E-0, "Reactor Trip or Safety Injection."

TIME	EXPECTED ACTION	INSTRUCTOR REMARKS
	SPD Verified: _____ (Initials) <ul style="list-style-type: none"> • RCS pressure and pressurizer level decrease • Charging flow increases • Annunciator A-C1 illuminates 	
	RO identifies charging flow increasing and PRZR level decreasing.	
	US directs entry into 1-AP-16.	
	Crew verifies unit in mode 1.	
	NOTE: Crew may initially determine that parameters are under control and not isolate letdown at this time. This is a continuous action step.	
	* RO verifies primary parameters under operator control: <ul style="list-style-type: none"> • PRZR level • RCS subcooling • VCT level. (NO) 	
	RO isolates letdown and maximizes charging flow.	
	RO commences a VCT makeup from the blender, as applicable.	
	RO checks 1-CH-LCV-1115A is not diverted.	
	RO verifies letdown in service with normal indications for: <ul style="list-style-type: none"> • Letdown flow • Non-regen HX outlet temperature • Regen HX outlet temperature • VCT temperature • VCT pressure • Auxiliary building General and Central radiation levels • Vent stack A radiation level. 	
	RO checks excess letdown temperature and pressure.	

EVENT 5: Given that the unit is at power and indications exist of a leak outside containment, the crew will respond in accordance with 1-AP-16, "Increasing Primary Plant Leakage," and "1-E-0, "Reactor Trip or Safety Injection."

TIME	EXPECTED ACTION	INSTRUCTOR REMARKS
	RO checks charging system parameters normal: <ul style="list-style-type: none"> • Charging pump discharge pressure • Charging flow • Regen HX outlet temperature • RCP seal injection flow • Auxiliary building sump level. 	
	Crew checks containment conditions normal: <ul style="list-style-type: none"> • Containment sump pumping rate • Containment temperature • Containment pressure • Containment radiation. 	
	Crew checks Safeguards area parameters: <ul style="list-style-type: none"> • No valve pit sump alarm • No safeguards sump alarm • Vent stack B radiation level normal • Safeguards area exhaust fan ambient temperature. 	
	Crew identifies that leak is located in the Safeguards building.	
	Crew dispatches operator to check safeguards area for leakage.	
	RO reports that pressurizer/VCT level cannot be maintained with letdown isolated.	
	NOTE: 0-AP-5.2 will be applicable once the "B" Vent stack RM alarms. This alarm is located on U-2 side.	
	NOTE: TS 3.4.13 (RCS Leakage) will be applicable.	
	NOTE: US may use 1-AP-16 steps to swap to RWST at this time. These steps are included in next event.	
	US directs crew to perform 1-E-0 immediate actions.	
	RO/BOP trip the reactor.	
	BOP verifies turbine trip.	
	RO verifies emergency busses are energized.	

EVENT 5: Given that the unit is at power and indications exist of a leak outside containment, the crew will respond in accordance with 1-AP-16, "Increasing Primary Plant Leakage," and "1-E-0, "Reactor Trip or Safety Injection."

TIME	EXPECTED ACTION	INSTRUCTOR REMARKS
	NOTE: It is possible that crew will choose to safety inject at this time depending on pressurizer pressure and level. In this case the crew will continue in 1-E-0. Leak will worsen 3 minutes after the reactor trips.	
	RO/BOP check is SI is required. (NO)	
	US announces transition to 1-ES-0.1.	
	NOTE: RO may identify need to swap to the RWST before the leak has worsened. Steps are included in next event.	
	US holds transient brief.	
	NOTE: The next event occurs 3 minutes after the reactor is tripped.	

EVENT 6: Given that the unit is shutdown and indications exist of a LOCA outside containment, the crew will respond in accordance with 1-E-0, "Reactor Trip or Safety Injection," and 1-ECA-1.2, "LOCA Outside Containment."

TIME	EXPECTED ACTION	INSTRUCTOR REMARKS
	SPD Verified: _____ (Initials) <ul style="list-style-type: none"> • RCS pressure and level decrease • Safeguards conditions worsen • Safety injection fails to actuate either automatically or manually • Train B of Phase A will fail to actuate manually 	
	RO identifies worsening RCS conditions.	
	US directs crew to initiate safety injection	Automatic/manual initiation of SI is disabled
	Crew attempts to manually initiate SI.	
	RO identifies that CAP item 2 applies (SI flow criteria).	CAP attached
	US directs crew to perform attachment 6 (Manual Verification of SI Flowpath).	Attached
	NOTE: Crew may have already done the steps for swapping to the RWST due to low level.	
CT 2	Crew establishes HHSI flow to the RCS per attachment 6: <ul style="list-style-type: none"> • Crew opens 1-CH-MOV-1115B or 1115D • Crew closes 1-CH-MOV-1115C or 1115E • Crew closes 1-CH-MOV-1289A or 1289B • Crew closes 1-SI-TV-1884A/B/C • Crew opens 1-SI-MOV-1867C or 1867D • Crew opens 1-SI-MOV-1867A or 1867B • Crew starts 1-CH-P-1B or 1C • Crew verifies SI flow indicated • Crew verifies SI flow aligned through BIT • Crew starts both LHSI pumps 	*Prior to completing the step directing its performance
	US initiates attachment 4 – Equipment Verification (Attachment 5 - Verification of SI and Phase A Isolation will be directed by attachment 4).	Attached

EVENT 6: Given that the unit is shutdown and indications exist of a LOCA outside containment, the crew will respond in accordance with 1-E-0, "Reactor Trip or Safety Injection," and 1-ECA-1.2, "LOCA Outside Containment."

TIME	EXPECTED ACTION	INSTRUCTOR REMARKS
	NOTE: The crew will actuate Phase A in attachment 4. Train B will not actuate. Equipment will have to be manually operated in attachment 5.	
	RO verifies HHSI flow.	
	Crew checks RCS pressure 225 psig [450 psig] and verifies LHSI pumps are flowing if required.	
	Crew verifies AFW flow indicated and > 340 GPM until NR level > 11% [22%] in any SG.	
	RO checks RCS average temperature: <ul style="list-style-type: none"> • Stable or trending to 547°F if controlling on steam dumps OR • Stable or trending to 551°F if controlling on PORVs. 	
	Crew adjusts AFW flow, as required.	
	*RO checks PRZR PORVs closed, spray valves closed or controlling pressure, and at least one PORV block valve open.	
	*RO checks RCP trip and charging pump recirc criteria: <ul style="list-style-type: none"> • RO checks RCS subcooling < 25°F [85°F] 	
	BOP checks SGs not faulted: All SG pressures > 80 psig and under control of operator. (YES)	
	BOP checks SGs not ruptured: No SG level increasing in an uncontrolled manner. (YES)	
	Crew checks if RCS is intact inside containment: <ul style="list-style-type: none"> • Containment pressure normal • Recirc spray sump level normal • Containment radiation normal. 	
	NOTE: If an operator was dispatched he will report that when door to Safeguards building was opened the room was filled with steam. He did not enter.	

EVENT 6: Given that the unit is shutdown and indications exist of a LOCA outside containment, the crew will respond in accordance with 1-E-0, "Reactor Trip or Safety Injection," and 1-ECA-1.2, "LOCA Outside Containment."

TIME	EXPECTED ACTION	INSTRUCTOR REMARKS
	Crew checks for outside containment inventory loss: <ul style="list-style-type: none"> • Vent stacks A and B radiation normal • Safeguards area sump level annunciators A-C1 and E-F8 NOT LIT • AB sump level annunciator E-F6 NOT LIT • Ambient Area temperature annunciator A-C4 NOT LIT. (NO for ANY of these kicks to RNO) 	
	US directs crew to transition to 1-ECA-1.2.	
CT 3	Crew isolates LOCA outside containment: <ul style="list-style-type: none"> • Crew verifies 1-SI-MOV-1890A and 1890B are closed. • Crew verifies SI accumulator sample isolation valves closed. (1-SI-HCV-1850A-F) • Crew closes LHSI pump cold-leg injection valves 1-SI-MOV-1890C and 1890D. • Crew closes LHSI pump discharge valves 1-SI-MOV-1864A and 1864B. 	*Before exiting 1-ECA-1.2.
	Crew checks RCS pressure increasing. (YES)	
	US directs crew to transition to 1-E-1.	
	NOTE: The scenario may be terminated after the crew isolates the leak, or as directed by the lead evaluator.	

REFERENCES

PROCEDURE	REV.
Abnormal Procedure 1-AP- 44, "Loss of Reactor Coolant System Pressure."	19
Abnormal Procedure 1-AP- 38, "Excessive Load Increase."	16
Abnormal Procedure 1-AP-3, "Loss of Vital Instrumentation."	24
Abnormal Procedure 1-AP-16, "Increasing Primary Leakage."	26
Abnormal Procedure 0-AP-5.2, "MGP Radiation Monitoring System."	22
Emergency Procedure 1-E-0, "Reactor trip or Safety Injection."	42
Emergency Procedure 1-E-1, "Loss of Reactor or Secondary Coolant."	24
Emergency Contingency Procedure 1-ECA-1.2, "LOCA Outside Containment."	6
Station Annunciator Response Procedures.	N/A
Guide and Reference Document PI-AA-5000, "Human Performance."	3
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
2010 NRC RUN 5

Initial conditions

1. Recall IC 191
2. Ensure Tave (575-585), Tref, PDDT level, and VCT level are selected on trend recorders.
3. Close discharge MOV, open power supply for MOV, and rack out breakers for 1-FW-P-1B.
4. Place stickers on switches for 1-FW-P-1B and discharge MOV.
5. Designate 2H as the protected train.

PRELOADS PRIOR TO SCENARIO START

CONDITION	MALFUNCTION/OVERRIDE/ETC.
SI does not occur automatically or manually	Malfunctions: SI0701 SI0702
Train B of Phase A does not actuate	Malfunction: SI1304

SCENARIO EVENTS

EVENT	MALFUNCTION/OVERRIDE/COMMUNICATIONS
1) Pressurizer spray valve failure	Malfunction: RC2002, Delay time = 5, Value = True, Trigger = 1 NOTE: The next event may occur after the crew has returned RCS pressure to normal and TS have been reviewed.
2) Failure of 1-AS-PT-105	Malfunction: AS01, Delay time = 5, Ramp = 30, Severity= -1, Trigger = 2 RD14, Trigger = 2 NOTE: If Unit 2 is contacted about AS pressure, can report that it is pegged high initially. After PCV is closed it returns to 200 psig. NOTE: The next event may occur once the PCV is closed and power has been stabilized.

EVENT	MALFUNCTION/OVERRIDE/COMMUNICATIONS
3) 1-CH-LT-1112 fails high	<p>Malfunction: CH1201, Delay time = 5, Ramp = 10, Severity = 1, Trigger = 3</p> <p>NOTE: The next event may occur once the letdown divert valve has been closed.</p>
4) "C" SG steam pressure channel III fails high	<p>Malfunction: MS1705, Delay time = 5, Ramp = 5, Severity = 1, Trigger = 4</p> <p>NOTE: The next event can occur once the redundant channel is selected, the MOPs are identified, and the US has reviewed Tech Specs.</p>
5) Leak outside containment in Safeguards	<p>Malfunction: SI16, Delay time = 5, Ramp = 180, Severity = 16, Trigger = 5</p> <p>NOTE: The next event will occur 3 minutes after the reactor is tripped.</p>
6) LOCA outside containment	<p>Update malfunction: Set up trigger 6 to update leak malfunction 3 minutes after the reactor is tripped: RX_RTA_52.EQ.0 IMF SI16 (6 180) 100 30</p> <p>NOTE: If sent to Safeguards building, report that you opened the door and saw a lot of steam. At that time you re-closed the door and did not enter.</p> <p>NOTE: The scenario may be terminated after the crew isolates the leak, or as directed by the lead evaluator.</p>

ATTACHMENT 2
SCENARIO PERFORMANCE OBJECTIVES

SIMULATOR REQUALIFICATION EXAMINATION

TERMINAL PERFORMANCE OBJECTIVE

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

GENERIC PERFORMANCE OBJECTIVES

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

EVENT 1 PERFORMANCE OBJECTIVES

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

NORTH ANNA SPECIFIC TASKS:

R634 Respond to a loss of Reactor Coolant System Pressure

S70 Evaluate compliance with Technical Specifications

CRITICAL TASK:

See next page

CT Statement:

Crew stops RCS pressure decrease.

Safety Significance:

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

Cues:

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

Performance Indicator:

RO places REMOTE CLOSE SOV in CLOSE for associated spray

Feedback:

RCS pressure decrease stopped.

WOG Reference:

N/A

Conditions:

Prior to reaching an automatic reactor trip on low pressure.

EVENT 2 PERFORMANCE OBJECTIVES

EVENT GOAL: Given that the unit is at power and 1-AS-PT-105 has failed low, 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 3 PERFORMANCE OBJECTIVES

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

NORTH ANNA SPECIFIC TASKS:

None

CRITICAL TASK:

N/A

EVENT 4 PERFORMANCE OBJECTIVES

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

NORTH ANNA SPECIFIC TASKS:

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

S70 Evaluate compliance with Technical Specifications

CRITICAL TASK:

N/A

EVENT 5 PERFORMANCE OBJECTIVES

EVENT GOAL: Given that the unit is at power and indications exist of a leak outside containment, the crew will respond in accordance with 1-AP-16, "Increasing Primary Plant Leakage," and "1-E-0, "Reactor Trip or Safety Injection."

NORTH ANNA SPECIFIC TASKS:

- R520 Respond to increasing primary-plant leakage
- R18 Perform the immediate operator actions in response to a reactor trip or safety injection
- R727 Perform the phase A isolation verification following a safety injection actuation
- R730 Verify safety injection flow

- S70 Evaluate compliance with Technical Specifications

CRITICAL TASK:

See next page

CT Statement:

Crew establishes HHSI flow to the RCS.

Safety Significance:

Failure to establish HHSI flow constitutes a "mis-operation or incorrect crew performance which leads to degraded ECCS capacity."

Cues:

Indication/annunciation of:
PRZR level requiring SI

- no HHSI flow
- no HHSI pumps running

Performance Indicator:

RO/BOP manually aligns valves to establish charging pump cold leg injection.

- RO opens 1-CH-MOV-1115B or 1115D
- RO closes 1-CH-MOV-1115C or 1115E
- BOP closes 1-SI-TV-1884A/B/C
- BOP opens 1-SI-MOV-1867C or 1867 D
- BOP 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 completing the step directing its performance.

EVENT 6 PERFORMANCE OBJECTIVES

EVENT GOAL: Given that the unit is shutdown and indications exist of a LOCA outside containment, the crew will respond in accordance with 1-E-0, "Reactor Trip or Safety Injection," and 1-ECA-1.2, "LOCA Outside Containment."

NORTH ANNA SPECIFIC TASKS:

R727 Perform the phase A isolation verification following a safety injection actuation
R730 Verify safety injection flow
R761 Respond to a LOCA outside containment

CRITICAL TASK:

See next page

CT Statement:

Crew isolates LOCA outside containment.

Safety Significance:

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

Cues:

- *Indication/annunciation that SI is actuated and is required and
- *Indication and/or annunciation of abnormally high temperature in the safeguards building and
- *Indication and/or annunciation of abnormally high sump level in the safeguards building

Performance Indicator:

BOP closes LHSI pump Cold Leg Injection valves.

* 1-SI-MOV-1890C

* 1-SI-MOV-1890D

Feedback:

- RCS pressure increasing.

WOG Reference:

ECA-1.2 -- A Background

Conditions:

Before procedure transition.

ATTACHMENT 3
SIMULATOR PERFORMANCE DATASHEET

Scenario Performance Datasheet

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

SPD Verified: _____ (Initials)

- PRZR spray valve 1-RC-PCV-1455B has full open indication
- Master pressure controller output decreases
- PRZR pressure is decreases
- Spray valve controller will not close valve
- Annunciators B-F7 and B-H6 illuminate

EVENT 2: Given that the unit is at power and 1-AS-PT-105 has failed low, the crew will respond in accordance with 1-AP-38, "Excessive Load Increase."

SPD Verified: _____ (Initials)

- Reactor power increases
- Tave decreases
- Megawatts decrease
- 1-AS-PI-105 indicates low
- 1-AS-PCV-105 has 100% demand
- Control rods don't insert automatically

EVENT 3: Given that the unit is at power and VCT level transmitter, 1-CH-LT-1112, has failed high, the crew will respond in accordance with the applicable annunciator response.

SPD Verified: _____ (Initials)

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

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

SPD Verified: _____ (Initials)

- "C" SG steam pressure channel III fails high
- "C" SG steam flow channel III indicates high
- "C" MFRV ramps open
- "C" SG level increases
- Annunciators F-H1 and F-H2 illuminate
- Status lights N-D3 and N-F3 illuminate

Scenario Performance Datasheet

EVENT 5: Given that the unit is at power and indications exist of a leak outside containment, the crew will respond in accordance with 1-AP-16, "Increasing Primary Plant Leakage," and "1-E-0, "Reactor Trip or Safety Injection."

SPD Verified: _____ (Initials)

- RCS pressure and pressurizer level decrease
- Charging flow increases
- Annunciator A-C1 illuminates

EVENT 6: Given that the unit is shutdown and indications exist of a LOCA outside containment, the crew will respond in accordance with 1-E-0, "Reactor Trip or Safety Injection," and 1-ECA-1.2, "LOCA Outside Containment."

SPD Verified: _____ (Initials)

- RCS pressure and level decrease
- Safeguards conditions worsen
- Safety injection fails to actuate either automatically or manually
- Train B of Phase A will fail to actuate manually

DOMINION
NORTH ANNA POWER STATION

INITIAL LICENSED OPERATOR EXAMINATION

SIMULATOR EXAMINATION GUIDE
SCENARIO 2010 NRC RUN 6

SIMULATOR EXAMINATION GUIDE

<u>EVENT</u>	<u>DESCRIPTION</u>
1.	Leak on letdown line in Auxiliary building
1a.	Place excess letdown in service
2.	Nitrogen leak on "A" Accumulator
3.	"H" Steam dump fails open
4.	"C" SG level channel III fails high
5.	Steam leak on 40" manifold
5a.	Unit power reduction due to steam leak
6.	Steam break at 40" manifold requiring reactor trip

Scenario Recapitulation:

Malfunctions after EOP entry	3	Turbine doesn't trip automatically, "C" MSTV doesn't close, "C" NRV thermals out
Total Malfunctions	9	Leak on letdown line in Auxiliary building, nitrogen leak on "A" Accumulator, "H" Steam dump fails open, "C" SG level channel III fails high, steam leak on 40" manifold, steam break at 40" manifold requiring reactor trip, turbine doesn't trip automatically, "C" MSTV doesn't close, "C" NRV thermals out
Abnormal Events	5	leak on letdown line in Auxiliary building, nitrogen leak on "A" Accumulator, "H" Steam dump fails open, "C" SG level channel III fails high, steam leak on 40" manifold
Major Transients	1	Steam break at 40" manifold
EOPs Entered	2	1-E-2, 1-ES-1.1
EOP Contingencies	0	
Critical Tasks	3	

SCENARIO DURATION

90 Minutes

SIMULATOR EXAMINATION SCENARIO SUMMARY

SCENARIO 2010 NRC RUN 6

Scenario begins with unit at 100% power. 1-FW-P-3A was tagged out last shift for motor bearing replacement. Shift orders are to maintain current plant conditions and support maintenance on 1-FW-P-3A.

The first event will be a leak on the letdown line in the Auxiliary building. The crew will enter 1-AP-16, "Increasing Primary Plant Leakage," and isolate the leak. They will place excess letdown in service using 1-OP-8.5, "Operation of Excess Letdown." The US will review Tech Specs for primary plant leakage.

The second event will be triggered with event 1 and cause a PCS alarm about 20 minutes later. The event is a slow nitrogen leak on the "A" SI Accumulator. The crew will enter 1-OP-7.3, "Filling, Sluicing, Draining, Pressurizing, and Venting SI Accumulators," and re-pressurize the accumulator with nitrogen. The US will review Tech Specs. Once the accumulator pressure is back in spec, the next event can occur.

The "H" steam dump will slowly fail open. The crew will enter 1-AP-38, "Excessive Load Increase," and turn the steam dumps off. An operator should be dispatched to locally isolate the steam dump, the will allow the crew to return the dumps to normal. At this time, the next event can occur.

Level channel III on "C" SG will fail high causing the "C" MFRV to ramp closed. The crew will enter 1-AP-3, "Loss of Vital Instrumentation," and the BOP will take manual control of the "C" MFRV. Once the crew has identified the correct MOP and the US has reviewed Tech Specs, the next event can occur. The MFRV will remain in manual.

A steam leak will occur on the 40" manifold in the turbine building. The crew will enter 1-AP-38, "Excessive Load Increase," and ramp the unit back. Once a sufficient reactivity manipulation has been observed the next event can occur.

The steam leak will worsen and require the reactor to be tripped. The crew will enter 1-E-0, "Reactor Trip or Safety Injection." The turbine will not trip automatically, but can be tripped manually with the pushbuttons. The "C" MSTV will not close and the crew will try to isolate using the NRV. The NRV will thermal out. The crew will transition to 1-E-2, "Faulted Steam Generator," isolate the SG, and eventually to 1-ES-1.1, "SI Termination." Once safety injection has been terminated the scenario can be stopped.

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 100% power. RCS boron is 1017 ppm and core age is 9000 MWD/MTU. Aux steam is on unit 2.

Unit 2 is at 100% power.

Equipment Status:

1-FW-P-3A was tagged out last shift for motor bearing replacement. Maintenance rule window is green.

Shift Orders:

Maintain current plant conditions and support maintenance on 1-FW-P-3A.

EVENT 1/1a: Given that the unit is at power, and indications exist of a letdown leak outside containment, the crew will be expected to respond in accordance with 1-AP-16, "Increasing Primary Plant Leakage."

TIME	EXPECTED ACTION	INSTRUCTOR REMARKS
	SPD Verified: _____ (Initials) <ul style="list-style-type: none"> • Letdown flow decreases on 1-CH-FI-1150 • VCT level steadily decreases • Auxiliary building sump level steadily increases 	
	RO identifies decrease in letdown flow.	
	RO identifies decrease in VCT level.	
	BOP identifies increase in Aux building sump level.	
	Crew directs an operator to walkdown the Auxiliary Building and look for primary leaks.	
	US directs entry into 1-AP-16.	
	Crew verifies unit in mode 1.	
	RO verifies primary parameters under operator control. (YES)	
	RO checks LCV-1115A not diverted.	
	NOTE: If sent, operator will report that a leak exists on the letdown piping in the Auxiliary Building penetration area. If the leak is already isolated, he will report that the floor is wet back at the letdown penetration.	
	RO verifies letdown in service with normal indications. (NO)	
	Crew isolates letdown and minimizes/isolates charging.	
	Crew verifies that the leak stopped.	
	NOTE: Crew will initiate 1-OP-8.5 while continuing with 1-AP-16.	

EVENT 1/1a: Given that the unit is at power, and indications exist of a letdown leak outside containment, the crew will be expected to respond in accordance with 1-AP-16, "Increasing Primary Plant Leakage."

TIME	EXPECTED ACTION	INSTRUCTOR REMARKS
1a	Crew places excess letdown in service using 1-OP-8.5: <ul style="list-style-type: none"> • Closes 1-CH-HCV-1137 • Verifies 1-CH-MOV 1380 and 1381 are open • Has operator energize loop drains • Places 1-CH-HCV-1389 in VCT position • Deletes F0134A point from processing, as necessary • Places 1-CH-FCV-1122 in manual and closes • Opens a loop drain valve • Opens 1-CH-HCV-1201 • Slowly opens 1-CH-HCV-1137 • Maintains parameters 	Normal
	US directs WCC to make notifications and initiate WR and CR.	
	US reviews RCS leakage Tech Spec 3.4.13 Action A (4 hours). Applicable until letdown was isolated and the leak stopped.	
	Crew initiates leak rate PT.	
	NOTE: Event 2 was inserted with event 1 and will be handled when it is identified.	

EVENT 2: Given that the plant is at power and a nitrogen leak has developed on an accumulator, the crew will respond in accordance with 1-OP-7.3, "Filling, Sluicing, Draining, Pressurizing, and Venting SI Accumulators."

TIME	EXPECTED ACTION	INSTRUCTOR REMARKS
SPD Verified: _____ (Initials) • "A" accumulator pressure decreasing		
	BOP identifies that "A" accumulator pressure is decreasing.	
	US directs crew to pressurize the accumulator using 1-OP-7.3.	
	BOP pressurizes "A" SI accumulator: <ul style="list-style-type: none"> • Places 1-SI-HIC-100 at 0% • Opens 1-SI-TV-100 • Slowly increases output of 1-SI-HIC-100 • Opens 1-SI-HCV-1853A • Monitors pressure for desired pressure • Places 1-SI-HIC-100 at 0% • Closes 1-SI-HCV-1853A • Closes 1-SI-TV-100 • Places 1-SI-HIC-100 at 100% 	
	US reports nitrogen leak to WCC and requests WR, CR.	
	NOTE: Depending on when the crew identifies the nitrogen pressure decreasing and how long it takes them to start the makeup, the following TS may or may not be applicable.	
	US reviews TS 3.5.1 and determines that accumulator pressure must be kept ≥ 599 psig or returned within 1 hour.	
	NOTE: The next event can occur once accumulator is being pressurized and TS have been reviewed.	

EVENT 3: Given that the unit is at power and a steam dump has failed open, the crew will be expected to respond in accordance with 1-AP-38, "Excessive Load Increase."

TIME	EXPECTED ACTION	INSTRUCTOR REMARKS
SPD Verified: _____ (Initials) <ul style="list-style-type: none"> • "A" steam dump shows mid-position • Reactor power increases (magnitude is dependent on how long valve open) • Tave decreases • Megawatts decrease 		
	Crew identifies increase in reactor power or steam dump "H" indicating partially open.	
	US directs crew to enter 1-AP-38.	
	RO checks steam dumps closed. (NO)	
CT1	RO takes steam dumps to OFF.	*Prior to a reactor trip signal being generated
	BOP verifies all SG PORVs closed.	
	BOP verifies main turbine load normal.	
	Crew verifies reactor power less than or equal to 100% and stable.	
	RO verifies proper rod operation.	
	RO energizes pressurizer heaters as necessary to maintain RCS pressure.	
	BOP checks turbine load control.	
	BOP places turbine in IMP-IN, when directed.	
	RO maintains control rods above lo/lo-lo limits and AFD alarm clear.	
	Crew checks plant status stable.	
	BOP checks steam flow channel indications are normal.	
	BOP checks turbine control in operator auto.	
	NOTE: If an operator was dispatched to the steam dump, he will report an air demand signal of 9#.	

EVENT 3: Given that the unit is at power and a steam dump has failed open, the crew will be expected to respond in accordance with 1-AP-38, "Excessive Load Increase."

TIME	EXPECTED ACTION	INSTRUCTOR REMARKS
	Crew checks plant steam systems: <ul style="list-style-type: none"> • SG PORVs and safeties • MSR inlets • MS to AS PCV • Plant steam systems. 	
	Crew checks for RCS dilution.	
	NOTE: Crew may direct an operator to isolate air to steam dump to allow steam dumps to be returned to service.	
	Crew verifies cause for load increase has been corrected.	
	RO checks steam dump interlock switches in OFF/RESET.	
	NOTE: If crew has isolated the failed steam dump then they may return steam dumps to Tave mode.	
	Crew verifies steam dumps available.	
	RO places steam dumps in Tave mode, if applicable.	
	US directs WCC to make notification and submit WR and CR.	
	NOTE: The next event can occur once the unit is stable.	

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

TIME	EXPECTED ACTION	INSTRUCTOR REMARKS
SPD Verified: _____ (Initials) <ul style="list-style-type: none"> • Annunciators F-F3 and F-B3 are illuminated. • "C" Channel III SG level indicator (1-FW-LI-1496) is indicating off-scale low • "C" MFRV ramps open and "C" SG level increases 		
	BOP identifies annunciators 1F-F3, SG 1C LEVEL ERROR, and 1F-B3, STM GEN 1C LO-LO LEVEL CH I, II, III.	
	BOP identifies "C" SG level channel III has failed low and notifies US.	
	US directs entry into 1-AP-3.	
	BOP checks redundant instrumentation normal.	
	BOP checks SGWLC parameters normal. (NO)	
	BOP takes manual control of the "C" MFRV to restore SG level.	
	Crew verifies first-stage pressure indications normal.	
	RO verifies PRZR level channels normal.	
	RO verifies systems affected by pressurizer level channels are normal.	
	Crew verifies both turbine first stage pressure channels normal.	
	Crew verifies operable channels selected for SGWLC.	
	NOTE: The MFRV must remain in manual for this failure.	
	Crew verifies no other inoperable channels.	
	US references technical specifications: 3.3.1 Function 14, 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	
	Crew identifies 1-MOP-55.76.	
	US requests WCC to make notifications and submit WR and CR.	

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

TIME	EXPECTED ACTION	INSTRUCTOR REMARKS
	NOTE: The next event can occur after the crew has identified the appropriate MOP and the US has reviewed TS.	

EVENT 5: Given that the unit is at power, and a steam leak outside containment has occurred, the crew will be expected to respond in accordance with 1-AP-38, "Excessive Load Increase."

TIME	EXPECTED ACTION	INSTRUCTOR REMARKS
SPD Verified: _____ (Initials) <ul style="list-style-type: none"> • Reactor power increases • Tave decreases • RCS pressure and pressurizer level decrease • MW decrease 		
	RO identifies reactor power increasing unexpectedly.	
	BOP identifies megawatts decreasing.	
	US directs crew to enter 1-AP-38.	
	RO verifies all steam dumps closed.	
	BOP verifies all SG PORVs closed.	
	Crew verifies main turbine load normal and reactor power \leq 100% and stable. (NO)	
	NOTE: If an operator is dispatched then the leak will be reported as being in the turbine building in the vicinity of the 40" header. If not, someone should report it within 5 minutes.	
	RO commences lowering Tave using boration/control rods.	
	BOP commences lowering main turbine load.	
	Crew checks reactor power reduced to the power level before the event started.	
	NOTE: If the crew decides to trip the reactor at this time, the next event will occur at that time.	
	NOTE: The next event can occur once the crew has stabilized reactor power or decided to trip the unit.	

EVENT 6: Given that a steam leak outside containment has increased to a steam break, the crew will be expected to respond in accordance with 1-E-0, "Reactor Trip or Safety Injection," and 1-ES-1.1, "SI Termination."

TIME	EXPECTED ACTION	INSTRUCTOR REMARKS
SPD Verified: _____ (Initials)		
<ul style="list-style-type: none"> • Reactor power increases • Tave decreases • RCS pressure and pressurizer level decrease • MW decrease • Turbine does not automatically trip 		
	RO identifies degradation of primary plant parameters.	
	US directs crew to perform immediate actions of 1-E-0.	
	RO/BOP manually trip reactor.	
CT2	BOP trips turbine: <ul style="list-style-type: none"> • Presses manual trip pushbuttons 	*Prior to a severe challenge (orange path) to subcriticality or integrity CSFs <u>OR</u> transition to ECA-2.1
	RO verifies AC emergency busses energized.	
	Crew checks if SI is actuated or required. (YES)	
	Crew manually actuates safety injection.	
	RO reviews CAP items 1-6.	Attached
	NOTE: If crew does not close MSTVs, a phone call will be made about steam blowing out in the turbine building. The "C" MSTV will not close. The attempt to close the NRV will be by either attachment 8 or 1-E-2.	
	Crew isolates steam leak: Crew closes "A" and "B" MSTVs Crew attempts to close 1-MS-NRV-101C	"C" MSTV will not close. "C" NRV will thermal out
	US holds transient brief.	
	US initiates attachment 4(5) and 7.	Attached
	NOTE: The following steps are from attachment 7 of 1-E-0.	

EVENT 6: Given that a steam leak outside containment has increased to a steam break, the crew will be expected to respond in accordance with 1-E-0, "Reactor Trip or Safety Injection," and 1-ES-1.1, "SI Termination."

TIME	EXPECTED ACTION	INSTRUCTOR REMARKS
CT3	Crew isolates faulted SG: Crew identifies faulted SG as "C" Crew verifies all MSTVs closed (NO) Crew closes all SG Non-Return valves and NRV bypasses Crew isolates Main feedwater Crew closes 1-FW-HCV-100C Crew verifies affected SG PORVs closed.	*Prior to exiting 1 E-2
	RO verifies SI flow.	E-0 steps
	Crew verifies AFW flow.	
	RO checks RCS Tave stable at or trending to 547°F.	
	Crew adjusts AFW flow, as required.	
	RO checks PRZR PORVs and spray valves.	
	RO checks RCP trip and charging pump recirc criteria.	
	RO verifies RCPs are stopped.	
	RO verifies charging pump recirc valves closed.	
	BOP checks SGs not faulted. (NO)	
	US directs transition to 1-E-2.	
	Crew verifies MS isolation.	
	Crew closes all SG NRVs, if not previously closed.	
	NOTE: If the "A" and "B" NRVs were not closed previously, it is possible the crew will transition to 1-ECA-2.1. The CAP will return them to E-2 once any SG pressure is increasing.	
	Crew checks pressure in all SGs.	
	Crew identifies faulted SG as "C."	

EVENT 6: Given that a steam leak outside containment has increased to a steam break, the crew will be expected to respond in accordance with 1-E-0, "Reactor Trip or Safety Injection," and 1-ES-1.1, "SI Termination."

TIME	EXPECTED ACTION	INSTRUCTOR REMARKS
	Crew verifies attachment 7 of 1-E-0 is complete. (If not, crew will isolate feed sources.)	
	Crew verifies SG BD TVs are closed.	
	Crew initiates attachment for local operations.	
	Crew checks ECST level is > 40%.	
	Crew verifies outside IA supplying containment.	
	Crew checks secondary radiation: <ul style="list-style-type: none"> • RO resets SI, Phase A, and AMSAC • Crew checks last known SG blowdown radiation • Crew checks last known AE radiation • Crew checks MS line and Terry turbine radiation. 	
	Crew checks if SI can be terminated: <ul style="list-style-type: none"> • RCS subcooling > 25°F • Secondary heat sink • RCS pressure stable or increasing • Pressurizer level > 21% 	
	US announces transition to 1-ES-1.1, step 1.	
	RO resets both trains of SI.	
	RO stops one charging pump.	
	Crew checks RCS pressure stable or increasing.	
	Crew isolates BIT: <ul style="list-style-type: none"> • Verify/open 1-CH-MOV-1373 • Verify/open 1-CH-MOV-1275A/B/C • Close BIT inlet isolations 1-SI-MOV-1867A/B • Close BIT outlet isolations 1-SI-MOV-1867C/D • Verify 1-SI-MOV-1836, 1869A and 1869B are closed. 	
	NOTE: The scenario can be stopped once SI is terminated in 1-ES-1.1.	No EAL

REFERENCES

PROCEDURE	REV.
Operating Procedure 1-OP-7.3, "Filling, Sluicing, Draining, Pressurizing, and Venting SI Accumulators."	50-P2
Operating Procedure 1-OP-8.5, "Operation of Excess Letdown."	20
Abnormal Procedure 1-AP-16, "Increasing Primary Plant Leakage."	26
Abnormal Procedure 1-AP-38, "Excessive Load Increase."	16
Abnormal Procedure 1-AP-3, "Loss of Vital Instrumentation."	24
Maintenance Operating Procedure 1-MOP-55.76, "Steam Generator Level."	7
Emergency Procedure 1-E-0, "Reactor Trip or Safety Injection."	42
Emergency Procedure 1-E-2, "Faulted SG Isolation."	12
Emergency Procedure 1-ES-1.1, "SI Termination."	21
Station Annunciator Response Procedures.	N/A
Guide and Reference Document PI-AA-5000, "Human Performance."	3
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
2010 NRC RUN 6

Initial conditions

1. Recall IC 192
2. Ensure Tave (575-585), Tref, PDTT level, and VCT level are selected on trend recorders.
3. Rackout 1-FW-P-3A pump breaker and close discharge valve.
4. Place sticker on 1-FW-P-3A.
5. Designate 1J as the protected train.

PRELOADS PRIOR TO SCENARIO START

CONDITION	MALFUNCTION/OVERRIDE/ETC.
Failure of turbine to trip automatically	Malfunction: TU03
"C" MSTV doesn't close "C" NRV thermals out	Malfunction: MS0503 Switch Overrides: MSTV_APP_R_CLOSE, Override = OFF MOV Control: Set up trigger 15 on trigger screen to actuate when the NRV is about 50% closed MSNRV101C.LE. 0.5 MSNRV101C_RACKIN = RACKOUT, Trigger = 15

SCENARIO EVENTS

EVENT	MALFUNCTION/OVERRIDE/COMMUNICATIONS
1) Letdown leak	<p>Malfunction: CH02, Delay time = 5, Ramp = 120, Severity = 100, Trigger = 1</p> <p>NOTE: When sent to penetration area, give a cue for current plant conditions, if leak not isolated then water is leaking out, if isolated then floor is wet and pipes are dripping water. Can later report that leak was downstream of 1-CH-TV-1204B.</p> <p>Remote function: HCV1557_ENERGIZE = T, Trigger = 20</p> <p>NOTE: The next event is on the same trigger and will be handled when it is identified.</p>
2) "A" accumulator nitrogen leak	<p>Malfunction: SI0101, Delay time = 5, Ramp = 30, Severity = 10, Trigger = 1</p> <p>NOTE: The next event can occur once accumulator is being pressurized and TS have been reviewed.</p>

EVENT	MALFUNCTION/OVERRIDE/COMMUNICATIONS
3) Steam dump failure	<p>Remote Function: MSTCV408H_DESD, Severity = 50, Trigger = 3</p> <p>NOTE: Setup a trigger 9 to close the valve once when a steam dump switch is taken to OFF:</p> <p>Trigger 9 SD2A_OFF_RESET(1) .EQ. 1 .OR. SD2B_OFF_RESET .EQ. 1 Command: IRF MSTCV408H_DESD 0</p> <p>NOTE: If sent to investigate, the TB operator can report a 9# air demand signal on the valve.</p> <p>NOTE: If directed to isolate air, report that air is isolated and valve is closed. (1-IA-1046 is air isolation valve to "H" steam dump.)</p> <p>NOTE: If directed to isolate air then insert trigger 10 after air is isolated.</p> <p>Lamp Overrides: (To give indication that 1-MS-TCV-1408H remains closed on reactor trip.)</p> <p>TCV408H_GREEN, Override = ON, Trigger = 10 TCV408H_RED, Override = OFF, Trigger = 10</p> <p>NOTE: 1-MS-168 manually isolates "B" steam dump header.</p> <p>NOTE: The next event will occur once the unit is stable, or at the direction of the lead evaluator.</p>
4) "C" SG level transmitter failure	<p>Malfunction: FW0109, Delay time = 5, Ramp = 5, Severity = -1, Trigger = 4</p> <p>NOTE: The next event can occur after the crew has identified the appropriate MOP and the US has reviewed TS.</p>

EVENT	MALFUNCTION/OVERRIDE/COMMUNICATIONS
5) Steam leak on 40" manifold	<p>Malfunctions: MS0901, Delay time = 5, Ramp = 60, Severity = 0.5, Trigger = 5 MS0902, Delay time = 5, Ramp = 60, Severity = 0.5, Trigger = 5 MS0903, Delay time = 5, Ramp = 60, Severity = 0.5, Trigger = 5</p> <p>NOTE: Once crew has identified the possibility of a steam leak: Call the control room as a mechanic or operator and tell the crew that you can see steam blowing up at the 40" manifold.</p> <p>NOTE: The next event can occur once the crew has stabilized reactor power or decided to trip the unit.</p>
6) Steam rupture at 40" manifold	<p>Update malfunction MS0903 to 10% over 30 seconds using trigger 6. IMF MS0903 (6 0) 10 30</p> <p>NOTE: If crew does not close MSTVs after tripping reactor and turbine, call and report steam blowing across the turbine building mezzanine.</p> <p>NOTE: Scenario can be stopped once crew has performed steps in 1-ES-1.1</p>

ATTACHMENT 2
SCENARIO PERFORMANCE OBJECTIVES

SIMULATOR REQUALIFICATION EXAMINATION

TERMINAL PERFORMANCE OBJECTIVE

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

GENERIC PERFORMANCE OBJECTIVES

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

EVENT 1 PERFORMANCE OBJECTIVES

EVENT GOAL: Given that the unit is at power, and indications exist of a letdown leak outside containment, the crew will be expected to respond 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 2 PERFORMANCE OBJECTIVES

EVENT GOAL: Given that the plant is at power and a nitrogen leak has developed on an accumulator, the crew will respond in accordance with 1-OP-7.3, "Filling, Sluicing, Draining, Pressurizing, and Venting SI Accumulators."

NORTH ANNA SPECIFIC TASKS:

R589 Pressurize a safety injection accumulator

CRITICAL TASK:

N/A

EVENT 3 PERFORMANCE OBJECTIVES

EVENT GOAL: Given that the unit is at power and a steam dump has failed open, the crew will be expected to 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:

See Next page

CT Statement:

Crew stops power increase.

Safety Significance:

Failure to stop power increase and coolant temperature decrease would cause average coolant temperature to drop below the minimum temperature for criticality, and the following can not be assured : 1) Moderator temperature coefficient is within its analyzed temperature range, 2) Protective instrumentation is within its normal operating range, 3) P-12 interlock is above its setpoint, and 4) Compliance with Appendix G to 10 CFR part 50.

Cues:

Indication of power increase:

- * Several annunciators. (i.e. PRZR Hi/Lo Press, PRZR Lo Level)
- * Reactor power increasing.
- * Steam flow increasing.

Performance Indicator:

RO places both steam dump interlock switches to off/reset.

Feedback:

Reactor power increase stopped
Steam dumps indicate closed
Steam flow decreased

WOG Reference:

None

Conditions:

Prior to receiving an automatic reactor trip on over power.

EVENT 4 PERFORMANCE OBJECTIVES

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

NORTH ANNA SPECIFIC TASKS:

R626 Respond to a steam generator water level control channel failure

S70 Evaluate compliance with technical specifications.

CRITICAL TASK:

N/A

EVENT 5 PERFORMANCE OBJECTIVES

EVENT GOAL: Given that the unit is at power, and a steam leak outside containment has occurred, the crew will be expected to 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 6 PERFORMANCE OBJECTIVES

EVENT GOAL: Given that a steam leak outside containment has increased to a steam break, the crew will be expected to respond in accordance with 1-E-0, "Reactor Trip or Safety Injection," and 1-ES-1.1, "SI Termination."

NORTH ANNA SPECIFIC TASKS:

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

R189 Terminate safety injection

R727 Perform the phase A isolation verification following a safety injection actuation

CRITICAL TASK:

See following pages

CT Statement:

Crew manually trips the turbine.

Safety Significance:

Failure to trip the turbine under the postulated conditions would cause an additional RCS cooldown beyond that irreparably introduced by the scenario.

Cues:

Indication/annunciation that a reactor trip has occurred
Indication that the turbine did not automatically or manually trip.
Indication of rapidly decreasing RCS temperatures

Performance Indicator:

BOP places both EHC pumps in PTL OR manually runback turbine

Feedback:

Annunciation/indication that all turbine stop valves are closed.

WOG Reference:

E-0 -- Q Background

Conditions:

Prior to a severe challenge (orange path) to subcriticality or integrity CSFs OR transition to ECA-2.1.

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:

- * "B" 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-HCV-100C to secure AFW flow to "C" steam generator.

Feedback:

AFW flow indication to "C" 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 power, and indications exist of a letdown leak outside containment, the crew will be expected to respond in accordance with 1-AP-16, "Increasing Primary Plant Leakage."

SPD Verified: _____ (Initials)

- Letdown flow decreases on 1-CH-FI-1150
- VCT level steadily decreases
- Auxiliary building sump level steadily increases

EVENT 2: Given that the plant is at power and a nitrogen leak has developed on an accumulator, the crew will respond in accordance with 1-OP-7.3, "Filling, Sluicing, Draining, Pressurizing, and Venting SI Accumulators."

SPD Verified: _____ (Initials)

- "A" accumulator pressure decreasing

EVENT 3: Given that the unit is at power and a steam dump has failed open, the crew will be expected to respond in accordance with 1-AP-38, "Excessive Load Increase."

SPD Verified: _____ (Initials)

- "A" steam dump shows mid-position
- Reactor power increases (magnitude is dependent on how long valve open)
- Tave decreases
- Megawatts decrease

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

SPD Verified: _____ (Initials)

- Annunciators F-F3 and F-B3 are illuminated.
- "C" Channel III SG level indicator (1-FW-LI-1496) is indicating off-scale low
- "C" MFRV ramps open and "C" SG level increases

Scenario Performance Datasheet

EVENT 5: Given that the unit is at power, and a steam leak outside containment has occurred, the crew will be expected to respond in accordance with 1-AP-38, "Excessive Load Increase."

SPD Verified: _____ (Initials)

- Reactor power increases
- Tave decreases
- RCS pressure and pressurizer level decrease
- MW decrease

EVENT 6: Given that a steam leak outside containment has increased to a steam break, the crew will be expected to respond in accordance with 1-E-0, "Reactor Trip or Safety Injection," and 1-ES-1.1, "SI Termination."

SPD Verified: _____ (Initials)

- Reactor power increases
- Tave decreases
- RCS pressure and pressurizer level decrease
- MW decrease
- Turbine does not automatically trip