

Facility: North Anna Power StationScenario No.: (2014) NRC-1Op-Test No.: 1

Examiners: _____ Operators: _____

Initial Conditions: Unit at 100% power MOL. 1-FW-P-2 (terry turbine) was just returned to service last shift. 2-CC-P-1B was tagged out last shift for major maintenance and is not expected to be returned to service for several days.

Turnover: Maintain current plant conditions.

Event No.	Malf. No.	Event Type*	Event Description
1		N (R) (S)	Gas the PRT
2		TS (S)	Loss of power to 1-FW-MOV-150C
3	RC1501	I (R) (S)	Tavg unit fails high causing rods to step in (CT)
4		C (B) (S)	Running condensate pump degrades. Auto start is defeated on standby pump
5	CH1601 CH2101	C (R) (S) TS (S)	Running charging pump trips and check valve sticks open (CT)
6		R (R) (S) N (B)	System operator calls and requests a power decrease due to problems on the grid. Crew commences a load reduction. (Control rods will have to manually inserted due to previous failure)
6a		C (B) (S)	Turbine fails to manual during power reduction
7	FW1602	M (ALL)	Feed line rupture in containment (CT)
8	RD32	C (ALL)	Reactor does not trip automatically (CT)
9	SI08	C (ALL)	Failure of automatic safety injection (CT)
10		C (R)	Failure of BOP SI switch. (RO must actuate SI)
			(Events 8, 9 and 10 happen during event 7 and are numbered only for use on subsequent forms.)
			The scenario can be terminated once the BIT is isolated in 1-ES-1.1.
* (N)ormal, (R)eactivity, (I)nstrument, (C)omponent, (M)ajor			

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DOMINION
NORTH ANNA POWER STATION

LICENSED OPERATOR REQUALIFICATION EXAMINATION
SIMULATOR EXAMINATION GUIDE
SCENARIO 2014 NRC 1

SIMULATOR EXAMINATION GUIDE

<u>EVENT</u>	<u>DESCRIPTION</u>
1.	Gas the PRT
2.	Loss of power to 1-FW-MOV-150C
3.	Tavg unit fails high causing rods to step in (CT)
4.	Running condensate pump degrades/auto start defeated on standby pump
5.	Running charging pump trips and check valve sticks open (CT)
6.	System operator requires a unit ramp back
6a.	Turbine fails to manual during ramp
7.	Feed line rupture in containment
8.	Reactor fails to trip automatically (CT)
9.	Safety Injection fails to actuate automatically (CT)
10.	BOP SI switch does not actuate SI

Scenario Recapitulation:

Malfunctions after EOP entry	3	(Reactor fails to automatically trip, safety injection fails to actuate automatically, BOP SI switch doesn't not work)
Total Malfunctions	9	(Loss of power to 1-FW-MOV-150C, Tavg unit fails high, running condensate pump degrades/auto start defeated on standby pump, charging pump trips/check valve sticks open, turbine fails to manual during ramp, feed line rupture in containment, reactor fails to automatically trip, safety injection fails to actuate automatically, BOP SI switch doesn't work)
Abnormal Events	4	(Tavg unit fails high, running condensate pump degrades/auto start defeated on standby pump, charging pump trips/check valve sticks open, unit must be ramped down quickly (fast ramp))
Major Transients	1	(Feed line rupture in containment)
EOPs Entered	2	(E-2, ES-1.1)
EOP Contingencies	0	
Critical Tasks	4	

SCENARIO DURATION

80 Minutes

SIMULATOR EXAMINATION SCENARIO SUMMARY

SCENARIO 2014 NRC 1

The unit is at 100 power, MOL. 1-FW-P-2 was returned to operable last shift after work on the governor valve. Unit 2 is at 100% power. 2-CC-P-1B was tagged out for major maintenance last shift and is not expected to be returned to service for several days. The maintenance rule window is green for both units. Shift orders are to gas the PRT to 11 psig and maintain current plant conditions.

The first event will be a normal event for gassing the PRT. The evolution will be pre-briefed. Once the PRT N2 addition is complete, the next event can occur.

Next, power will be lost to 1-FW-MOV-150C, "C" Main Feed Pump discharge isolation valve. The crew will receive a computer alarm and lose indication on the valve. They will enter the action for TS 3.7.3 and dispatch an operator to the power supply. The operator will report back that the breaker is open. Electricians are working at an adjacent breaker and may have inadvertently opened the breaker. The breaker can be re-closed, allowing the crew to exit the action. The next event can occur once the US has reviewed the TS, and the crew has either re-closed the breaker, or requested input from Ops management on the incident.

The next event will be a failure of the median/select T_{ave} unit. The crew will be expected to respond IAW 1-AP-1.1, "Continuous Uncontrolled Rod Motion," and place rod control in manual. Also, crew will address annunciators B-A7, MEDIAN/HI TAVG < > TREF DEVIATION, and B-A8, LOOP 1A-B-C TAVG DEVIATION, take manual control of charging flow, and place steam dumps in steam pressure mode. The crew will need to either withdraw control rods or ramp the turbine down in order to match T_{ave} and Tref. After these actions have been completed, the next event will occur.

A degradation of the running condensate pump will occur. The standby pump will be disabled and the crew will be required to start the standby condensate pump to maintain suction pressure to the running main feed water pumps. After the unit has been stabilized, the next event can occur..

The running charging pump will trip and its discharge check valve will stick open. Letdown will isolate and the standby charging pump will automatically start, but charging flow will be zero. The crew will enter 1-AP-49, "Loss of Normal Charging," and close the discharge valves on the "A" charging pump (CT). Charging header pressure will return to normal and flow will increase. The crew will throttle charging to maintain pressurizer level and return letdown to service (Normal). The US will review TS 3.5.2.

Next, the system operator will call and request that the two North Anna units shed 300 MW as quickly as possible due to problems on the grid. The crew will enter 1-AP-2.2, "Fast Load Reduction," and proceed to decrease unit load. Once enough of a load reduction has been observed, the next event can occur.

The "B" SG pressure will begin to decrease unexpectedly and a reactor trip and SI signal will occur. An automatic reactor trip will not occur and the crew will manually trip the reactor. An automatic SI will not occur and the crew will manually safety inject and continue in 1-E-0,

eventually transitioning to 1-E-2, "Faulted Steam Generator Isolation," and isolating the "B" SG. The crew will check if SI can be terminated and announce a transition to 1-ES-1.1, "SI Termination." Once the BIT has been isolated in 1-ES-1.1, the scenario can be terminated.

SCENARIO TURNOVER SHEET

Read the following to the crew:

Purpose: This examination is intended to evaluate the crew's performance of various tasks associated with the 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 988 ppm and core age is 9,000 MWD/MTU. Aux steam is on unit 2.

Unit 2 is at 100% power.

Equipment Status:

All equipment is available. 1-FW-P-2 was returned to operable last shift after work on the governor valve. Maintenance rule window is green. 2-CC-P-1B was tagged out last shift for major maintenance. It is expected to be out for several more days. Protected train is 2H.

Shift Orders:

Gas the PRT to approximately 11 psig. Maintain current plant conditions.

EVENT 1: Given that the unit is at power and the pressurizer relief tank gas pressure is low, the crew will add nitrogen in accordance with 1-OP-5.7, "Operation of the Pressurizer Relief Tank (PRT)."

TIME	EXPECTED ACTION	INSTRUCTOR REMARKS
SPD Verified: _____ (Initials) • PRT pressure increases		
	RO reduces demand on 1-SI-HCV-100.	
	RO opens 1-SI-TV-100.	
	RO opens 1-RC-HCV-1550.	
	RO opens 1-SI-HCV-1898.	
	RO monitors PRT pressure.	
	When desired pressure reached: RO closes 1-SI-HCV-1898 RO closes 1-RC-HCV-1550 RO closes 1-SI-TV-100 RO raises pressure on 1-SI-HCV-HIC-100 to 100%.	
	NOTE: The next event can occur once the PRT nitrogen addition has been completed.	Time = ~5 minutes

EVENT 2: Given a loss of power to 1-FW-MOV-150C, the crew will be expected to implement the correct Technical Specification action.

TIME	EXPECTED ACTION	INSTRUCTOR REMARKS
SPD Verified: _____ (Initials) • Indication is lost for 1-FW-MOV-150C		
	Crew recognizes PCS alarm for "C" MFP discharge valve.	
	BOP verifies that indication has been lost to 1-FW-MOV-150C.	
	Crew dispatches operator to power supply for 1-FW-MOV-150C (1-EP-BKR-1B1-3 F-3).	
	US references Technical Specification 3.7.3 and enters 72-hour action of Condition D.	
	NOTE: Operator dispatched to breaker will report that the breaker is open. Electricians are working in the area and admit that they might have inadvertently opened the breaker.	
	NOTE: Crew may request Ops management input. If asked for concurrence they will be allowed to reclose the breaker.	
	US directs that the breaker be re-closed.	
	US exits the TS action 3.7.3D (if and when breaker has been re-closed).	
	US reports the incident to the WCC and asks for CR.	
	NOTE: Once the US has entered the TS and either re-closed the breaker or asked for OPS management input, the next event can occur.	Time = ~5 minutes

EVENT 3: Given that the unit is at power, and the median/select Tave unit has failed, the crew will be expected to respond in accordance with 1-AP-1.1, "Continuous Uncontrolled Rod Motion."		
TIME	EXPECTED ACTION	INSTRUCTOR REMARKS
SPD Verified: _____ (Initials) <ul style="list-style-type: none"> Annunciators B-A7, and B-A8 illuminate Rods step in at maximum speed 1-RC-TI-1408 indicates high Pressurizer pressure and level decrease due to rod motion 		
	RO identifies annunciators B-A7, MEDIAN/HI TAVG < > TREF DEVIATION, and B-A8, LOOP1A-B-C TAVG DEVIATION.	
	RO identifies control rods stepping in at maximum speed.	
	RO identifies median/select Tave unit failed.	
	US directs crew to enter 1-AP-1.1.	
CT1	Crew takes action to stop rod motion and stabilize the unit. <ul style="list-style-type: none"> RO places rod control in MANUAL. RO verifies rod motion stopped. 	*Prior to going below the low-low insertion limit on D bank
	RO verifies 1-RC-TI-1408 is normal. (NO)	
	Crew initiates actions per AR for B-A7.	
	NOTE: The following 3 actions are IAW annunciator B-A7. It is possible that the BOP may do some, or all, or the actions.	
	RO place 1-CH-FCV-1122 in manual and controls PRZR level at program.	

EVENT 3: Given that the unit is at power, and the median/select Tave unit has failed, the crew will be expected to respond in accordance with 1-AP-1.1, "Continuous Uncontrolled Rod Motion."

TIME	EXPECTED ACTION	INSTRUCTOR REMARKS
	RO transfers condenser steam dumps to steam pressure mode: <ul style="list-style-type: none"> • RO places both STEAM DUMP INTLK switches to OFF/RESET • RO places MODE SELECTOR switch to STEAM PRESS • RO ensures steam dump demand is zero • RO returns STEAM DUMP CONTROLLER to AUTO • RO verifies steam dump demand is zero • RO places both STEAM DUMP INTLK switches to ON. 	
	US ensures a CR is entered to repair median/HI Tavg control circuit.	
	RO maintains control rods above the lo-lo insertion limit and annunciator A-H7 not lit.	
	NOTE: Crew may either ramp the turbine down or withdraw rods to restore temperature. If requested, OMOC permission will be given to withdraw rods.	
	RO checks RCS Tave $\geq 541^{\circ}\text{F}$.	
	RO checks RCS Tavg above minimum line and below max line on associated attachment.	
	RO adjusts Tavg to Tref as directed. (Rods, turbine load, dilution, boration)	
	RO checks PRZR pressure stable or trending to 2235 psig.	
	RO checks PRZR level stable.	
	Crew checks controls rods above lo insertion limit.	
	Crew maintains stable plant conditions: RCS Tave PRZR pressure PRZR level.	
	Crew notifies Instrument Department.	

EVENT 3: Given that the unit is at power, and the median/select Tave unit has failed, the crew will be expected to respond in accordance with 1-AP-1.1, "Continuous Uncontrolled Rod Motion."		
TIME	EXPECTED ACTION	INSTRUCTOR REMARKS
	Crew references the Reactivity Management Program and submits a CR to document the reactivity event.	
	NOTE: The next event can occur after the crew has stabilized the plant, or as directed by the lead evaluator.	Can put in trigger for event 2 as crew is conducting their brief. It will be several minutes before indications are available. Validation time: 8 minutes, including brief.

EVENT 4: Given that the unit is at power and a degradation of the running condensate pump is occurring, the crew will respond in accordance with 1-AP-31, "Loss of Main Feedwater."

TIME	EXPECTED ACTION	INSTRUCTOR REMARKS
SPD Verified: _____ (Initials) <ul style="list-style-type: none"> • Amps on 1-CN-P-1A decrease • Amps on 1-CN-P-1C increase • PCS alarms for MFP low suction pressure • 1-CN-P-1B does not auto-start, if required 		
	BOP identifies degradation of "A" Condensate pump.	
	US directs crew to enter 1-AP-31.	
	BOP checks power > 70%.	
	BOP checks 2 MFW pumps are running.	
	BOP checks MFW pump suction pressure >300 psig and stable. (NO)	
	BOP starts 1-CN-P-1B.	
	Crew checks any MFW pump tripped or degraded flow as indicated by low amps	
	Crew evaluates reducing turbine load to <50%: by verifying there are 2 MFPs running.	
	* BOP verifies feed flow is \geq steam flow or MFW suction pressure is adequate or feed reg valve throttle margin is adequate.	
	*BOP verifies SG levels at or trending to program level.	
	*BOP verifies MFW motor amps are < 550 amps on each motor.	
	*BOP verifies annunciator F-B5 is NOT lit.	
	BOP checks HP heater drain pumps are NOT tripped.	
	Crew maintains stable plant conditions.	
	Crew makes notifications (or instructs WCC to make notifications.)	
	Crew investigates reason for loss of feedwater.	

EVENT 4: Given that the unit is at power and a degradation of the running condensate pump is occurring, the crew will respond in accordance with 1-AP-31, "Loss of Main Feedwater."

TIME	EXPECTED ACTION	INSTRUCTOR REMARKS
	NOTE: If sent while pump is running, turbine operator will report that "A" condensate pump is making an unusual metallic noise and has little discharge pressure.	
	NOTE: The next event can occur once the standby condensate pump has been started and the unit is stable, or as directed by the lead evaluator.	Validation time: 11 minutes

EVENT 5: Given that the unit is at power and there is a loss of the running charging pump and a failed open discharge check valve, 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 and the discharge check valve sticks open 1-CH-P-1B automatically starts Charging pump discharge pressure decreases on 1-CH-PI-1121 Annunciators C-A5, C-B5, C-C5, and C-G6 illuminate Charging flow goes to zero on 1-CH-FI-1122 Letdown isolates 		
	RO identifies the trip of 1-CH-P-1A and the auto-start of 1-CH-P-1B.	
	RO identifies annunciator C-B5, CH PP TO REGEN HX LO PRESS, and C-C5, CH PP TO REGEN HX HI-LO FLOW.	
	Crew identifies loss of charging flow.	
	US directs crew to enter 1-AP-49.	
	Crew checks the charging pump that was started for gas binding. (NO)	
	Crew identifies that a charging pump manipulation has taken place.	
CT2	Crew closes discharge MOVs for the previously running pump ("A"). <ul style="list-style-type: none"> 1-CH-MOV-1286A 1-CH-MOV-1287A 	*Prior to Safety Injection being required by degraded plant conditions.
	RO verifies charging conditions returning to normal: Discharge header pressure Charging flow Motor amps.	
	RO checks letdown in service. (NO)	

EVENT 5: Given that the unit is at power and there is a loss of the running charging pump and a failed open discharge check valve, the crew will respond in accordance with 1-AP-49, "Loss of Normal Charging."

TIME	EXPECTED ACTION	INSTRUCTOR REMARKS
	RO restores letdown per RNO of step 6: <ul style="list-style-type: none"> Controls 1-CH-FCV-1122 to establish at least 25 gpm charging flow Places 1-CH-PCV-1145 in manual and opens to 100% Verifies 1-CH-TV-1204A/B and 1-CH-LCV-1460A/B open Opens 1-CH-HCV-1200A/B/C(as required) Adjusts 1-CH-PCV-1145 to establish 300 psig letdown pressure and puts the valve in auto Leaves 1-CH-FCV-1122 in manual due to previous failure Maintains pressurizer pressure at 2235 by operating pressurizer heaters and spray valves. 	
	Crew determines that there is no standby charging pump at this time.	
	US reviews Technical Specification 3.5.2 Condition A for having only one operable HHSI pump. Have 72 hours to restore 2 trains to operable	
	NOTE: Crew should discuss starting the "C" pump on the 1H bus.	
	US reports failures and requests CR and management notifications be made.	
	NOTE: Crew should also discuss an entry into TS 3.0.3, which was applicable from the time the "B" started until the "A" discharge MOVs were closed.	
	NOTE: The next event can occur once the US has referred to Tech Specs, or as directed by the lead evaluator.	Validation time: 14 minutes.

EVENT 6/6a: Given that the unit is at power and the system operator has requested a unit load reduction be quickly performed, the crew will respond in accordance with 1-AP-2.2, "Fast Load Reduction."

TIME	EXPECTED ACTION	INSTRUCTOR REMARKS
SPD Verified: _____ (Initials) <ul style="list-style-type: none"> • Reactor power slowly decreases • Tave slowly decreases • Megawatts decrease • Turbine fails to turbine manual during ramp 		
	NOTE: Call will be received from system operator requesting that NA units decrease MW by a total of 300 as quickly as possible due to problems on the grid. Power reduction should be completed within the next 30 minutes.	
	NOTE: US may decide to only ramp Unit 1, or to split the required MW decrease between the units.	
	US directs crew to enter 1-AP-2.2.	
	RO initiates RCS boration using either attachment 5 of 1-AP-2.2 or a standard ramp plan and 1-GOP-8.3.4.	Attachment 5 is attached AP-2.2 steps
	BOP reduces plant load: <ul style="list-style-type: none"> • Verifies valve position limit light OFF • Removes turbine from limiter using attachment 4, as required • Verifies turbine load control in IMP-IN • Places turbine control in IMP-IN by depressing pushbutton • Initiates turbine load reduction using attachment 4. 	
	RO verifies rods in automatic.(NO)	
	RO adjusts control rods as required to maintain Tavg within 5°F of Tref.	
	BOP identifies that turbine has failed to TURB MAN.	Turbine fails to TURB MANUAL.
	BOP ramps turbine in TURB MANUAL using attachment to turnover sheet or attachment to 1-AP-2.2.	If crew asks about continuing to ramp with turbine control in manual, they will be asked to do so.
	RO locks on additional pressurizer heaters.	

EVENT 6/6a: Given that the unit is at power and the system operator has requested a unit load reduction be quickly performed, the crew will respond in accordance with 1-AP-2.2, "Fast Load Reduction."

TIME	EXPECTED ACTION	INSTRUCTOR REMARKS
	RO verifies proper rod insertion.	
	RO monitors steam dumps for proper operation.	
	RO maintains control rods and AFD within limits.	
	US initiates notifications and evaluations.	
	Crew ensures Auxiliary steam is on Unit 2. (Note that Unit 2 may also be ramping. If so, should discuss that AS will eventually transfer to PCV.)	
	BOP verifies HP TB gland steam pressure is adequate.	
	Crew checks is power will be reduced to < 30%. (NO)	
	BOP stops HP heater drain pumps at approximately 85% power.	
	NOTE: US may also enter 0-AP-8 for grid instability. Several steps are included below. Could ask for Unit 2 US to take care of this AP.	
	US checks for notification from system operator that RTCA is inoperable. (NO)	AP-8 steps
	US checks for increased risk of electrical grid control system vulnerability exploitation. (NO)	
	US is contacted to determine extent of condition and any required actions. (Covered by phone call)	
	US verifies required equipment is operable. (YES)	
	US notifies manager nuclear operations or OMOC.	
	US checks both units station service busses are energized. (YES)	
	NOTE: The next event can occur once enough of a load reduction has been performed, or at the direction of the lead evaluator.	Validation: Let them go a full 10% for validation purposes. Took about 18 minutes from time phone call received.

EVENT 7: Given that the unit is at power and a feed line break has occurred, the crew will be expected to respond in accordance with 1-E-0, "Reactor Trip or Safety Injection," 1-E-2, Faulted Steam Generator Isolation," and 1-ES-1.1, SI Termination."

TIME	EXPECTED ACTION	INSTRUCTOR REMARKS
SPD Verified: _____ (Initials) <ul style="list-style-type: none"> • Annunciator F-F2 alarms • "B" SG level decreases • "B" SG pressure decreases • Containment sump level increases • Automatic reactor trip does not occur, if required • Automatic SI does not occur • BOP SI switch does not work. 		
	BOP identifies annunciator F-F2, SG1B LEVEL ERROR.	
	BOP identifies "B" SG level and/or pressure decreasing.	
	Crew identifies containment sump level increasing.	
	Crew identifies need to trip the reactor.	
CT3	Crew manually trips reactor.	Automatic reactor trip is disabled *Prior to a transition to FR-S.1
	BOP verifies turbine trip.	
	Crew verifies emergency busses energized.	
	Crew identifies the need for a safety injection.	
	US directs crew to manually SI.	
CT4	Crew manually initiates safety injection. RO manually actuates safety injection.	Automatic SI is disabled BOP SI switch is disabled. RO must manually initiate SI *Prior to transitioning out of 1-E-0 after SI required
	RO checks that CAP items 1-5 are not applicable. (None are)	
	US holds transient brief.	
	US initiates attachments 4(5) and 7.	Attachment 5 is initiated by attachment 4. Attached.

EVENT 7: Given that the unit is at power and a feed line break has occurred, the crew will be expected to respond in accordance with 1-E-0, "Reactor Trip or Safety Injection," 1-E-2, Faulted Steam Generator Isolation," and 1-ES-1.1, SI Termination."

TIME	EXPECTED ACTION	INSTRUCTOR REMARKS
	NOTE: One operator will be doing attachment 4,5 and one will be doing attachment 7. US will not read on in 1-E-0 until the operator in attachment 7 has finished his actions.	
	NOTE: The RO could get permission and start 1-CH-P-1C, or it will be started by attachment 4.	
	Crew verifies SI flow.	
	Crew verifies AFW flow.	
	RO checks RCS average temperature and throttles AFW to "A" and C" SGs	
	RO checks pressurizer PORVs and spray valves.	
	RO checks RCP trip and charging pump recirc criteria.	
	Crew checks SGs not faulted. <ul style="list-style-type: none"> • All SG pressures > 80 psig and under control of operator. (NO) 	
	Crew transitions to 1-E-2.	
	BOP closes MSTVs and bypass valves.	
	BOP checks pressures in all SGs.	
	Crew identifies faulted SG as "B."	
	NOTE: Crew may have already isolated "B" SG per attachment 7 of 1-E-0.	

EVENT 7: Given that the unit is at power and a feed line break has occurred, the crew will be expected to respond in accordance with 1-E-0, "Reactor Trip or Safety Injection," 1-E-2, Faulted Steam Generator Isolation," and 1-ES-1.1, SI Termination."

TIME	EXPECTED ACTION	INSTRUCTOR REMARKS
CT5	Crew isolates the faulted SG. <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. • Crew dispatches an operator to verify closed 1-MS-58. 	*Prior to exiting procedure step that requires it
	BOP checks ECST level.	
	BOP establishes IA to containment.	
	Crew checks secondary radiation: <ul style="list-style-type: none"> • RO resets safety injection • RO resets phase A isolation • RO resets AMSAC • BOP checks secondary radiation normal: <ul style="list-style-type: none"> Condenser air ejector last known SG blowdown last known SG main steamline Terry Turbine AFW pump exhaust. 	
	Crew checks if SI can be terminated. (YES)	
	US directs crew to transition to 1-ES-1.1.	
	RO verifies safety injection reset.	
	RO stops all but one charging pump and puts it in PTL.	
	RO checks RCS pressure stable or increasing.	

EVENT 7: Given that the unit is at power and a feed line break has occurred, the crew will be expected to respond in accordance with 1-E-0, "Reactor Trip or Safety Injection," 1-E-2, Faulted Steam Generator Isolation," and 1-ES-1.1, SI Termination."

TIME	EXPECTED ACTION	INSTRUCTOR REMARKS
	Crew isolates BIT: <ul style="list-style-type: none"> • BOP checks LHSI pump suctions from containment sump are closed • RO verifies 1-CH-MOV-1373 and 1-CH-MOV-1275A,B,C open. • BOP closes 1-SI-MOV-1867A/B • BOP closes 1-SI-MOV-1867 C/D • BOP verifies 1-SI-MOV-1836, 1869B, 1869A are closed. 	
	NOTE: The scenario can be terminated once the BIT has been isolated, or at the direction of the lead evaluator.	Validation time: 20 minutes

REFERENCES

PROCEDURE	REV.
Operating Procedure 1-OP-5.7, "Operation of the Pressurizer Relief Tank (PRT)."	10
Abnormal Procedure 1-AP-1.1, "Continuous Uncontrolled Rod Motion."	9
Abnormal Procedure 1-AP-2.2, "Fast Load Reduction."	27
Abnormal Procedure 1-AP-31, "Loss of Main Feedwater."	12
Abnormal Procedure 1-AP-49, "Loss of Normal Charging."	14
Emergency Procedure 1-E-0, "Reactor Trip or Safety Injection."	46
Emergency Procedure 1-E-2, "Faulted Steam Generator Isolation."	14
Emergency Procedure 1-ES-1.1, "SI Termination."	23
Station Annunciator Response Procedures.	N/A
Administrative Procedure PI-AA-5000, "Human Performance."	8
INPO, Guideline for Teamwork and Diagnostic Skill Development: INPO 88-003,	Jan. 1988
INPO, ACAD 07-002 Simulator Training Guidelines	Jan. 2007

ATTACHMENT 1

SIMULATOR OPERATOR'S COMPUTER PROGRAM

SIMULATOR OPERATOR'S COMPUTER PROGRAM
2014 NRC 1

Initial conditions

1. Recall IC 368
2. Ensure Tave, Tref, PDTT level, and VCT level are selected on trend recorders.
3. **Place red sticker** on 2-CC-P-1B switch
4. **2H is the protected train.**
5. Copy of attachment 7 of 1-E-0 available for booth actions.

PRELOADS PRIOR TO SCENARIO START

CONDITION	MALFUNCTION/OVERRIDE/ETC.
Tagout of 2-CC-P-1B	Verify 2-CC-P-1A is running Place 2-CC-P-1B in PTL Remote functions: U2_CCP1B_RACKIN = RACKOUT U2_CC_28 = 0
Increase lake temperature	Remote function: (CW) CW_INLET_TEMP = 80
Failure of standby condensate pump	Switch override: CNP1B_ASTOP = OFF
1-CH-P-1A check valve sticks open	Malfunction: CH2101
Failure of auto reactor trip	Malfunctions: RD32
Failure of auto SI	Malfunction: SI08
Failure of BOP SI switch	Switch override: SAF_INJ2_INIT = OFF

SCENARIO EVENTS

EVENT 1	Gas the PRT
MALFUNCTIONS/OVERRIDES	
COMMUNICATIONS	
If outside operator is contacted: Report that N2 plant pressure is normal and the pump has just stopped. You will monitor pressure.	

EVENT 2	Power is lost to 1-FW-MOV-150C
MALFUNCTIONS/OVERRIDES	
<p>Remote function: FWMOV150C_RACKIN = RACKOUT, Delay time = 5, Trigger = 2</p> <p>Once the US has entered the TS and either re-closed the breaker or asked for OPS management input, the next event can occur.</p>	
COMMUNICATIONS	
<p>If operators have not identified the loss of power to the breaker within 5 minutes, then call as an electrician and report that you think you may have bumped the handle for breaker 1-EP-BKR-1B1-3 F3. It is currently open.</p> <p>If operator is dispatched, wait 5 minutes and then report that the breaker (1-EP-BKR-1B1-3 F3) is open. Electricians are working in the vicinity and report that they may have inadvertently bumped the breaker handle.</p> <p>If asked to reclose the breaker then wait 2 minutes and change from RACKOUT to RACKIN</p>	

EVENT 3	Tave unit fails high
MALFUNCTIONS/OVERRIDES	
Malfunction: RC1501, Delay time = 5, Ramp = 5, Severity = 1, Trigger = 3 The next event will occur after the crew has stabilized the plant, or as directed by the lead evaluator.	
COMMUNICATIONS	
If OMOC is consulted for rod withdrawal to restore temperature, wait 2 minutes and then call and give permission to restore temperature by withdrawing control rods.	

EVENT 4	Degradation of running condensate pump
MALFUNCTIONS/OVERRIDES	
Remote function: CN_10 = 25, Delay time = 5, Ramp = 120, Trigger = 4	
COMMUNICATIONS	
If dispatched to check out "A" condensate pump: wait 3 minutes and verify it is still running, then either report back that pump is making an unusual metallic-sounding noise and has very little discharge pressure OR that there is nothing unusual at the pump, it is just not running.	

EVENT 5	Running charging pump trips and check valve sticks open
MALFUNCTIONS/OVERRIDES	
<p>Malfunctions: CH1601, Delay time = 5, Trigger = 5</p> <p>NOTE: Once the US has referred to Tech Specs or as directed by the Lead Evaluator, the next event will occur.</p>	
COMMUNICATIONS	
<p>If asked to check on 1-CH-P-1B, wait 5 minutes and then report that the pump appears to running satisfactorily, with no seal leakage.</p> <p>If asked to look at 1-CH-P-1A, wait 5 minutes and then report that the pump looks fine, just no longer running. No seal leakage. (Can be combined with report on "B" pump)</p> <p>If asked to look at breaker for 1-CH-P-1A, wait 3 minutes and report an overcurrent drop on 15H6 breaker.</p>	

EVENT 6	System operator requests unit rampdown
MALFUNCTIONS/OVERRIDES	
<p>See communication below for system operator.</p> <p>***Put in trigger 10 once the turbine has been removed from the limiter and the ramp has been started.</p> <p>Switch override: TURBINE_MAN = ON, TRIGGER = 10</p> <p>The next event can occur after enough of a power reduction has been seen.</p>	
COMMUNICATIONS	
<p>System operator calls on ringdown phone: Due to problems on the grid, it is requested that North Anna shed 300 MW between the two units as quickly as possible. Power reduction should be completed within the next 30 minutes.</p> <p>If asked about unit 2 taking care of 0-AP-8, agree that you will take care of it.</p> <p>If called about continuing the ramp in turbine manual: Ask if there is any reason why they can't continue? Agree that it is fine to continue in turbine manual (or request that they do so.)</p>	

EVENT 7	Main feed line break in containment
MALFUNCTIONS/OVERRIDES	
<p>Malfunction: FW1602, Delay time = 5, Ramp = 300, Severity = 50, Trigger = 7</p> <p>Remote function: MS_57 = 0, Delay = 30, Ramp = 30, Trigger = 8</p> <p>NOTE: Scenario can be terminated when Bit has been isolated in 1-ES-1.1.</p>	
COMMUNICATIONS	
<p>When dispatched, close 1-MS-57, wait 3 minutes and then insert trigger 7. Once valve closed report back that attachment 1 of 1-E-2 is complete for "B" SG.</p>	

ATTACHMENT 3

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.
- E. During shift operations each crew member will utilize operator fundamentals to ensure Teamwork Effectiveness, High Standards for Controlling Evolutions, Indications Monitored Closely, a Natural Bias for Conservatism, and Knowledge of Plant Design and Theory.

EVENT 1 PERFORMANCE OBJECTIVES

EVENT GOAL:

Given that the unit is at power and the pressurizer relief tank gas pressure is low, the crew will add nitrogen in accordance with 1-OP-5.7, "Operation of the Pressurizer Relief Tank (PRT)."

NORTH ANNA SPECIFIC TASKS:

R640 Pressurize the pressurizer relief tank.

CRITICAL TASK:

N/A

EVENT 2 PERFORMANCE OBJECTIVES

EVENT GOAL: Given a loss of power to 1-FW-MOV-150C, the crew will be expected to implement the correct Technical Specification action.

NORTH ANNA SPECIFIC TASKS:

S70 Evaluate compliance with technical specifications

CRITICAL TASK:

N/A

EVENT 3 PERFORMANCE OBJECTIVES

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

NORTH ANNA SPECIFIC TASKS:

R474 Restore stable plant conditions following continuous uncontrolled rod motion.

CRITICAL TASK:

See next page

CT Statement:

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

Safety Significance:

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

Cues:

Indication of a failed median/select Tave unit.

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

Performance Indicator:

RO places rod control to manual.

Feedback:

Rod motion stops

WOG Reference:

None

Conditions:

Prior to going below the low-low insertion limit on D bank.

EVENT 4 PERFORMANCE OBJECTIVES

EVENT GOAL: Given that the unit is at power and a degradation of the running condensate pump is occurring, the crew will respond in accordance with 1-AP-31, "Loss of Main Feedwater."

NORTH ANNA SPECIFIC TASKS:

R781 Respond to a loss of main feedwater

CRITICAL TASK:

N/A

EVENT 5 PERFORMANCE OBJECTIVES

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

NORTH ANNA SPECIFIC TASKS:

R704 Respond to a loss of normal charging.

S70 Evaluate compliance with technical specifications.

CRITICAL TASK:

See next page

CT Statement:

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

Safety Significance:

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

Cues:

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

Performance Indicator:

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

Feedback:

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

WOG Reference:

None.

Conditions:

Prior to Safety Injection being required by degraded plant conditions.

EVENT 6 PERFORMANCE OBJECTIVES

EVENT GOAL: Given that the unit is at power and the system operator has requested a unit load reduction be quickly performed, the crew will respond in accordance with 1-AP-2.2, "Fast Load Reduction."

NORTH ANNA SPECIFIC TASKS:

None

CRITICAL TASK:

N/A

EVENT 7 PERFORMANCE OBJECTIVES

EVENT GOAL: Given that the unit is at power and a feed line break has occurred, the crew will be expected to respond in accordance with 1-E-0, "Reactor Trip or Safety Injection," 1-E-2, Faulted Steam Generator 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.

R183 Identify and isolate a faulted steam generator.

R189 Terminate safety injection.

CRITICAL TASK:

See Following Pages

CT Statement:

Crew manually trips the reactor.

Safety Significance:

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

Cues:

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

Performance Indicator:

RO/BOP open both reactor trip breakers.

Feedback:

Control rods at bottom of core
Neutron flux decreasing

WOG Reference:

Appendix B CT-1

Conditions:

Prior to a transition to FR-S.1.

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." Additionally, failure to manually actuate SI (when it is possible to do so) results in a "significant reduction of safety margin beyond that irreparably introduced by the scenario." Finally, failure to manually actuate SI under the postulated conditions is a "violation of the facility license condition."

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 at least one train of SI has actuated.

WOG Reference:

Appendix B CT-2

Conditions:

Prior to transitioning out of 1-E-0 after SI required.

CT Statement:

Crew isolates the 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:

Steam pressure and flow rate indications of a faulted SG
AFW continues to be delivered to the faulted SG

Performance Indicator:

Faulted SG MSTV is closed using Appendix R isolation switch OR all SG NRVs are closed
MFW is isolated to faulted SG
AFW is isolated to faulted SG

Feedback:

Depressurization of intact SGs is stopped
Steam flow from faulted SG decreases to zero
RCS cooldown stops
MFW flow to faulted SG is zero
AFW flow to faulted SG is zero

WOG Reference:

Appendix B CT 17

Conditions:

Prior to exiting procedure step that requires it

ATTACHMENT 2

SIMULATOR PERFORMANCE DATASHEET

Scenario Performance Datasheet

EVENT 1: Given that the unit is at power and the pressurizer relief tank gas pressure is low, the crew will add nitrogen in accordance with 1-OP-5.7, "Operation of the Pressurizer Relief Tank (PRT)."

SPD Verified: _____ (Initials)

- PRT pressure increases

EVENT 2: Given a loss of power to 1-FW-MOV-150C, the crew will be expected to implement the correct Technical Specification action.

SPD Verified: _____ (Initials)

- Indication is lost for 1-FW-MOV-150C

EVENT 3: Given that the unit is at power, and the median/select Tave unit has failed, the crew will be expected to respond in accordance with 1-AP-1.1, "Continuous Uncontrolled Rod Motion."

SPD Verified: _____ (Initials)

- Annunciators B-A7, and B-A8 illuminate
- Rods step in at maximum speed
- 1-RC-TI-1408 indicates high
- Pressurizer pressure and level decrease due to rod motion

EVENT 4: Given that the unit is at power and a degradation of the running condensate pump is occurring, the crew will respond in accordance with 1-AP-31, "Loss of Main Feedwater."

SPD Verified: _____ (Initials)

- Amps on 1-CN-P-1A decrease
- Amps on 1-CN-P-1C increase
- PCS alarms for MFP low suction pressure
- 1-CN-P-1B does not auto-start, if required

EVENT 5: Given that the unit is at power and there is a loss of the running charging pump and a failed open discharge check valve, the crew will respond in accordance with 1-AP-49, "Loss of Normal Charging."

SPD Verified: _____ (Initials)

- 1-CH-P-1A trips and the discharge check valve sticks open
- 1-CH-P-1B automatically starts
- Charging pump discharge pressure decreases on 1-CH-PI-1121
- Annunciators C-A5, C-B5, C-C5, and C-G6 illuminate
- Charging flow goes to zero on 1-CH-FI-1122
- Letdown isolates

EVENT 6: Given that the unit is at power and the system operator has requested a unit load reduction be quickly performed, the crew will respond in accordance with 1-AP-2.2, "Fast Load Reduction."

SPD Verified: _____ (Initials)

- Reactor power slowly decreases
- Tave slowly decreases
- Megawatts decrease
- Turbine fails to turbine manual during ramp

Facility: North Anna Power StationScenario No.: (2014) NRC-2Op-Test No.: 1

Examiners: _____ Operators: _____

Initial Conditions: Reactor is at approximately 49% power BOL. Unit was returned to power 2 days ago following work on the generator exciter. Power has been at 49% for several days due to a problem with a containment sump pump. The sump pump has been replaced and the unit as been cleared to increase power to 100%. 2-CC-P-1B was tagged out last shift for major maintenance and is not expected to be returned to service for several days.

Turnover: Shift orders are to transfer acid from "B" BAST to "A" BAST and then ramp the unit to 100% power.

Event No.	Malf. No.	Event Type*	Event Description
1		N (R) (S)	Xfer acid from "B" to "A" BAST
2		N (B) R (R) (S)	Ramp unit up using normal ramping OP
3	RC1901 RC0701	I (R) (S) TS (S)	Pressurizer pressure transmitter fails high causing PORV to open. Valve sticks open and block valve must be closed. (CT)
4	EL09	C (B) (S)	Main generator voltage regulator fails high
5		C (R) (S)	Steam dump fails open (isolable from control room) (CT)
6	MS1702	I (B) (S) TS (S)	"B" SG steam pressure channel III fails low (which also fails steam flow)
7	EL10	C (ALL)	G-12 opens causing a turbine/reactor trip
8	SI16	M (ALL)	LOCA outside containment (CT)
9		C (B) (S)	BIT inlets fail to open automatically or manually (CT)
			The scenario can be terminated once the crew has isolated the leak in 1-ECA-1.2 and transitioned to 1-E-1.
			(Event 9 occurs during event 8 and is numbered only for use on subsequent forms.)

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

Facility: North Anna Power StationScenario No.: (2014) NRC-2Op-Test No.: 1

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

DOMINION
NORTH ANNA POWER STATION

LICENSED OPERATOR REQUALIFICATION EXAMINATION
SIMULATOR EXAMINATION GUIDE
SCENARIO 2014 NRC 2

SIMULATOR EXAMINATION GUIDE

<u>EVENT</u>	<u>DESCRIPTION</u>
1.	Xfer acid from "B" to "A" BAST
2.	Ramp unit up using normal ramping OP
3.	Pressurizer pressure transmitter fails high causing PORV to open. Valve sticks open and block valve must be closed. (CT)
4.	Main generator voltage regulator fails high
5.	Steam dump fails open (isolable from control room) (CT)
6.	"B" SG steam pressure channel III fails low (which also fails steam flow)
7.	G-12 opens causing a turbine/reactor trip
8.	LOCA outside containment (CT)
9.	BIT inlets fail to open automatically or manually (CT)

Scenario Recapitulation:

Malfunctions after EOP entry	2	(LOCA outside containment, BIT valves fail to open automatically or manually)
Total Malfunctions	7	(Pressurizer pressure transmitter fails high causing PORV to open/valve sticks open, main generator voltage regulator fails high, steam dump fails open, failure of selected steam pressure channel, G-12 opens causing a turbine/reactor trip, LOCA outside containment, BIT valves fail to open automatically or manually)
Abnormal Events	4	(Pressurizer pressure transmitter fails high causing PORV to open/valve sticks open, main generator voltage regulator fails high, steam dump fails open, failure of selected steam pressure channel)
Major Transients	1	LOCA outside containment
EOPs Entered	2	(ES-0.1, ECA-1.2)
EOP Contingencies	1	(ECA-1.2)
Critical Tasks	4	

SCENARIO DURATION

135 Minutes

SIMULATOR EXAMINATION SCENARIO SUMMARY

SCENARIO 2014 NRC2

Reactor is at approximately 49% power BOL. Unit was returned to power 2 days ago following work on the generator exciter. Power has been at 49% for several days due to a problem with a containment sump pump. The sump pump has been replaced and the unit has been cleared to increase power to 100%. 1-FW-P-2 was returned to operable last shift after work on the governor valve. Unit 2 is at 100% power. 2-CC-P-1B was tagged out for major maintenance last shift and is not expected to be returned to service for several days. Shift orders are to transfer acid from "B" BAST to "A" BAST and then ramp the unit to 100% power.

The first event will be a normal event of transferring acid from "B" BAST to "A" BAST. The RO will use 0-OP-8.8, "Transferring Boric Acid," and transfer acid. This event will be briefed prior to the crew assuming the watch. Once the acid transfer is complete the next event can occur.

Next will be a unit power increase. This evolution will be briefed prior to the crew assuming the watch. The RO will use dilution and rods to increase reactor power. The BOP will ramp the turbine up. The power increase will be done in accordance with 1-OP-2.1, "Unit Operation from Mode 1 to Mode 2." Once enough of a power increase has been observed, the next event can occur.

The next event will be pressurizer pressure transmitter 1-RC-PT-1445 failing high, resulting in the opening of PRZR PORV 1-RC-PCV-1456. The crew will be expected to perform the immediate actions of 1-AP-44, "Loss of Reactor Coolant System Pressure," and attempt to close 1-RC-PCV-1456. The PORV will not close and the RO will perform the RNO action of closing the PORV block valve. After RCS pressure has been stabilized, the next event will occur.

At this time the main generator voltage regulator will fail. The crew will perform the actions of 1-AP-26, "Failure of Main Generator Regulator High," and place the voltage regulator switch in OFF. Once the system operator has been notified of the failure, the next event can occur.

Now, a steam dump valve will fail open. The crew will enter 1-AP-38, "Excessive Load Increase," and turn the steam dumps off. The crew will have an operator isolate air to the failed valve. Once power has been stabilized, the next event can occur.

Next, the Channel III Steam Pressure Transmitter for the "A" SG (PT-1475) fails low as a result of a leak at the transmitter. The crew will enter 1-AP-3, "Loss of Vital Instrumentation," and swap to an operable channel, refer to technical specifications, and notify the Instrument Department to place the channel in trip within 72 hours. Once the channel is swapped and TS have been identified, the next event can occur.

At this time the generator output breaker will open and cause a reactor and turbine trip. The crew will enter 1-E-0, "Reactor Trip or Safety Injection," and perform the immediate operator actions. The crew will transition to 1-ES-0.1, "Reactor Trip Response. The next event can occur once the crew has transitioned.

A RCS leak outside containment will develop in the Safeguards. The check valves from the RCS cold legs to the LHSI pumps will experience severe backleakage. The LHSI pump discharge check valves will hold causing relief valves 1-SI-RV-1845A, B, & C to lift. This will result in annunciator A-C1, SFGDS AREA SUMP HI/HI-HI LEVEL, and high and high-high alarms on 1-RM-VG-112/113. PRZR level will decrease. The crew will respond IAW 1-AP-16, "Increasing Primary Plant Leakage," and isolate letdown, then maximize charging flow. PRZR level will continue to decrease; the crew should respond IAW the 1-ES-0.1 CAP, manually initiate SI and return to 1-E-0. The BIT inlet valves will fail to open and the BIT will have to be bypassed until a valve can be opened locally. The crew will determine that there is a LOCA outside the containment and continue in 1-E-0 until directed to transition to 1-ECA-1.2, "LOCA Outside Containment." The scenario may be terminated after the completion of 1-ECA-1.2 or as directed by the lead evaluator.

SCENARIO TURNOVER SHEET

Read the following to the crew:

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

1. You are on a day shift during the week.
2. 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 49% power. Unit was returned to power 2 days ago following work on the generator exciter. Power has been at 49% for several days due to a problem with a containment sump pump. The sump pump has been replaced and the unit as been cleared to increase power to 100%. RCS boron is 1537 ppm and core age is 150 MWD/MTU. Aux steam is on unit 2.

Unit 2 is at 100% power.

Equipment Status:

1-FW-P-2 was returned to service last shift. Maintenance rule window is green. 2-CC-P-1B was tagged out last shift for major maintenance. It is expected to be out for several more days. Protected train is 2H.

Shift Orders:

Shift orders are to increase "A" BAST level to 90% by transferring acid from "B" BAST to "A" BAST and then ramp the unit to 100% power.

EVENT 1: Given that the unit is at power and a transfer of boric acid from "B" BAST to "A" BAST is required, the RO will transfer acid in accordance with 0-OP-8.8, "Transferring Boric Acid."		
TIME	EXPECTED ACTION	INSTRUCTOR REMARKS
SPD Verified: _____ (Initials) <ul style="list-style-type: none"> • "B" BAST level decreases • "A" BAST level increases 		
	RO instructs AB operator to open 1-CH-95.	
	RO opens 1-CH-HCV-1110.	
	RO closes 1-CH-HCV-1105.	
	RO places 1-CH-P-2B in FAST.	
	RO verifies desired level in "A" BAST has been reached.	
	RO places 1-CH-P-2B in OFF.	
	RO opens 1-CH-HCV-1105 to 20%.	
	RO instructs AB operator to close 1-CH-95.	
	RO places switch for 1-CH-P-2B in SLOW.	
	RO verifies level in "A" BAST is stable.	
	RO ensures control switch for 1-CH-P-2A in AUTO	
	RO adjusts recirc valve 1-CH-HCV-1110 to 20%.	
	RO requests chemistry to sample "A" BAST.	
	NOTE: The next event can occur once the acid transfer is complete.	Validation time: 15 minutes. (Changed initial BAST level. Won't take as long with higher level.)

EVENT 2: Given that the unit is at 50% power and a power increase to 100% is desired, the crew will increase power in accordance with 1-OP-2.1, "Unit Operation 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 		
	BOP ramps down to get off limiter.	
	BOP adjusts limiter up.	
	BOP verifies/sets desired ramp rate (0.3% per minute).	
	BOP increases turbine setter to desired position.	
	BOP presses GO on turbine.	
	BOP monitors turbine ramp.	
	RO starts a dilution when required using appropriate GOP.	
	RO monitors control rods.	AFD
	NOTE: The next event can occur once enough of a power increase has been observed.	Validation time: 28 minutes to ramp about 10%.

EVENT 3: Given that the unit is at power, and the PRZR PORV has failed open and will not close, the crew will be expected to 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 C-D1, B-F7, B-E7, B-H6, and B-H2 are illuminated 1-RC-PCV-1456 indicates open 1-RC-PCV-1456 will not close 		
	RO identifies annunciator C-D1, PRZR SAFETY VALVE OR PORV OPEN.	
	RO identifies RCS pressure is decreasing.	
	US directs crew to perform actions of 1-AP-44.	
CT1	Crew stops RCS pressure decrease. <ul style="list-style-type: none"> Crew identifies PORV open. RO performs RNO step and attempts to close 1-RC-PCV-1456. RO closes PORV block valve 1-RC-MOV-1535. 	*Prior to a PRZR low pressure reactor trip
	RO checks master controller is controlling properly.	
	RO checks PRZR spray valves closed.	
	NOTE: At this time the RO should secure the dilution and the BOP should be directed to hold the ramp.	
	RO verifies all PRZR heaters energized.	
	RO checks 1-CH-HCV-1311 closed.	
	RO checks PRZR PORVs and safety valves closed.	
	RO verifies RCS pressure stable or increasing.	
	RO verifies RCS pressure normal.	
	US refers to TS 3.4.1 for DNB 3.4.13 for RCS leakage. (Only applied while valve was open and unisolated.) TS 3.4.11C and determines that the block valve must be de-energized within an hour.	

EVENT 3: Given that the unit is at power, and the PRZR PORV has failed open and will not close, the crew will be expected to respond in accordance with 1-AP-44, "Loss of Reactor Coolant System Pressure."

TIME	EXPECTED ACTION	INSTRUCTOR REMARKS
	Crew directs a watchstander to de-energize 1-RC-MOV-1535.	
	NOTE: The next event can occur once tech specs have been reviewed, or at the discretion of the lead evaluator.	

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

TIME	EXPECTED ACTION	INSTRUCTOR REMARKS
SPD Verified: _____ (Initials) <ul style="list-style-type: none"> • Annunciator K-C1 illuminates • Annunciator K-B4 may illuminate • Generator output voltage increases 		
	BOP identifies annunciator K-C1, VOLTAGE REGULATOR CRITICAL FAILURE.	
	US directs entry into 1-AP-26.	
	BOP identifies generator output voltage and MVARs increasing with MW stable.	
	BOP places voltage regulator control switch to OFF.	
	BOP adjusts generator output voltage using base adjust, if required.	
	Crew notifies Dominion Energy Supply Market Operations Center that the voltage regulator is in base control and the PSS is not available and that PJM must be notified within 30 minutes.	
	Crew notifies system operator that the voltage regulator is in base control and the PSS is not available.	
	Crew maintains 500kVv voltage schedule.	
	US has conditions reports entered.	
	Crew initiates 1-MISC-32.	
	NOTE: The next event can occur after the crew has stabilized the plant, or at the direction of the lead evaluator.	Validation time: 11 minutes Did not include acknowledging alarms in TB. This was done during the next event.

EVENT 5: 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"> • "C" steam dump shows mid-position • Reactor power increases slightly (until dump is closed) • Tave decreases slightly (until dump is closed) • Megawatts decrease slightly (until dump is closed) 		
	Crew identifies increase in reactor power, decrease in Tave, or steam dump red light lit.	
	US directs crew to enter 1-AP-38.	
	RO checks steam dumps closed. (NO)	
CT2	RO takes steam dumps to OFF.	Steam dump will close. *Prior to receiving an automatic reactor trip on over power
	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 auto rod control.	
	RO energizes additional pressurizer heaters, as required to maintain RCS pressure.	
	BOP checks turbine load control.	
	RO maintains rods above limits and AFD within specifications.	
	Crew checks plant status stable: <ul style="list-style-type: none"> • BOP checks main generator output is stable • Crew verifies Tave on program with Tref. 	
	BOP checks steam flow channel indications.	
	Crew turbine control in operator auto.	

EVENT 5: 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"> • Crew checks SG PORVs are closed by SPDS and local indication • Crew checks SG safeties are closed by SPDS indication and local indication • BOP checks MSR inlet FCV operation is normal • BOP checks 1-AS-PCV-105 operation is normal • Crew checks plant steam system are intact. 	
	NOTE: May request tagout or APC sheet before isolating the "C" steam dump.	
	Crew checks for RCS dilution.	
	Crew directs WCC/operator to isolate air to steam dump.	
	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.	Did not wait for this during validation.
	Crew verifies steam dumps available.	
	RO places steam dumps in Tave mode, if applicable: <ul style="list-style-type: none"> • RO verifies both channels of first stage pressure are operable • RO verifies both STEAM DUMP INTKL switches in OFF/RESET • RO verifies P-E4 is NOT lit • RO places MODE SELECTOR switch to Tave • RO ensures steam dump demand is zero • RO places both STEAM DUMP INTLK switches to ON 	
	Crew enters a CR to document the Reactivity Management event.	

EVENT 5: 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
	NOTE: The next event can occur once the unit is stable, or at the direction of the lead evaluator.	Validation time: 15 minutes.

EVENT 6: Given the plant is in mode one with indications of a failed steam pressure transmitter, the crew will respond in accordance with 1-AP-3, "Loss of Vital Instrumentation."

TIME	EXPECTED ACTION	INSTRUCTOR REMARKS
SPD Verified: _____ (Initials) <ul style="list-style-type: none"> • Annunciators F-H1 illuminates • Status light N-C3 and N-C4 illuminate • 1-MS-PI-1475 fails down scale • 1-MS-FI-1474 fails down scale • "A" MFRV demand decreases 		
	BOP identifies annunciators F-H1, HI STM LINE Δ P SG 1A LO.	
	BOP identifies 1-MS-PI-1475 failing low.	
	US directs the crew to enter 1-AP-3.	
	BOP verifies redundant channels normal.	
	BOP verifies SG level controlling channel normal. (NO)	
	BOP takes manual control of the "A" Main Feed Reg Valve to control SG level.	
	Crew verifies first stage pressure indications normal.	
	RO verifies systems affected by PRZR level channels normal.	
	RO verifies systems affected by PRZR level channels are normal.	
	Crew verifies both first stage pressure channels normal.	
	Crew verifies all SGWLC channels selected to an operable channel. (NO)	
	RO verifies rods are in manual.	
	RO places steam dumps in OFF or steam pressure mode, as required.	
	BOP places "B" and "C" MFRVs to manual.	
	Crew swaps to operable SGWLC channels.	
	BOP verifies all SG levels are on program and returns MFRVs to automatic.	
	RO verifies steam dumps are available and places them in Tave Mode.	

EVENT 6: Given the plant is in mode one with indications of a failed steam pressure transmitter, the crew will respond in accordance with 1-AP-3, "Loss of Vital Instrumentation."		
TIME	EXPECTED ACTION	INSTRUCTOR REMARKS
	Crew verifies auto rod control desired. (NO)	
	<div style="border: 2px solid black; padding: 5px;"> US review TS 3.3.2 (Functions 1e, 1f, 1g, 4d, and 4e) Condition D Determine that the channel must be placed in trip within 72 hours applies. 3.3.3 does not apply </div>	"B" Channel III and "C" channel IV are in ASDP (verified in loop book. (DGT/SRC)
	US directs RO to enter 1-MOP-55.77 and 1-MOP-55.79.	
	NOTE: After the crew has identified channel trip requirements and the US has referred to tech specs, or as directed by the lead evaluator, the next event may occur.	Validation time: 20 minutes, including placing steam dumps back in service after the failed dump was isolated.

EVENT 7: Given that the generator output breaker has opened causing a reactor trip, the crew will respond in accordance with 1-E-0, "Reactor Trip or Safety Injection."		
TIME	EXPECTED ACTION	INSTRUCTOR REMARKS
SPD Verified: _____ (Initials) <ul style="list-style-type: none"> • G-12 opens • Reactor and turbine trips occur 		
	Crew identifies that a reactor and turbine trip have occurred.	
	US directs entry into 1-E-0.	
	Crew verifies reactor trip: <ul style="list-style-type: none"> • RO/BOP manually trip reactor • RO checks reactor trip and bypass breakers are open • RO checks rod bottom lights lit • RO checks neutron flux decreasing. 	
	BOP verifies turbine trip: <ul style="list-style-type: none"> • Manually trips turbine • Verifies all turbine stop valves closed • Resets reheaters • Verifies MSR FCVs closed • Verifies generator output breaker open 	
	RO verifies both emergency busses are energized.	
	Crew verifies that safety injection has not occurred and is not required. <ul style="list-style-type: none"> • No LHSI pumps running • No SI first out annunciator lit • No low pressurizer pressure • No high containment pressure • No steamline differential pressure • No high steam flow with low-lo Tave or low steam pressure 	
	US directs transitions to 1-ES-0.1.	
	RO checks any RCPs running.	
	RO checks RCS Tave stable at or trending to desired temperature. (547°F on steam dumps)	
	BOP reduces AFW flow between generators to maintain >400 gpm.	

EVENT 7: Given that the generator output breaker has opened causing a reactor trip, the crew will respond in accordance with 1-E-0, "Reactor Trip or Safety Injection."		
TIME	EXPECTED ACTION	INSTRUCTOR REMARKS
	BOP checks feedwater status: <ul style="list-style-type: none"> • Checks RCS average temperature < 554°F • Verifies MFRVs closed • Verifies AFW pumps running • Verifies total AFW flow ≥ 400 gpm. 	
	BOP checks SG levels: <ul style="list-style-type: none"> • Checks ALL SG NR levels > 11%. (NO) • Checks WR levels are increasing • Controls feed flow to maintain narrow range levels between 23 and 33%. 	
	RO verifies charging in service.	
	NOTE: The next event can occur once the crew has transitioned to 1-ES-0.1 and adjusted AFW flows.	

EVENT 8: With the unit stabilized in 1-ES-0.1, "Reactor Trip Response," and indications exist of a SBLOCA outside containment, the crew will respond in accordance with "1-E-0, "Reactor Trip or Safety Injection," and 1-ECA-1.2, "LOCA Outside Containmentment."

TIME	EXPECTED ACTION	INSTRUCTOR REMARKS
SPD Verified: _____ (Initials) <ul style="list-style-type: none"> • RCS pressure and pressurizer level decrease • Charging flow increases • Annunciators A-C1, E-F8, then A-C4 illuminate • Vent stack "B" radiation increases to alarm setpoint • BIT inlet valves fail to open 		
	Crew identifies annunciator A-C1, SFGDS AREA SUMP HI/HI-HI LEVEL.	
	RO identifies charging flow increasing and PRZR level decreasing.	
	NOTE: Crew may or may not initially enter 1-AP-16.	
	NOTE: If crew dispatches an operator to check the safeguards building, the operator will report that the door is hot and steam is issuing from around the door seals.	
	Crew verifies unit is in Mode 1, 2, or 3.	AP-16 steps
	RO verifies pressurizer level stable or increasing. (NO)	
	RO places 1-CH-FCV-1122 in manual and adjusts charging flow to control pressurizer level.	
	RO isolates letdown if pressurizer level is still decreasing: Closes 1-CH-HCV-1200B Closes 1-CH-LCV-1460A/B	
	NOTE: The US may use the CAP of 1-ES-0.1 and initiate SI and return to 1-E-0.	
	RO shifts charging pump suction to RWST if pressurizer level is still decreasing: Opens 1-CH-MOV-1115B/D Closes 1-CH-MOV-1115C/E	
	Crew returns to 1-E-0.	
	Crew identifies annunciator A-C4, AREA AMBIENT AIR TEMP HIGH.	

EVENT 8: With the unit stabilized in 1-ES-0.1, "Reactor Trip Response," and indications exist of a SBLOCA outside containment, the crew will respond in accordance with "1-E-0, "Reactor Trip or Safety Injection," and 1-ECA-1.2, "LOCA Outside Containment."

TIME	EXPECTED ACTION	INSTRUCTOR REMARKS
	Crew identifies high temperature in U-1 SFGDS.	
	US directs crew to manually initiate SI and return to 1-E-0.	
	RO/BOP manually initiate SI.	
	Crew verifies 1-E-0 immediate operator actions.	
	RO reviews CAP items 1-5.	
	Crew determines that CAP item 2 applies.	No SI flow is available.
	Per CAP, crew initiates attachment for manual verification of SI flowpath.	
	NOTE: The following steps are from attachment, "Manual Verification of SI Flowpath."	
	Crew verifies RWST aligned.	
	Crew verifies BIT recircs closed.	
	Crew attempts to open BIT inlet valves. (NO)	
CT3	Crew aligns BIT bypass: <ul style="list-style-type: none"> • BOP turns on control power for 1-SI-MOV-1836. • BOP opens 1-SI-MOV-1836 • BOP verifies flow indicated through BIT bypass • BOP dispatches operator to locally open BIT inlet • BOP closes 1-SI-MOV-1836 when a BIT inlet has been locally opened. 	*Prior to exiting E-0 after safety injection initiated.
	US holds a transient crew brief.	
	US initiates attachment 4(5).	Attachment 5 is initiated by attachment 4.
	Crew verifies SI flow.	
	BOP verifies AFW flow.	

EVENT 8: With the unit stabilized in 1-ES-0.1, "Reactor Trip Response," and indications exist of a SBLOCA outside containment, the crew will respond in accordance with "1-E-0, "Reactor Trip or Safety Injection," and 1-ECA-1.2, "LOCA Outside Containment."

TIME	EXPECTED ACTION	INSTRUCTOR REMARKS
	RO checks RCS Tave stable at or trending to 547°F.	
	RO checks PRZR PORVs and spray valves.	
	RO checks RCP trip and charging pump recirc criteria.	
	BOP checks SGs not faulted. <ul style="list-style-type: none"> All SG pressures > 80 psig and under control of operator. (YES) 	
	BOP checks SGs tubes are not ruptured: (YES): <ul style="list-style-type: none"> Level in any SG increasing in an uncontrolled manner (NO, continue on) Check radiation monitors are normal <ul style="list-style-type: none"> SG blowdown radiation last known valid indication Condenser air ejector radiation last known valid indication SG main steamline radiation Terry turbine AFW pump exhaust radiation 	
	Crew checks if RCS is intact inside containment: (YES) <ul style="list-style-type: none"> Containment pressure normal Containment recirc spray sump level normal Containment radiation normal. 	
	NOTE: Crew will enter 0-AP-5.2 for the MGPI vent stack alarm as resources permit.	
	Crew checks for outside containment inventory loss. <ul style="list-style-type: none"> Vent stack radiation normal. (NO) 	
	Crew determines cause of abnormal conditions is loss of RCS inventory outside containment.	
	US directs crew to transition to 1-ECA-1.2.	
	BOP verifies LHSI pump hot-leg valves closed: <p>1-SI-MOV-1890A and 1890B.</p>	

EVENT 8: With the unit stabilized in 1-ES-0.1, "Reactor Trip Response," and indications exist of a SBLOCA outside containment, the crew will respond in accordance with "1-E-0, "Reactor Trip or Safety Injection," and 1-ECA-1.2, "LOCA Outside Containment."

TIME	EXPECTED ACTION	INSTRUCTOR REMARKS
	BOP verifies SI accumulator sample valves closed: 1-SI-HCV-1850B, D, F 1-SI-HCV-1850A, C, E	
CT4	Crew isolates LOCA outside containment. <ul style="list-style-type: none"> • BOP closes LHSI pump cold-leg injection valves 1-SI-MOV-1890C and 1890D. • BOP closes LHSI pump discharge valves 1-SI-MOV 1864A and 1864B. 	*Before exiting 1-ECA-1.2
	RO 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.	Validation time 20 minutes from when event 7 happened. Total time: 135 minutes.

REFERENCES

PROCEDURE	REV.
Operating Procedure 1-OP-8.8, "Transferring Boric Acid."	10
Operating Procedure 1-OP-2.1, "Unit Operation from Mode 2 to Mode 1."	113
Abnormal Procedure 1-AP-44, "Loss of RCS Pressure."	19
Abnormal Procedure 1-AP-3, "Loss of Vital Instrumentation."	26
Abnormal Procedure 1-AP-38, "Excessive Load Increase."	18
Abnormal Procedure 1-AP-26, "Loss of Main Generator Voltage Control."	12
Abnormal Procedure 1-AP-16, "Primary Plant Leakage."	29
Abnormal Procedure 0-AP-5.2, "MGP Radiation Monitoring System."	23
Maintenance Operating Procedure 1-MOP-55.77, "Steam Flow Instrumentation."	10
Maintenance Operating Procedure 1-MOP-77.79, "Steam Pressure Instrumentation."	12
Emergency Operating Procedure 1-E-0, "Reactor Trip or Safety Injection."	46
Emergency Operating Procedure 1-ES-0.1, "Reactor Trip Response."	31
Emergency Contingency Action 1-ECA-1.2, "LOCA Outside Containment."	6
Station Annunciator Response Procedures.	N/A
Administrative Procedure PI-AA-5000, "Human Performance."	8
INPO, Guideline for Teamwork and Diagnostic Skill Development: INPO 88-003,	Jan. 1988
INPO, ACAD 07-002 Simulator Training Guidelines	Jan. 2007

ATTACHMENT 1

SIMULATOR OPERATOR'S COMPUTER PROGRAM

**SIMULATOR OPERATOR'S COMPUTER PROGRAM
2014 NRC 2**

Initial conditions

1. Recall IC 369
2. Ensure Tave(555-565), Tref, PDTT level, and VCT level are selected on trend recorders.
3. **Place red sticker** on 2-CC-P-1B.
4. **2H is the protected train.**
5. Control rods at 160 steps.
6. Calorimetric selected to 0.
7. Copy of 0-OP-8.8 for booth.

PRELOADS PRIOR TO SCENARIO START

CONDITION	MALFUNCTION/OVERRIDE/ETC.
Tagout of 2-CC-P-1B	Verify 2-CC-P-1A is running Place 2-CC-P-1B in PTL Remote functions: U2_CCP1B_RACKIN = RACKOUT U2_CC_28 = 0
Lower level in "A" BAST	Use tanks and stuff: chm405(1) = 69000 (78.2%)
Failure of BIT inlet MOVs	Monitor: SIMOV867_RATE(1) = 0 SIMOV867_RATE(2) = 0
"C" steam dump rate to 0 on reactor trip	Set up trigger on Trigger 7 Set VTMS408C_R = 0
"C" steam dump red light is overridden on	Set up on trigger 13 to occur on a reactor trip (RD1) Lamp override: TCV408C_RED = OFF

SCENARIO EVENTS

EVENT 1	Transfer acid from "B" BAST to "A" BAST
MALFUNCTIONS/OVERRIDES	
When directed to perform lineup per 0-OP-8.8 step 5.1.4:: Open 1-CH-95 using trigger 1: CH_95 = 100, Ramp = 30, Trigger = 1 When directed to secure lineup per 0-OP-8.8 step 5.1.11c : Return CH_95 to 0 over 30 seconds using summary screen.	
COMMUNICATIONS	
Report back when 1-CH-95 has been opened and also when it has been reclosed.	

EVENT 2	Increase power
MALFUNCTIONS/OVERRIDES	
COMMUNICATIONS	

EVENT 3	PRZR PORV fails open
MALFUNCTIONS/OVERRIDES	
<p>Malfunctions: RC0702, Delay time = 5, Ramp = 20, Severity = 1, Trigger = 3 RC1902, Delay time = 5, Trigger = 3</p> <p>MOV control: RCMOV535_RACKIN = RACKOUT, Trigger = 10</p> <p>NOTE: The next event will occur once tech specs have been reviewed, or at the discretion of the lead evaluator.</p>	
COMMUNICATIONS	
<p>When directed to de-energize 1-RC-MOV-1535, wait 5 minutes and then insert trigger 10 and report back.</p>	

EVENT 4	Main Generator Voltage Regulator Failure
MALFUNCTIONS/OVERRIDES	
<p>Malfunction: EL09, Delay time = 5, Ramp = 35, Severity = 60, Trigger = 4</p> <p>If need to reset K-B4: V2KB4_W_RST = TRUE, Trigger = 12</p> <p>The next event can occur once the unit is stable and the system operator has been notified of the VR status.</p>	
COMMUNICATIONS	
<p>The turbine building operator may be sent to look at voltage regulator panel. Can report that there are many messages and need electrical support.</p> <p>When dispatched with AR for K-C1: The AVR system stabilizer in NOT on. Circle the following: HLTH FBKPOST, HLTH FBKPRE, HLTH IOICUFAIL, and HLTH NOCTRLR See below for resetting ARs as this is required in AR for K-C1 also.</p> <p>When dispatched with AR for K-B4: If need to reset K-B4: Use trigger 12 above.</p> <p>Circle the following on AR for K-B4: FORCING, MXL, OVERVOLT</p>	

EVENT 5	Steam dump failure
MALFUNCTIONS/OVERRIDES	
Remote Function MSTCV408C_DESD, Delay time = 5, Severity = 50, Trigger = 5 Setup a trigger 11 to close the valve when a steam dump switch is taken to OFF: SD2A_OFF_RESET(1) = 1 .OR. SD2B_OFF_RESET = 1 Command: SET MSTCV408C_DESD = 0 NOTE: The next event will occur once the unit is stable, or at the direction of the lead evaluator.	
COMMUNICATIONS	
When sent to investigate, the TB operator can report a 9 psig air demand signal on the valve. If directed to isolate air: Wait 2 minutes and then report that air is isolated and regulator has been bled off for "C" steam dump. (1-IA-1213 is air isolation valve to "C" steam dump.) If tagout has been requested to isolate air: wait at least 10 minutes. Then report (As WCC) that air has been isolated to "C" steam dump per an APC sheet (which you have in the WCC). Tagout will be hung when ready. Steam dumps can be returned to service. I&C will report that the air booster to the "C" steam dump has failed.	

EVENT 6	"A" SG Press Ch III failure
MALFUNCTIONS/OVERRIDES	
<p>Malfunction: MS1701, Delay time = 5, Ramp = 10, Severity = -1, Trigger = 6</p> <p>After the crew has identified channel trip requirements and the US has referred to tech specs, the next event may occur.</p>	
COMMUNICATIONS	
<p>If sent to look at transmitter locally, wait 5 minutes and report that there are no obvious abnormalities with transmitter. (QSPH basement)</p>	

EVENT 7	G-12 opens causing a reactor/turbine trip
MALFUNCTIONS/OVERRIDES	
Malfunction: EL10, Delay time = 5, Trigger = 7	
COMMUNICATIONS	

EVENT 8	Inter-system LOCA
MALFUNCTIONS/OVERRIDES	
<p>Malfunction: SI16, Delay time = 120, Ramp = 100, Severity = 75, Trigger = 8</p> <p>If sent to open BIT valve(s) locally AFTER de-energizing it/them: MOV Override: SI SIMOV867A_RACKIN = RACKOUT, Delay time = 60, Trigger = 15 SIMOV867A = 100, Delay time = 300, Ramp = 90, Trigger = 15 and/or SIMOV867B_RACKIN = RACKOUT, Delay time = 90, Trigger = 16 SIMOV867B = 100, Delay time = 400, Ramp = 90, Trigger = 16</p> <p>If sent to open BIT valves locally WITHOUT de-energizing them then wait 5 minutes and then one at a time (as required) change the rates using the monitor screen:</p> <p>SET SIMOV867_RATE(1) = 450 SET SIMOV867_RATE(2) = 450</p> <p>The scenario may be terminated after the crew isolates the leak, or as directed by the lead evaluator.</p>	
COMMUNICATIONS	
<p>If sent to Safeguards, report that door is hot. (If leak has already been isolated can report that there was a loud noise, but it has now stopped.)</p> <p>When sent to manually open one of the BIT inlet valves use instructions above and report back when requested valve has been opened.</p> <p>If asked about cask drying for 0-AP-5.2: No cask drying is occurring.</p>	

ATTACHMENT 3

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.
- E. During shift operations each crew member will utilize operator fundamentals to ensure Teamwork Effectiveness, High Standards for Controlling Evolutions, Indications Monitored Closely, a Natural Bias for Conservatism, and Knowledge of Plant Design and Theory.

EVENT 1 PERFORMANCE OBJECTIVES

EVENT GOAL:

Given that the unit is at power and a transfer of boric acid from "B" BAST to "A" BAST is required, the RO will transfer acid in accordance with 0-OP-8.8, "Transferring Boric Acid."

NORTH ANNA SPECIFIC TASKS:

None

CRITICAL TASK:

N/A

EVENT 2 PERFORMANCE OBJECTIVES

EVENT GOAL:

Given that the unit is at 50% power and a power increase to 100% is desire, the crew will increase power in accordance with 1-OP-2.1, "Unit Operation from Mode 2 to Mode 1."

NORTH ANNA SPECIFIC TASKS:

None

CRITICAL TASK:

N/A

EVENT 3 PERFORMANCE OBJECTIVES

EVENT GOAL:

Given that the unit is at power, and the PRZR PORV has failed open and will not close, the crew will be expected to 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

CT Statement:

Crew stops RCS pressure decrease.

Safety Significance:

Failure to close the 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." The RCS fission product barrier can be restored to full integrity simply by closing the block MOV. Therefore, failure to close the 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:

Indication/annunciation of:

- * RCS pressure decrease, and
- * PRZR PORV open, and
- * associated block MOV open

Performance Indicator:

RO closes PORV block valve 1-RC-MOV-1535.

Feedback:

RCS pressure decrease stopped.

WOG Reference:

Appendix B CT-10.

Conditions:

Prior to a PRZR low pressure reactor trip.

EVENT 4 PERFORMANCE OBJECTIVES

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

NORTH ANNA SPECIFIC TASKS:

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

CRITICAL TASK:

N/A

EVENT 5 PERFORMANCE OBJECTIVES

EVENT GOAL: Given that 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:

- * Reactor power increasing.
- * Steam flow increasing.
- * Megawatts decreasing

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 6 PERFORMANCE OBJECTIVES

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

NORTH ANNA SPECIFIC TASKS:

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

CRITICAL TASK:

N/A

EVENT 7 PERFORMANCE OBJECTIVES

EVENT GOAL: Given that the generator output breaker has opened causing a reactor trip, the crew will respond in accordance with 1-E-0, "Reactor Trip or Safety Injection."

NORTH ANNA SPECIFIC TASKS:

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

CRITICAL TASK:

N/A

EVENT 8 PERFORMANCE OBJECTIVES

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

NORTH ANNA SPECIFIC TASKS:

R520 Respond to increasing primary plant leakage.
R730 Verify safety injection flow
R761 Respond to a LOCA outside containment.

CRITICAL TASK:

See following pages

CT Statement:

Crew aligns Charging pumps.

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:

- * reactor trip and safety injection
- * no SI flow
- * BIT inlet valves closed

Performance Indicator:

RO manually opens 1-SI-MOV-1836.

Feedback:

HHSI flow to the cold legs is indicated.

WOG Reference:

Based on Appendix B CT-7

Conditions:

Prior to exiting E-0 after safety injection initiated.

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:

Crew closes LHSI pump Cold Leg Injection valves.

1-SI-MOV-1890C

1-SI-MOV-1890D

Feedback:

RCS pressure increasing.

WOG Reference:

Appendix B CT-32

Conditions:

When directed by procedure

ATTACHMENT 2

SIMULATOR PERFORMANCE DATASHEET

Scenario Performance Datasheet

EVENT 1: Given that the unit is at power and a transfer of boric acid from "B" BAST to "A" BAST is required, the RO will transfer acid in accordance with 0-OP-8.8, "Transferring Boric Acid."

SPD Verified: _____ (Initials)

- "B" BAST level decreases
- "A" BAST level increases

EVENT 2: Given that the unit is at 50% power and a power increase to 100% is desire, the crew will increase power in accordance with 1-OP-2.1, "Unit Operation from Mode 2 to Mode 1."

SPD Verified: _____ (Initials)

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

EVENT 3: Given that the unit is at power, and the PRZR PORV has failed open and will not close, the crew will be expected to respond in accordance with 1-AP-44, "Loss of Reactor Coolant System Pressure."

SPD Verified: _____ (Initials)

- Annunciators C-D1, B-F7, B-E7, B-H6, and B-H2 are illuminated
- 1-RC-PCV-1456 indicates open
- 1-RC-PCV-1456 will not close

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

SPD Verified: _____ (Initials)

- Annunciator K-C1 illuminates
- Annunciator K-B4 may illuminate
- Generator output voltage increases

EVENT 5: 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)

- "C" steam dump shows mid-position
- Reactor power increases slightly (until dump is closed)
- Tave decreases slightly (until dump is closed)
- Megawatts decrease slightly (until dump is closed)

Scenario Performance Datasheet

EVENT 6: Given the plant is in mode one with indications of a failed steam pressure transmitter, the crew will respond in accordance with 1-AP-3, "Loss of Vital Instrumentation."

SPD Verified: _____ (Initials)

- Annunciators F-H1 illuminates
- Status light N-C3 and N-C4 illuminate
- 1-MS-PI-1475 fails down scale
- 1-MS-FI-1474 fails down scale
- "A" MFRV demand decreases

EVENT 7: Given that the generator output breaker has opened causing a reactor trip, the crew will respond in accordance with 1-E-0, "Reactor Trip or Safety Injection."

SPD Verified: _____ (Initials)

- G-12 opens
- Reactor and turbine trips occur

EVENT 8: With the unit stabilized in 1-ES-0.1, "Reactor Trip Response," and indications exist of a SBLOCA outside containment, the crew will respond in accordance with "1-E-0, "Reactor Trip or Safety Injection," and 1-ECA-1.2, "LOCA Outside Containment."

SPD Verified: _____ (Initials)

- RCS pressure and pressurizer level decrease
- Charging flow increases
- Annunciators A-C1, E-F8, then A-C4 illuminate
- Vent stack "B" radiation increases to alarm setpoint
- BIT inlet valves fail to open

Facility: North Anna Power StationScenario No.: (2014) NRC-3Op-Test No.: 1

Examiners: _____ Operators: _____

Initial Conditions: Unit is at 49% power BOL. Unit was returned to power 2 days ago following work on the generator exciter. Power has been at 49% for several days due to a problem with a containment sump pump. The sump pump has been replaced and the unit as been cleared to increase power to 100%. 1-FW-P-2 (terry turbine) was just returned to service last shift. 2-CC-P-1B was tagged out last shift for major maintenance and is not expected to be returned to service for several days.

Turnover: Shift orders are to swap charging pumps to "B" for an upcoming PT, then ramp the unit to 100% power.

Event No.	Malf. No.	Event Type*	Event Description
1		N (R) (S)	Swap charging pumps
2		N (B) R (R) (S)	Ramp unit up using turbine and dilution/rods
3	NI0101	I (R) (S) TS (S)	Power range detector N-44 fails high causing control rods to step out. (CT)
3a		N (B) (S)	N-44 is placed in trip (Normal)
4	CA0402	C (B) (S)	Instrument air leak in containment. Standby compressor fails to start automatically. Relief valve reseats after containment has been isolated from outside IA system. (CT)
5	CH1201	I (R) (S)	VCT level transmitter failure
6	CC0201	C (B) (S) TS (S)	Running CC pump trips with failure of standby pump to auto-start
7	FW2201 FW2202 FW2203	M (ALL)	Loss of Main Feed
8		C (B) (S)	Failure of turbine to trip automatically or manually (CT)
9		C (ALL)	AFW pumps trip, degrade, or don't put water into generator (CT)
			The scenario can be terminated once Terry Turbine is returned to service.
			(Event 8 happens during event 7 and is numbered for use on subsequent forms. Events 8 and 9 happen after the reactor trip.)
* (N)ormal, (R)eactivity, (I)nstrument, (C)omponent, (M)ajor			

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DOMINION
NORTH ANNA POWER STATION

LICENSED OPERATOR REQUALIFICATION EXAMINATION
SIMULATOR EXAMINATION GUIDE
SCENARIO 2014 NRC 3

SIMULATOR EXAMINATION GUIDE

<u>EVENT</u>	<u>DESCRIPTION</u>
1.	Swap charging pumps (Normal)
2.	Ramp unit up using turbine and dilution/rods
3/3a.	Power range detector N-44 fails high causing control rods to step out. N-44 is placed in trip (Normal/BOP)
4.	Instrument air leak in containment. Standby compressor fails to start automatically. Relief valve reseats after containment has been isolated from outside IA system.
5.	VCT level transmitter failure
6.	Running CC pump trips with failure of standby pump to auto-start
7/8.	Loss of Main Feed Failure of turbine to trip automatically or manually
9.	Loss of secondary heat sink

Scenario Recapitulation:

Malfunctions after EOP entry	2	(Turbine fails to trip automatically or manually, loss of AFW)
Total Malfunctions	7	(Failure of N-44, instrument air leak in containment/standby compressor fails to start automatically, VCT level transmitter failure, CC pump trips/standby pump fails to auto-start, loss of main feed, turbine fails to trip automatically or manually, loss of AFW.)
Abnormal Events	4	(Failure of N-44, instrument air leak in containment/standby compressor fails to start automatically, VCT level transmitter failure, CC pump trips/standby pump fails to auto-start)
Major Transients	1	(Loss of main feed)
EOPs Entered	2	(ES-0.1, FR-H.1)
EOP Contingencies	1	(FR-H.1)
Critical Tasks	4	

SCENARIO DURATION

138 Minutes

SIMULATOR EXAMINATION SCENARIO SUMMARY

SCENARIO 2014 NRC 3

Unit is at 49% power BOL. Unit was returned to power 2 days ago following work on the generator exciter. Power has been at 49% for several days due to a problem with a containment sump pump. The sump pump has been replaced and the unit has been cleared to increase power to 100%. 1-FW-P-2 (turbine) was returned to service last shift. 2-CC-P-1B was tagged out for major maintenance last shift and is not expected to be returned to service for several days. Shift orders are to swap charging pumps to "B" for an upcoming PT, then ramp the unit to 100% power

The first event will be a normal evolution of swapping charging pumps by the RO using 1-OP-8.9, "Transferring Running Pumps." This evolution can be pre-briefed so that the crew is prepared to do the swap. Once the charging pumps have been swapped, the next event can occur.

The next event will be a ramp up in power. This event can be pre-briefed. Once enough of a power increase has been seen, the next event can occur.

Power-range NI channel IV will fail high, causing control rods to insert. The crew should enter 1-AP-4.3, "Malfunction of Nuclear Instrumentation (Power Range)," and place control rods in MANUAL. The crew should place the channel in trip and withdraw control rods to their previous position to restore Tave. After the crew restores control rods to AUTO; or at the discretion of the lead evaluator, the next event can occur.

Now, a loss of instrument air inside containment will occur. The source of the leak will be a relief valve on the containment IA receiver that lifted and will not reseal. The crew will be expected to perform the actions of 1-AP-28, "Loss of Instrument Air," start all available air compressors, and isolate containment instrument air, which will isolate the leak from the rest of the station air. Once isolated, containment instrument air will continue to decrease where the relief valve will eventually reseal and air pressure will recover. After the crew identifies that containment instrument air pressure has recovered, the next event will occur.

VCT level transmitter, 1-CH-LT-1112, will fail high. The VCT divert valve will fail open. The RO will use the annunciator response for VCT hi/lo level (C-A4) to manually close the divert valve. The crew will discuss the loss of auto-swapover to the RWST on low VCT level.

The next event will be a loss of component cooling. The running pump, 1-CC-P-1A will trip and the standby pump, 1-CC-P-1B will fail to auto start. The crew will be expected to respond IAW 1-AP-15, "Loss of Component Cooling," and start 1-CC-P-1B. After CC flow has been restored and TS have been reviewed, the next event can occur.

A feed line break will occur on the main feed pump suction line, resulting in a loss of all main feed pumps. Upon initiation of the reactor trip the crew should enter 1-E-0, "Reactor Trip or Safety Injection", and perform the required actions. The turbine will not trip, requiring the BOP to perform the RNO action to trip it. If the crew can quickly trip the main turbine, then safety injection will not occur and the crew will transition to 1-ES-0.1, "Reactor Trip Response." Depending on crew speed, a safety injection may occur due to the turbine trip failure and the crew

will remain in 1-E-0. The terry turbine will start and then trip. It will be reported that the linkage to the trip valve is broken.

The "A" motor-driven pump will be pumping water to the floor of the MSVH. The "B" motor-driven pump will degrade to the point where it is not putting water in the "B" SG. These failures will lead to the next event.

The crew will identify that they have no feed to the SGs and enter 1-FR-H.1, "Response to a Loss of Secondary Heat Sink." The crew will not be able to restore Main or Aux feedwater the first time through the procedure and will return to step 1. At this time the terry turbine trip valve will be repaired and the terry turbine will be restarted. Once the crew has established sufficient flow to "A" SG, 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 49% power. Unit was returned to power 2 days ago following work on the generator exciter. Power has been at 49% for several days due to a problem with a containment sump pump. The sump pump has been replaced and the unit has been cleared to increase power to 100%. RCS boron is 1537 ppm and core age is 150 MWD/MTU. Aux steam is on unit 2.

Unit 2 is at 100% power.

Equipment Status:

1-FW-P-2 (turbine) was just returned to service last shift. 2-CC-P-1B was tagged out last shift for major maintenance. It is expected to be out for several more days. Maintenance rule window is green Protected train is 2H.

Shift Orders:

Swap charging pumps to "B" for an upcoming PT, then ramp the unit to 100% power

EVENT 1: Swap charging pumps to 1-CH- P-1B in service per 1-OP-8.9, "Transferring Running Charging Pumps."

TIME	EXPECTED ACTION	INSTRUCTOR REMARKS
SPD Verified: _____ (Initials) <ul style="list-style-type: none"> Amps increase on "B" charging pump when started Amps decrease on "A" charging pump when stopped 		
	RO places "B" charging pump bearing temperatures on a short interval trend using PCS.	Normal event
	RO verifies with operator in AB that Aux oil pump for 1-CH-P-1B is in auto and running.	
	RO announces and starts 1-CH-P-1B.	
	RO verifies that 1-SW-TI-103B is < 128°F.	
	RO stops 1-CH-P-1A and places in AUTO-AFTER-STOP.	
	RO continues to monitor bearing temperatures on 1-CH-P-1B until stable, then returns trend interval to normal.	
	RO clears annunciator C-A7 by placing control switch in PTL and returning to After Stop. (per AR)	
	NOTE: The next event can occur once the crew has swapped charging pumps.	Validation time: 13 minutes

EVENT 2: Given that the unit is at approximately 49% 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. Turbine operation is done using attachment 8 (Guidance for main turbine operations) of 1-OP-2.1.	Attached
	BOP verifies/sets desired ramp rate (0.3% per minute).	
	BOP ramps down to get off limiter, as required.	
	BOP adjusts limiter position up, as required.	
	BOP increases turbine setter to desired position.	
	BOP presses GO on turbine.	
	BOP monitors turbine ramp.	
	RO starts a dilution when required using 1-GOP-8.3.1 or 1-GOP-8.3.2.	Attached
	RO monitors 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.	Validation time: 37 minutes (10% power)

EVENT 3/3a: Given that the unit is stable at power, and power-range channel IV has failed high resulting in rods stepping in, the crew will respond in accordance with 1-AP-4.3, "Malfunction of Nuclear Instrumentation (Power Range)."

TIME	EXPECTED ACTION	INSTRUCTOR REMARKS
SPD Verified: _____ (Initials) <ul style="list-style-type: none"> Control rods step in Annunciators A-A7, A-B7, and A-D8 illuminate N-44 indication is failed high 		
	RO identifies control rods stepping in.	
	RO identifies annunciators for an NI failure are lit.	
	RO identifies N-44 failed high.	
	US directs entry into 1-AP-4.3.	
	BOP stops power increase by holding the ramp.	
CT1	RO places control rods in MANUAL.	*Prior to receiving a reactor trip due to rod motion
	BOP verifies MFRV bypass valves in MANUAL.	
	NOTE: The RO will stop the dilution once immediate actions have been completed.	
	Crew verifies the other three power-range instruments operable.	
	Crew verifies unit in mode 1.	
	Crew checks reactor trip interlocks: <ul style="list-style-type: none"> Power >7% and P-G2 NOT lit Power >10% and P-D2 lit Power >30% and P-F1 NOT lit 	TS 3.3.1 Functions 18b, 18d, 18c – 1-hour permissives
	Crew checks Tave within 1.5°F of Tref.	There is a rod stop signal present until N-44 is placed in trip.
	RO maintains rods above insertion limit and AFD in spec.	

EVENT 3/3a: Given that the unit is stable at power, and power-range channel IV has failed high resulting in rods stepping in, the crew will respond in accordance with 1-AP-4.3, "Malfunction of Nuclear Instrumentation (Power Range)."

TIME	EXPECTED ACTION	INSTRUCTOR REMARKS
	BOP defeats N-44 <ul style="list-style-type: none"> • BOP selects N\$\$ on the comparator and rate drawer • BOP selects N-44 on the miscellaneous control and indication drawer for rod stop bypass and upper and lower sections • BOP removes control power fuses 	Normal
	Crew verifies N-43 selected on the N-16 status panel.	
	Crew notifies Chemistry that N-44 input to the OLCMS is unreliable.	
	Crew checks N-41, N-42 and N-43 not failed.	
	Crew checks N-44 failed.	
	Crew checks reactor power >5%.	
	Crew removes points from processing. N0047A, N0048A, and N0052A	
	US refers to Technical Specifications: 3.3.1 Functions 2 and 3 (Conditions D and E) and determines the channel must be placed in trip within 72 hours. (Done by AP) (Functions 18b,c,d for the 1 hour permissives are already checked per AP)	
	Crew adjusts control rods as required and places rod control in AUTO, as appropriate.	
	NOTE: The next event will occur after the crew restores control rods to AUTO, or as directed by the lead evaluator.	Validation time 20 minutes, including brief.

EVENT 4: Given that the unit is at power, and a loss of instrument air inside containment has occurred, the crew will be expected to respond in accordance with 1-AP-28, "Loss of Instrument Air."

TIME	EXPECTED ACTION	INSTRUCTOR REMARKS
SPD Verified: _____ (Initials) <ul style="list-style-type: none"> • Annunciators F-F8, and J-E2 illuminates • Instrument air and containment instrument air pressures decrease • Compressors do not auto-start when required 		
	BOP identifies annunciators 1J-F8, SAND FLTR IS SUPPLY LO PRESS, and 1J-E2, CONT INST AIR HDR LOW PRESS OR COMP B TROUBLE.	
	Crew identifies decreasing IA pressure.	
	US directs entry into 1-AP-28.	
CT2	BOP starts all available air compressors.	*Prior to reaching the (manual reactor) trip set point of 70 PSIG.
	Crew starts IA/SA compressors by placing them in HAND.	
	BOP checks IA pressure <70 psig. (NO)	
	US directs BOP to continue monitoring IA pressure.	
	Crew dispatches operators to determine cause for loss of IA.	
	Crew attempts to correct cause for loss of IA.	
	BOP verifies IA pressure >94 psig. (NO)	
	Crew determines IA pressure is NOT trending to >94 psig.	
CT2	BOP closes 1-IA-TV-102A to isolate IA to containment.	This will isolate the containment IA header. The relief valve will reseal.
	Crew checks IA pressure outside containment increasing. (YES)	
	Crew monitors IA pressure inside containment decreasing, then increasing back to normal.	
	Crew checks RHR system in service.	

EVENT 4: Given that the unit is at power, and a loss of instrument air inside containment has occurred, the crew will be expected to respond in accordance with 1-AP-28, "Loss of Instrument Air."

TIME	EXPECTED ACTION	INSTRUCTOR REMARKS
	Crew checks RCPs running.	
	Crew verifies RCP temperatures normal.	
	Crew checks RCP seal cooling normal.	
	NOTE: Operators dispatched to investigate loss of IA will report that nothing abnormal was noted.	
	Crew checks PRZR PORV accumulator pressure normal.	
	RO maintains RCS pressure stable.	
	RO maintains PRZR level stable.	
	Crew checks containment IA pressure increasing.	
	Crew verifies containment IA pressure >75 psig.	
	NOTE: Crew may choose not to reopen 1-IA-TV-102A at this time or to locally isolate penetration and valve in air slowly per RNO.	
	BOP opens 1-IA-TV-102A.	
	Crew verifies containment cooling normal.	
	BOP verifies IA pressure >94 psig.	
	BOP returns air compressors to normal and directs unit 2 to do the same.	
	NOTE: The next event can occur after the crew verifies air pressure is returned to normal, or as directed by the lead evaluator.	Validation time: 15 minutes, waited for IA TV to be reopened. Brief.

EVENT 5: Given that the unit is at power and a failure of VCT level transmitter, 1-CH-LT-1112, 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.	
	NOTE: The following steps are from the annunciator response for C-A4. (Attached)	
	US reads note in AR about 1-CH-LT-1112 failing high - loss of auto swapover capability on low VCT level, full divert to stripper.	
	RO places 1-CH-LCV-1112C in manual and raises output to 100%.	
	RO verifies VCT level > 5 %.	
	RO verifies charging flow normal and 1-CH-FCV-1122 is not failed.	
	RO verifies Letdown flow is normal.	
	RO verifies VCT makeup is not in progress.	
	RO verifies 1-CH-LCV-1115A in VCT position.	
	RO verifies all instrumentation is normal. (NO)	
	US reviews TRM 3.3.9 for Reg Guide 1.97 instrumentation. (Not Applicable)	
	Crew evaluates plant parameters to determine if VCT or letdown line leaking or ruptured. (NO)	
	US reviews TS 3.4.13 (RCS leakage) which applied while letdown was diverting to the stripper.	

EVENT 5: Given that the unit is at power and a failure of VCT level transmitter, 1-CH-LT-1112, the crew will respond in accordance with the applicable annunciator response.

TIME	EXPECTED ACTION	INSTRUCTOR REMARKS
	US makes notifications about 1-CH-LT-1112 failure and requests instrument shop assistance along with CR.	
	NOTE: The next event will occur once the unit has been stabilized.	Validation time: 10 minutes, including brief.

EVENT 6: Given that the unit is at power, and the running component cooling pump has tripped, the crew will be expected to respond in accordance with 1-AP-15, "Loss of Component Cooling."		
TIME	EXPECTED ACTION	INSTRUCTOR REMARKS
SPD Verified: _____ (Initials) <ul style="list-style-type: none"> Annunciators G-F5, C-C1, C-C2, and C-C3 illuminate (also G-B3, but it doesn't lock in) 1-CC-P-1A trips (green and amber lights lit) 1-CC-P-1B fails to auto-start 		
	BOP identifies loss of 1-CC-P-1A.	
	NOTE: Crew may decide to start 1-CC-P-1B without waiting for the AP since it should have auto-started.	
	US directs crew to enter 1-AP-15.	
	BOP checks CC head tank level stable or increasing.	
	BOP verifies at least one Unit 1 CC pump running. (NO)	
	BOP performs RNO step and starts 1-CC-P-1B.	
	BOP checks running CC pump amps are normal.	
	BOP checks CC flow normal	
	US directs Safeguards watchstander and electricians to investigate "A" CC pump breaker. (An overcurrent drop will be reported.)	
	US directs auxiliary building operator to investigate cause of "A" CC pump trip and to verify "B" CC pumps are operating satisfactorily.	
	Crew directs operator to locally check SW to CC heat exchanger delta Ps.	
	US consults TS 3.7.19A. 7 days to return a required CC subsystem to operable.	
	NOTE: The next event can occur once the CC system has been returned to normal, or at the discretion of the lead evaluator.	Validation time: 9 minutes, including brief.

EVENT 7/8: Given that the unit is at power and a loss of main feedwater, the crew will respond in accordance with 1-E-0, "Reactor Trip or Safety Injection."

TIME	EXPECTED ACTION	INSTRUCTOR REMARKS
SPD Verified: _____ (Initials) <ul style="list-style-type: none"> Annunciators F-B6 and G-F6 are illuminated Turbine does not trip automatically or manually 1-FW-P-2 starts and trips 		
	BOP identifies annunciator 1F-B6, MAIN FD PUMPS SUCT HDR LO PRESS.	
	BOP informs crew that feed pump suction pressure is rapidly decreasing.	
	NOTE: Once the crew has identified a problem, a security officer, or operator if one in the area, will call the MCR and inform the crew that there is a large amount of steam in the east end of the turbine building basement.	
	US directs crew to enter 1-E-0.	
	RO manually trips the reactor.	
CT3	Crew manually trips the turbine by performing the following: <ul style="list-style-type: none"> BOP simultaneously pushes both turbine trip pushbuttons. Places both EHC Pumps in PTL Manually runs back the Turbine OR Closes the MSTVs and Bypass Valves BOP opens G-12 and EFB 	*Prior to a severe challenge (orange path) to subcriticality or integrity CSFs <u>OR</u> transition to ECA-2.1.
	RO verifies power to AC emergency busses.	
	NOTE: If SI actuates, crew will continue in 1-E-0 while securing secondary equipment.	
	Crew checks if SI has actuated or is required. (NO)	
	NOTE: Loss of terry turbine is covered in next event.	
	US directs team to transition to 1-ES-0.1.	
	NOTE: Crew may decide not to brief until they throttle AFW in 1-ES-0.1.	
	US holds transient crew brief.	

EVENT 7/8: Given that the unit is at power and a loss of main feedwater, the crew will respond in accordance with 1-E-0, "Reactor Trip or Safety Injection."

TIME	EXPECTED ACTION	INSTRUCTOR REMARKS
	NOTE: The turbine building flooding AP (39.1) may be used as guidance for securing pumps.	
	Crew secures condensate pumps, and HPs. MFP switches are placed in PTL.	
	NOTE: The next event will occur automatically 3 minutes after the reactor is tripped.	

EVENT 9: Given that the unit has tripped and a total loss of main and auxiliary feedwater has occurred, the crew will respond in accordance with 1-FR-H.1, "Response to Loss of Secondary Heat Sink."

TIME	EXPECTED ACTION	INSTRUCTOR REMARKS
SPD Verified: _____ (Initials) <ul style="list-style-type: none"> • Annunciators F-D8 is illuminated • 1-FW-P-3B degrades over a period of time • Steam driven aux feed pump has no discharge flow • "C" SG WR level does not increase as expected 		
	BOP identifies annunciator F-D8, TURBINE DRIVEN AFW PUMP TROUBLE OR LUBE OIL TRBL, and informs crew.	
	BOP identifies that the "B" AFW pump has degraded flow.	
	BOP identifies that "C" SG WR level is not increasing as expected	
	NOTE: If crew is in 1-E-0 due to SI they will not be able to transition until step 7.	
	Crew identifies red path condition on the heat sink critical safety function.	Due to one SG's AFW flow going to the floor of the MSVH, the ERG monitor will still show sufficient AFW flow, thus it will not show a red path.
	US directs crew to transition to 1-FR-H.1.	
	Crew checks if secondary heat sink is required.	
	NOTE: The operator dispatched to reset the overspeed trip valve will report that the linkage is bound (or broken) and mechanics are working on it.	
	NOTE: When dispatched, operator/mechanics will report "B" AFW pump is not flowing and there is a metallic sound coming from the pump.	
	NOTE: Once crew determines that AFW is not reaching "C" SG: security or an operator can report that there is water coming out of the door of the MSVH.	
	Crew tries to establish AFW flow.	
	NOTE: Crew may place 1-FW-P-3B in PTL. AMSAC will have to be reset first.	

EVENT 9: Given that the unit has tripped and a total loss of main and auxiliary feedwater has occurred, the crew will respond in accordance with 1-FR-H.1, "Response to Loss of Secondary Heat Sink."

TIME	EXPECTED ACTION	INSTRUCTOR REMARKS
	RO places both spray valves in manual and closes them.	
	Crew attempts to establish main feed flow to the SGs. (NO)	
	BOP checks SG wide range levels in 2/3 SGs less the 14%.	
	Crew returns to step 1.	
	NOTE: After the crew has cycled through 1-FR-H.1, the terry turbine can be returned to service.	
	Crew identifies that AFW flow is available to "A" SG.	
	Crew establishes at least 340 gpm to "A" SG.	
	Crew verifies that CETC are decreasing and SG WR level is increasing.	
	Crew returns to procedure and step in effect.	NOTE: RCS temperature was decreasing prior to returning an AFW pump to service due to the low decay heat (55% BOL).
	NOTE: The scenario can be terminated once the crew has transitioned out of FR-H.1.	Total time: 2 hours and 18 minutes.

REFERENCES

PROCEDURE	REV.
1-OP-8.9, "Transferring Running Charging Pumps."	10
1-OP-2.1, "Unit Startup From Mode 2 to Mode 1."	113
Abnormal Procedure 1-AP-4.3, "Malfunction of Nuclear Instrumentation (Power Range)"	21
Abnormal Procedure 1-AP-15, "Loss of Component Cooling."	23
Abnormal Procedure 1-AP-28, "Loss of Instrument Air."	34
Emergency Operating Procedure 1-E-0, "Reactor Trip or Safety Injection."	46
Functional Restoration Procedure 1-FR-H.1, "Response to Loss of Secondary Heat Sink."	22
Station Annunciator Response Procedures.	N/A
Administrative Procedure PI-AA-5000, "Human Performance."	8
INPO, Guideline for Teamwork and Diagnostic Skill Development: INPO 88-003,	Jan. 1988
INPO, ACAD 07-002 Simulator Training Guidelines	Jan. 2007

ATTACHMENT 1

SIMULATOR OPERATOR'S COMPUTER PROGRAM

SIMULATOR OPERATOR'S COMPUTER PROGRAM
2014 NRC 3

Initial conditions

1. Recall IC 370
2. Ensure Tave(555-565), Tref, PDTT level, and VCT level are selected on trend recorders.
3. **2H is the protected train.**
4. **Place red sticker on 2-CC-P-1B switch**
5. Control rods at 160 steps.
6. Calorimetric selected to 0.

PRELOADS PRIOR TO SCENARIO START

CONDITION	MALFUNCTION/OVERRIDE/ETC.
Tagout of 2-CC-P-1B	Verify 2-CC-P-1A is running Place 2-CC-P-1B in PTL Remote functions: U2_CCP1B_RACKIN = RACKOUT U2_CC_28 = 0
Failure of turbine to trip automatically or manually	Malfunctions: TU02 TU03
Block Auto Start of "B" CC Pump	Remote function: CCP1B_Auto_Defeate = T (Monitor point: CCP1_auto_defeat(2))
Failed auto-start of air compressors	Switch override: IAC1_AUTO = OFF SAC1_AUTO = OFF IAC2B_AUTO = OFF

SCENARIO EVENTS

EVENT 1	Swap charging pumps
MALFUNCTIONS/OVERRIDES	
The next event can occur once charging pumps are swapped.	
COMMUNICATIONS	
Give communication that aux oil pump is in auto and running. Give all communications required as AB operator for both charging pumps. This can include seal leakage – none, vibrations, etc. Wait 3 or 4 minutes after "B" started to report condition. Wait 3 or 4 minutes after "A" stopped to report condition.	

EVENT 2	Unit Ramp
MALFUNCTIONS/OVERRIDES	
<p>The next event will occur once the crew has increased power by a sufficient amount.</p>	
COMMUNICATIONS	
<p>NOTE: During validation they did a 18 gpm dilution. Ramped up approximately 10% power. When dilution was stopped they had put in 687 gallons of water.</p>	

EVENT 3	Power range channel IV failure
MALFUNCTIONS/OVERRIDES	
Malfunction: NI0204, Delay time = 5, Ramp = 10, Severity = 1, Trigger = 3 The next event will occur after the crew has placed the channel in trip.	
COMMUNICATIONS	
If asked for permission to withdraw control rods to match Tave/Tref: wait 2 minutes and give permission from OMOC and/or Reactor Engineering.	

NOTE: rods stepped to 162 steps on D.

EVENT 4	Loss of Instrument Air
MALFUNCTIONS/OVERRIDES	
<p>Malfunctions: CA0402, Delay time = 5, Ramp = 60, Severity =20, Trigger = 4 CA02, Delay time = 5, Ramp = 60, Severity = 100, Trigger = 4</p> <p>Check the following when the IA TV is closed: CA0402 to be automatically deleted when crew closes containment isolation valve, after approximately 15 sec it will automatically delete malfunction CA02.</p> <p>Can set up on triggers as follows: (Deletes malfunction CA0402 when an IA trip valve is closed) Trigger 14 TVIA102A_CLOSE(1)=1 .OR. TVIA102B_CLOSE=1 DMF CA0402</p> <p>(Updates CA02 to 0 after 15 seconds when an IA trip valve is closed) Trigger 15 TVIA102A_CLOSE(1)=1 .OR. TVIA102B_CLOSE=1 IMF CA02 (0 15) 0</p> <p>Can delete the 1-IA-C-1 and 1-SA-C-1 air compressor overrides once they have been started in "HAND." This will make them look right after they are placed back in auto.</p> <p>The next event can occur after the crew returns air pressure to normal, or as directed by the lead evaluator.</p>	
COMMUNICATIONS	
<p>Operators dispatched to investigate loss of IA will report that nothing abnormal was noted.</p> <p>If asked to restore IA to containment using 1-IA-304, this is available on ExtremeView.</p>	

EVENT 5	1-CH-LT-1112 fails high
MALFUNCTIONS/OVERRIDES	
Malfunction: CH1201, Delay time = 5, Ramp = 10, Severity = 1, Trigger = 5 The next event may occur once VCT level has been stabilized and TS reviewed.	
COMMUNICATIONS	
If sent to look in VCT cube, can't see any water.	

EVENT 6	Loss of running CC pump/failure of standby pump to auto-start
MALFUNCTIONS/OVERRIDES	
<p>Malfunction: CC0201, Delay time = 5, Trigger = 6</p> <p>The next event can occur once the CC system has been returned to normal.</p>	
COMMUNICATIONS	
<p>When sent to look at CC pump breaker (15H13), wait 3 minutes and report that it has an instantaneous overcurrent drop.</p> <p>When sent to look at pumps in auxiliary building, wait 5 minutes and report that 1-CC-P-1A looks fine, just no longer running. 1-CC-P-1B is running fine with no leakage.</p> <p>When asked to check CC heat exchanger delta Ps, they are unchanged from when you took logs (4 psid)</p>	

EVENT 7/8	Loss of MFW, reactor trip
MALFUNCTIONS/OVERRIDES	
<p>Malfunctions: FW2101, Delay time = 5, Ramp = 30, Severity = 40, Trigger = 7 FW2102, Delay time = 15, Ramp = 45, Severity = 40, Trigger = 7 FW2103, Delay time = 25, Ramp = 60, Severity = 40, Trigger = 7 (Note: Making the severity of these too large or with too little of a ramp causes an MST abort.)</p> <p>Alarm overrides: V1DF8_W, Delay time = 70, Override = ON, Trigger = 7 V1DG8_W, Delay time = 100, Override = ON, Trigger = 7 V2GC8_W, Delay time = 105, Override = ON, Trigger = 7 V1AD3_W, Delay time = 110, Override = ON, Trigger = 7</p> <p>Event 8, failure of turbine to trip automatically or manually, is pre-loaded.</p> <p>The following will trip the terry turbine when flux has decreased to 10%. Verify that the pump trips before a heat sink is established.</p> <p>Remote function: MSTV115 = 0, Delay time = 60, Trigger = 11 (RX23)</p> <p>The following will cause a leak on AFW to "C" SG in the MSVH:</p> <p>Malfunction: FW1403, Delay time = 30, Ramp = 30, Severity = 100, Trigger = 7</p> <p><u>Event 9 is pre-loaded on trigger 7 and will occur after 3 minutes.</u></p> <p>The next event can occur after the crew secures FW and CN pumps, or as directed by the lead evaluator.</p>	
COMMUNICATIONS	
<p>A security officer (or operator if one has been dispatched to the area) will call the MCR on the gaitronics and inform the crew that there is a large amount of steam in the east end of the turbine building basement.</p> <p>Once crew determines that AFW is not reaching "C" SG: security or an operator can report that there is water coming out of the door of the MSVH.</p> <p>The operator dispatched to reset the overspeed trip valve will report that the throttle valve linkage is broken. Mechanics have been notified.</p>	

EVENT 8	Loss of heat sink
MALFUNCTIONS/OVERRIDES	
<p>Malfunction: FW1103, Delay time = 180, Ramp = 300, Severity = 80, Trigger = 7</p> <p>When crew has returned to step 1 of FR-H.1 and ready to return TT to service: MSTV115 = 100, Ramp = 30</p> <p>The scenario can be terminated once the crew has transitioned back to 1-E-0.</p>	
COMMUNICATIONS	
<p>When dispatched, operator/mechanics after a sufficient amount of time (depending on whether you were already in the area) report that "B" AFW pump is not flowing and there is a metallic sound coming from the pump.</p> <p>If sent: Mechanics think it probably has a cracked impeller.</p> <p>Once crew determines that AFW is not reaching "C" SG: security or an operator can report that there is water coming out of the door of the MSVH.</p> <p>If asked to look at leak in MSVH after leak has been isolated: Wait 5 minutes and then report that the location of the leak only affects the "C" SG.</p> <p>The operator dispatched to reset the overspeed trip valve will report that the throttle valve linkage is broken. Mechanics have been contacted.</p> <p>When TT trip valve has been repaired: Report that linkage is repaired and the valve has been reset.</p>	

ATTACHMENT 3
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.
- E. During shift operations each crew member will utilize operator fundamentals to ensure Teamwork Effectiveness, High Standards for Controlling Evolutions, Indications Monitored Closely, a Natural Bias for Conservatism, and Knowledge of Plant Design and Theory.

EVENT 1 PERFORMANCE OBJECTIVES

EVENT GOAL: Swap charging pumps to 1-CH- P-1B in service per 1-OP-8.9,
"Transferring Running Charging Pumps."

NORTH ANNA SPECIFIC TASKS:

R593 Transfer the running charging pump.

CRITICAL TASK:

N/A

EVENT 2 PERFORMANCE OBJECTIVES

EVENT GOAL: Given that the unit is at approximately 49% power and the crew has been instructed to increase power, the crew will ramp the unit up in accordance with 1-OP-2.1, "Unit Startup from Mode 2 to Mode 1."

NORTH ANNA SPECIFIC TASKS:

R705 Dilute the RCS using the blender.

CRITICAL TASK:

N/A

EVENT 3 PERFORMANCE OBJECTIVES

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

NORTH ANNA SPECIFIC TASKS:

R494 Respond to a malfunction of the power-range nuclear instrumentation

S70 Evaluate compliance with technical specifications

CRITICAL TASK:

See Following Pages

CT Statement:

Crew stops control rod movement due to N-44 failure. (Rods Moving IN)

Safety Significance:

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

Cues:

N-44 indicates failed high.

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

Performance Indicator:

RO places control rod bank selector switch in manual.

Feedback:

Inward rod motion stops.

WOG Reference:

None

Conditions:

Prior to receiving a reactor trip due to rod motion.

EVENT 4 PERFORMANCE OBJECTIVES

EVENT GOAL: Given that the unit is at power, and a loss of instrument air inside containment has occurred, the crew will be expected to respond in accordance with 1-AP-28, "Loss of Instrument Air."

NORTH ANNA SPECIFIC TASKS:

R531 Respond to a loss of instrument air inside of containment.

CRITICAL TASK:

See next page.

CT Statement:

Crew starts all available air compressors.

Safety Significance:

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

Cues:

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

Performance Indicator:

BOP starts all available air compressors.

Feedback:

Instrument air pressure stabilizes above the trip set point.

WOG Reference:

None

Conditions:

Prior to reaching the (manual reactor) trip set point of 70 PSIG.

EVENT 5 PERFORMANCE OBJECTIVES

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

NORTH ANNA SPECIFIC TASKS:

None

CRITICAL TASK:

N/A

EVENT 6 PERFORMANCE OBJECTIVES

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

NORTH ANNA SPECIFIC TASKS:

None

CRITICAL TASK:

N/A

EVENT 7 PERFORMANCE OBJECTIVES

EVENT GOAL: Given that the unit is at power and a loss of main feedwater, the crew will respond in accordance with 1-E-0, "Reactor Trip or Safety Injection."

NORTH ANNA SPECIFIC TASKS:

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

CRITICAL TASK:

See next page

CT Statement:

Crew manually trips the 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 OR close MSTVs and bypass valves.

Feedback:

Annunciation/indication that all turbine stop valves are closed.

WOG Reference:

E-0 Background

Conditions:

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

EVENT 9 PERFORMANCE OBJECTIVES

EVENT GOAL: Given that the unit has tripped and a total loss of main and auxiliary feedwater has occurred, the crew will respond in accordance with 1-FR-H.1, "Response to Loss of Secondary Heat Sink."

NORTH ANNA SPECIFIC TASKS:

R223 Initiate reactor coolant system bleed and feed in response to a loss of secondary heat sink.

CRITICAL TASK:

See Following Pages

CT Statement:

Crew stops Reactor Coolant Pumps.

Safety Significance:

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

Cues:

Indication of:

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

Performance Indicator:

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

Feedback:

Indication/annunciation of no RCPs running.

WOG Reference:

FR-H.1 Background

Conditions:

Prior to being required to initiate RCS bleed and feed.

ATTACHMENT 2

SIMULATOR PERFORMANCE DATASHEET

Scenario Performance Datasheet

EVENT 1: Swap charging pumps to 1-CH- P-1B in service per 1-OP-8.9, "Transferring Running Charging Pumps."

SPD Verified: _____ (Initials)

- Amps increase on "B" charging pump when started
- Amps decrease on "A" charging pump when stopped

EVENT 2: Given that the unit is at approximately 49% power and the crew has been instructed to increase power, the crew will ramp the unit up in accordance with 1-OP-2.1, "Unit Startup from Mode 2 to Mode 1."

SPD Verified: _____ (Initials)

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

EVENT 3: Given that the unit is stable at power, and power-range channel IV has failed high resulting in rods stepping in, the crew will respond in accordance with 1-AP-4.3, "Malfunction of Nuclear Instrumentation (Power Range)."

SPD Verified: _____ (Initials)

- Control rods step in
- Annunciators A-A7, A-B7, and A-D8 illuminate
- N-44 indication is failed high

EVENT 4: Given that the unit is at power, and a loss of instrument air inside containment has occurred, the crew will be expected to respond in accordance with 1-AP-28, "Loss of Instrument Air."

SPD Verified: _____ (Initials)

- Annunciators F-F8, and J-E2 illuminates
- Instrument air and containment instrument air pressures decrease
- Compressors do not auto-start when required

EVENT 5: Given that the unit is at power and a failure of VCT level transmitter, 1-CH-LT-1112, 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

Scenario Performance Datasheet

EVENT 6: Given that the unit is at power, and the running component cooling pump has tripped, the crew will be expected to respond in accordance with 1-AP-15, "Loss of Component Cooling."

SPD Verified: _____ (Initials)

- Annunciators G-F5, C-C1, C-C2, and C-C3 illuminate (also G-B3, but it doesn't lock in)
- 1-CC-P-1A trips (green and amber lights lit)
- 1-CC-P-1B fails to auto-start

EVENT 7/8: Given that the unit is at power and a loss of main feedwater, the crew will respond in accordance with 1-E-0, "Reactor Trip or Safety Injection."

SPD Verified: _____ (Initials)

- Annunciators F-B6 and G-F6 are illuminated
- Turbine does not trip automatically or manually
- 1-FW-P-2 starts and trips

EVENT 9: Given that the unit has tripped and a total loss of main and auxiliary feedwater has occurred, the crew will respond in accordance with 1-FR-H.1, "Response to Loss of Secondary Heat Sink."

SPD Verified: _____ (Initials)

- Annunciators F-D8 is illuminated
- 1-FW-P-3B degrades over a period of time
- Steam driven aux feed pump has no discharge flow
- "C" SG WR level does not increase as expected

Facility: North Anna Power StationScenario No.: (2014) NRC-4Op-Test No.: 1

Examiners: _____

Operators: _____

Initial Conditions: Unit at 100% power. MOL. 1-FW-P-2 returned to service last shift. 2-CC-P-1B was tagged out last shift for major maintenance and is not expected to be returned to service for several days.

Turnover: Maintain current plant conditions.

Event No.	Malfunction No.	Event Type*	Event Description
1		N (R) (S)	Makeup to RWST
2	FW3202	I (B) (S) TRM (S)	"B" SG Median SG level channel fails. Level control remains in manual.
3	RC29	C (R) (S) TS (S)	Master pressure controller fails high causing PORV and spray valves to open. All can be closed. (CT)
4		C (B) (S)	Running BC pump trips and standby pump does not automatically start.
5	RC2401	C (All)	"A" SGTL requiring 1-AP-24 entry
6	RC2401	R (R) (S) N (B) TRM (S)	SGTL increases to >100 gpd requiring unit ramp
6a		C (R) (S)	Control rods fail to move in automatic during load reduction (after initially moving)
7	RC1203	C (R) (S)	Seal leak on "C" RCP requires pump shutdown and isolation after reactor trip (CT)
8	RC2401	M (All)	SGTL increases to SGTR requiring SI (2 CTs)
9	MS0501	C (B) (S)	"A" MSTV cannot be closed (CT)
			Event 9 happens during event 8 and is numbered only for use on subsequent forms.
			The scenario can be terminated once an RCS cooldown has been started in 1-E-3.

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

Facility: North Anna Power StationScenario No.: (2014) NRC-4Op-Test No.: 1

Examiners: _____

Operators: _____

Initial Conditions: Unit at 100% power. MOL. 1-FW-P-2 returned to service last shift. 2-CC-P-1B was tagged out last shift for major maintenance and is not expected to be returned to service for several days.

Turnover: Maintain current plant conditions.

Event No.	Malf. No.	Event Type*	Event Description
1		N (R) (S)	Makeup to RWST
2	FW3202	I (B) (S) TRM (S)	"B" SG Median SG level channel fails. Level control remains in manual.
3	RC29	C (R) (S) TS (S)	Master pressure controller fails high causing PORV and spray valves to open. All can be closed. (CT)
4		C (B) (S)	Running BC pump trips and standby pump does not automatically start.
5	RC2401	C (All)	"A" SGTL requiring 1-AP-24 entry
6	RC2401	R (R) (S) N (B) TRM (S)	SGTL increases to >100 gpd requiring unit ramp
6a		C (R) (S)	Control rods fail to move in automatic during load reduction (after initially moving)
7	RC1203	C (R) (S)	Seal leak on "C" RCP requires pump shutdown and isolation after reactor trip (CT)
8	RC2401	M (All)	SGTL increases to SGTR requiring SI (2 CTs)
9	MS0501	C (B) (S)	"A" MSTV cannot be closed (CT)
			Event 9 happens during event 8 and is numbered only for use on subsequent forms.
			The scenario can be terminated once an RCS cooldown has been started in 1-E-3.
* (N)ormal, (R)eactivity, (I)nstrument, (C)omponent, (M)ajor			

DOMINION
NORTH ANNA POWER STATION

LICENSED OPERATOR REQUALIFICATION EXAMINATION
SIMULATOR EXAMINATION GUIDE
SCENARIO 2014 NRC4

SIMULATOR EXAMINATION GUIDE

<u>EVENT</u>	<u>DESCRIPTION</u>
1.	Makeup to RWST
2.	"B" SG Median SG level channel fails
3.	Master pressure controller fails high causing PORV and spray valves to open. All can be closed. (CT)
4.	Running BC pump trips and standby pump does not automatically start.
5.	"A" SGTL
6/6a.	SGTL increases to >100 gpd requiring unit ramp Control rods fail to insert automatically
7.	Seal leak on "C" RCP requires reactor to be tripped, pump shutdown and isolation (CT)
8.	SGTR
9.	"A" MSTV cannot be closed (CT)

Scenario Recapitulation:

Malfunctions after EOP entry	2	(SGTR, "A" MSTV cannot be closed)
Total Malfunctions	8	(SG Median SG level channel failure, master pressure controller failure, trip of running bearing cooling pump with failure of standby pump to auto start, "A" SGTL, control rods fail to insert automatically, SGTR, seal leak on "C" RCP, "A" MSTV cannot be closed.)
Abnormal Events	5	(SG Median SG level channel failure, master pressure controller failure, trip of running bearing cooling pump with failure of standby pump to auto start, "A" SGTL, seal leak on "C" RCP)
Major Transients	1	(SGTR)
EOPs Entered	1	(E-3)
EOP Contingencies	0	
Critical Tasks	4	

SCENARIO DURATION

125 Minutes

SIMULATOR EXAMINATION SCENARIO SUMMARY

SCENARIO 2014 NRC4

The scenario will start with Unit 1 at 100% power MOL. 1-FW-P-2 was returned to service last shift following governor valve work. Unit 2 is also at 100% power with Auxiliary Steam being supplied by Unit 2 extraction steam. 2-CC-P-1B was tagged out for major maintenance last shift and is not expected to be returned to service for several days. Shift orders are to use the Unit 1 blender to perform a makeup to the RWST of 1000 gallons at 6600 ppm for boron concentration adjustment.

Once the crew assumes the watch, they will perform a makeup to the RWST. Once the makeup has been completed, the next event may occur. (NOTE: This event can be pre-briefed.)

At this time, "B" SG median level will fail. The crew will use the annunciator response for F-F2 to take manual control of "B" SG level and restore feedwater flow and level to normal. The US will refer to the TRM. Once SG level has been restored the next event can occur. Level control will remain in manual for the rest of the scenario.

Next, the PRZR master pressure controller will fail causing PORV, 1-RC-PCV-1455C, to open. The US will direct the crew to enter 1-AP-44, "Loss of RCS Pressure." The RO will manually close the open PORV and take manual control of the master pressure controller and close the spray valves.

Next, the running BC pump breaker will trip. The crew should identify annunciators associated with the loss of BC and the US should direct the crew to enter 1-AP-19, "Loss of Bearing Cooling Water." The crew will identify the failure of the standby BC pump to auto-start and manually start the pump. Once the crew has stabilized the plant, the next event will occur.

Now, a tube leak will occur on "A" SG. The first indication will be the N-16 radiation monitor for "A" SG indicating increased leakage. The US should direct the crew to enter 1-AP-5, "Unit 1 Radiation Monitoring System," and direct HP/Chemistry to obtain and analyze a "A" SG blowdown sample. Eventually, the main steamline header N-16 monitor indication will increase and Chemistry will inform the crew that they have indications of a tube leak on the "A" SG. Based on confirmed leakage, the US should direct the crew to enter 1-AP-24, "Steam Generator Tube Leak." The US should refer to technical specifications and the TRM for primary to secondary leakage.

The steam generator tube leakage will increase to the point where a unit ramp is required per the TRM. The crew will commence a unit ramp using 1-AP-2.1, "Fast Load Reduction." Control rods will fail to insert automatically and the RO will have to maintain temperature and pressure manually during the ramp.

There will be a #1 seal failure on the "C" RCP. The crew will respond IAW 1-AP-33.1, "Reactor Coolant Pump Seal Failure." They will identify that the high seal leakage requires that the "C" RCP be secured. The crew will enter 1-E-0, "Reactor Trip or Safety Injection," trip the reactor, stop the "C" RCP, and close the seal leakoff valve. When the reactor coolant pump is secured the next event will happen automatically.

The steam generator tube leakage will increase to where a safety injection is required. The crew will continue in 1-E-0, eventually transitioning to 1-E-3, "SGTR." When the crew attempts to close the MSTV for the ruptured SG it will not close and the crew will have to close the associated NRV. The crew will commence an RCS cooldown. Once the cooldown is stopped, 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 988 ppm and core age is 9,000 MWD/MTU. Aux steam is on unit 2.

Unit 2 is at 100% power.

Equipment Status:

1-FW-P-2 was returned to service last shift. Maintenance rule window is green. 2-CC-P-1B was tagged out last shift for major maintenance. It is expected to be out for several more days. Protected train is 2H.

Shift Orders:

Makeup to the RWST using the unit 1 blender. Add 500 gallons of water at approximately 3000 ppm boron. Maintain current plant conditions.

EVENT 1: Given that a makeup to the RWST has been requested, the crew will use 1-OP-7.7, "Refueling Water Storage Tank System Operation" to adjust boron concentration.

TIME	EXPECTED ACTION	INSTRUCTOR REMARKS
SPD Verified: _____ (Initials)		
<ul style="list-style-type: none"> Blender functions as expected 		
	Crew informs HP of the RWST makeup and the anticipated volume addition.	
	RO directs an operator to close 1-CH-232 and open 1-CH-233.	
	RO records the as-found positions for 1-CH-FC-1113A, 1-CH-FC-1114A and 1-CH-HFC-1114.	
	RO turns the blender control switch to STOP.	
	RO closes 1-CH-FCV-1113A, 1-CH-FCV-1113B and 1-CH-FCV-1114B (IV required)	
	RO determines the required flow for desired concentration of the blend. (Given at turnover.)	
	RO adjusts integrators on blenders.	
	RO requests AB operator to open 1-CH-230.	
	Crew informs HP count room that makeup to the RWST will commence.	
	RO places blender mode selector switch in Manual.	
	RO places blender control switch in START.	
	RO ensures control switch for 1-CH-FCV-1113A in desired position.	
	RO adjusts 1-CH-FC-1113A and 1114A for desired flow.	
	Crew performs channel checks on RWST indications and verifies level channels agree within 3% and that levels are increasing.	
	RO places 1-CH-FCV-1113A in close and places blender control switch in STOP when desired volume has been added.	
	RO has operator close valves in AB (and has them IV'd).	

EVENT 1: Given that a makeup to the RWST has been requested, the crew will use 1-OP-7.7, "Refueling Water Storage Tank System Operation" to adjust boron concentration.		
TIME	EXPECTED ACTION	INSTRUCTOR REMARKS
	RO places blender valves in automatic.	
	RO ensures blender controller is returned to the as-found settings.	
	RO uses 1-OP-8.3 to adjust blender controller settings, if desired.	
	RO returns the blender to AUTO using 1-OP-8.3, if required.	
	RO ensures the 1-CH-DCC-1113 integrator setpoint values are set correctly.	
	Crew notifies chemistry to sample the RWST.	
	NOTE: The next event can occur once the SFP makeup has been completed.	Validation time: 35 minutes

EVENT 2: Given that the unit is at power and "B" SG median select level has failed, the crew will respond in accordance with the AR for annunciator F-F2.		
TIME	EXPECTED ACTION	INSTRUCTOR REMARKS
SPD Verified: _____ (Initials) <ul style="list-style-type: none"> • Annunciator F-F2 illuminates • "B" FRV modulates closed • "B" SG level decreases 		
	BOP identifies annunciator F-F2, SG 1B LEVEL ERROR, is illuminated.	
	BOP identifies that "B" SG level is decreasing and "B" MFRV is closing.	
	US directs crew to obtain annunciator response for annunciator F-F2.	
	BOP takes manual control of "B" MFRV and adjusts FW flow to restore level to normal.	
	US or BOP determine a control band for "B" SG level.	
	US requests CR and I&C support for failure.	
	US refers to TR 3.3.11A and verifies that the "B" MFRV is in manual within 72 hours.	
	NOTE: The next event can occur once "B" SG level has been restored to normal.	Level control will remain in manual. Validation time: 6 minutes

EVENT 3: Given the unit is at power and the PRZR pressure master controller fails high, the crew will respond in accordance with 1-AP-44, "Loss of Reactor Coolant System Pressure."		
TIME	EXPECTED ACTION	INSTRUCTOR REMARKS
SPD Verified: _____ (Initials) <ul style="list-style-type: none"> • Annunciators B-E6, C-D1, and later B-F7 illuminate • Master pressure controller fails high • 1-RC-PCV-1455C indicates open • 1-RC-PCV-1455A and 1455B indicate open • RCS pressure decreases 		
	Crew identifies annunciator B-E6, PRZR PRESS CONT HI OUTPUT.	
	US directs crew to enter 1-AP-44.	
	RO verifies PRZR PORVs closed. (NO)	
CT1	Crew stops RCS pressure decrease. <ul style="list-style-type: none"> • RO closes 1-RC-PCV-1455C. • RO checks master pressure controller controlling properly. (NO) • RO places master pressure controller to manual and adjusts to stabilize and restore pressure. 	*Prior to receiving an automatic reactor trip on low pressure
	RO verifies PRZR spray valves closed.	
	RO verifies all PRZR heaters energized.	
	RO verifies auxiliary spray valve closed.	
	Crew verifies PORV and safety valves closed.	
	RO verifies RCS pressure stable or increasing.	
	RO verifies RCS pressure normal and adjusts sprays or heaters, as required.	
	US refers to: TS 3.4.1A – DNB 2 hours to restore pressure to within COLR limits (>2205 psig), if required. TS 3.4.13 for primary leakage (while PORV open and unisolated).	
	Crew evaluates malfunction and submits work request.	

EVENT 3: Given the unit is at power and the PRZR pressure master controller fails high, the crew will respond in accordance with 1-AP-44, "Loss of Reactor Coolant System Pressure."		
TIME	EXPECTED ACTION	INSTRUCTOR REMARKS
	NOTE: The next event will occur once the crew has stabilized the unit, or as directed by the lead evaluator.	Validation time: 14 minutes

EVENT 4: Given that the unit is at power and the running BC pump has tripped with the standby failing to start, the crew will be expected to 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-E4 and F-F4 are illuminated (possibly K-F5) "A" BC pump has amber light lit "B" BC pump does not auto start 		
	Crew identifies annunciators F-E4, BC WTR DISCH HDR LO PRESS, and F-F4, BC WTR PP 1A-1B AUTO TRIP SYS MISALIGNED, and informs US.	
	US directs the crew to enter 1-AP-19.	
	BOP checks one bearing cooling pump running with normal amps. (NO)	
	BOP starts "B" BC pump.	
	BOP checks BC pump evolutions in progress. (YES)	
	BOP places 1-BC-P-1A in PTL.	
	BOP verifies BC pump running with normal indications.	
	Crew verifies BC system operating normally in tower mode.	
	Crew verifies BC system operation is normal.	
	Crew dispatches operator to check BC pumps.	
	Crew checks main generator temperature alarms are not lit.	
	Crew dispatches operator to check bus duct temperatures locally.	This will take ~30 minutes
	Crew dispatches an operator to locally check equipment cooled by BC.	
	NOTE: The next event will occur after the crew has started the standby BC pump and stabilized the plant, or as directed by the lead evaluator.	NOTE: Check with booth to verify that charging flow is recovering from earlier pressure transient before initiating SGTL. Validation time: 8 minutes

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

TIME	EXPECTED ACTION	INSTRUCTOR REMARKS
SPD Verified: _____ (Initials) <ul style="list-style-type: none"> • 1-MS-RI-190, "A" SG N-16, is first in Alert • Annunciator K-G6 illuminated • Annunciator K-G6 reflashes • 1-MS-RI-190 is in hi alarm • 1-MS-RI-193, Main Steamline header N-16, indication increases to hi alarm • 1-MS-RI-191 and 1-MS-RI-192 increase to Alert 		
	RO/BOP identifies annunciator K-G6, N-16 RAD DET.	
	Crew identifies an Alert alarm on 1-MS-RI-190, "A" SG main steamline N-16 radiation monitor.	
	US directs BOP to enter 1-AP-5, "Unit 1 Radiation Monitoring System."	
	NOTE: If crew requests HP to perform local radiation surveys on the MS lines, HP will inform the crew that contact readings on the "A" MS line show a slight increases since last surveys.	
	Crew monitors radiation on N-16 trend recorder and determines leakage is increasing.	
	Crew identifies increasing radiation on main steamline header N-16 radiation monitor.	
	US directs crew to initiate the 1-AP-5 attachment for monitoring primary to secondary leakage, and enters 1-AP-24.	
	Crew determines if a reactor trip is required. (NO)	AP-24
	Crew refers to attachment 4 for required actions.	
	Crew notifies Chemistry to initiate increased monitoring and to initiate action level 1 actions.	
	Crew requests samples from Chemistry and HP.	
	Crew determines RCS leakrate, as time permits.	

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

TIME	EXPECTED ACTION	INSTRUCTOR REMARKS
	Crew reviews actions for high secondary coolant activity: <ul style="list-style-type: none"> • Turn off Unit 1 and Common sump pumps (turbine building) • Place caution tags to direct samples be taken before pumping sumps • Determine if AS should be transferred to Unit 2 (already on Unit 2 second-points) • Consult with HP prior to using hotwell high level divert. 	
	Crew notifies STA to evaluate the steam generator leak rate trend data.	AP-5
	Crew notifies HP SS and the OMOC of the abnormal status of the monitor reading.	
	Crew identifies the leaking generator as "A" and quantifies leakage using N-16.	
	Crew monitors leakage on trend recorder.	
	Crew verifies/initiates 1-AP-24 and attachment 13 of 1-AP-5.	
	Crew increases monitoring requirements by trending leakrate.	Attachment 13
	Crew requests Air Ejector grab samples every 4 hours.	
	US refers to TR 3.4.4.	
	NOTE: The next event will occur once the crew has made appropriate notifications and requests.	Validation time: 12 minutes

EVENT 6: Given that the unit is at power and indications exist of a SG tube leak requiring a unit ramp, the crew will be expected to respond in accordance with 1-AP-24, "Steam Generator Tube Leak," and 1-AP-2.2, "Fast Ramp."		
TIME	EXPECTED ACTION	INSTRUCTOR REMARKS
SPD Verified: _____ (Initials) <ul style="list-style-type: none"> Annunciator K-G6 reflashes 1-MS-RI-190 indication increases to 110 gpd 		
	RO/BOP identifies reflash of annunciator K-G6, N-16 RAD DET.	
	Crew identifies 1-MS-RI-190, "A" SG main steamline N-16 radiation monitor increasing to >100 gpd.	
	US reenters 1-AP-24 or reviews Note before step one requiring unit power to be reduced to $\leq 50\%$ power within 1 hour and to Mode 3 conditions within 3 hours.	
	US directs crew to enter 1-AP-2.2.	
	RO initiates RCS boration using either attachment 5 or a standard ramp plan.	AP-2.2 Reactivity for RO/SRO

EVENT 6: Given that the unit is at power and indications exist of a SG tube leak requiring a unit ramp, the crew will be expected to respond in accordance with 1-AP-24, "Steam Generator Tube Leak," and 1-AP-2.2, "Fast Ramp."

TIME	EXPECTED ACTION	INSTRUCTOR REMARKS
	<p>BOP reduces plant load at 5%/minute or less as follows:</p> <ul style="list-style-type: none"> • Verifies turbine in Operator Auto (NO) • Verifies GV tracking meter is approximately zero • Ensures turbine control reference and setter are matched • Presses the OPER AUTO push button • Verifies valve position limit light is OFF (NO) • Removes turbine from limiter using attachment 4 • Places setter at the desired setpoint • Sets ramp rate using thumbwheel • Presses the GO pushbutton • Presses HOLD pushbutton once limit light goes out • Verifies the turbine is in IMP-IN (NO) • Ensures reference and setter are matched • Presses IMP-IN pushbutton • Initiates load reduction using attachment 4 • Places setter at desired setpoint • Sets ramp rate using thumbwheel • Ensures the VPL is above the expected valve position • Presses GO pushbutton. 	Normal for BOP
	RO verifies rods are in auto.	
	NOTE: RO will have to maintain RCS pressure manually due to previous failure. BOP will have to maintain "B" SG level.	
	RO energizes additional pressurizer heaters.	
	*RO verifies proper auto control rod insertion. (NO)	
	RO places control rods in manual and adjusts as required to maintain Tave within 5° of Tref.	
	RO monitors steam dumps for proper operation.	

EVENT 6: Given that the unit is at power and indications exist of a SG tube leak requiring a unit ramp, the crew will be expected to respond in accordance with 1-AP-24, "Steam Generator Tube Leak," and 1-AP-2.2, "Fast Ramp."

TIME	EXPECTED ACTION	INSTRUCTOR REMARKS
	*RO maintains rod bank lo/lo-lo limit and AFD to keep within limits.	
	US makes required notifications to MOC and evaluates EIPs and VPAP-2802, as required.	
	Crew verifies auxiliary steam is on Unit 2 extraction steam.	
	BOP verifies HP TB gland steam pressure indicates between 1.5 and 15 psig.	
	Crew starts removing reheat steam system from service by slowly reducing the controller.	
	Crew stops LP heater drain pumps at ~85% power.	
	US will review TR 3.4.4, as time permits. (The actions of TR 3.4.4 are directed by 1-AP-24.)	NOTE: This may need to be a follow-up question. May have been done during response to event 5.
	NOTE: The next event will occur once enough of a ramp down has been observed. Includes manual rod insertion for RO.	Validation time: 17 minutes

EVENT 7: Given that the unit is at power and indications exist of an RCP seal leak , the crew will be expected to respond in accordance with 1-AP-33.1, "Reactor Coolant Pump Seal Failure," and 1-E-0, "Reactor Trip or Safety Injection."

TIME	EXPECTED ACTION	INSTRUCTOR REMARKS
SPD Verified: _____ (Initials) <ul style="list-style-type: none"> Annunciator C-G7 is lit "C" RCP Seal leakoff > 6 gpm 		
	RO identifies annunciator C-G7, "RCP 1A-B-C SEAL LEAK HI FLOW".	
	US directs crew to enter 1-AP-33.1.	
	Crew identifies "C" as the affected RCP.	
	RO checks if "C" #1 seal has a low delta P.	
	RO determines that "C" #1 seal leak-off flow is > 5.9 GPM.	
	RO checks that annunciator C-G7 is lit and valid based on other indications. (YES)	
	US directs crew to enter 1-E-0, while continuing with 1-AP-33.1.	
	RO/BOP trip the reactor.	
	BOP trips the turbine.	
	Crew verifies both emergency busses are energized.	
	Crew checks if SI is initiated or required.	
CT2	Crew isolates affected Reactor Coolant Pump seal leakoff <ul style="list-style-type: none"> Crew verifies reactor is tripped. Crew trips "C" RCP. Crew verifies "C" loop flow indicates RCP has stopped. Crew closes 1-CH-HCV-1303C, #1 seal leakoff valve. Crew closes 1-RC-PCV-1455B. 	*Within 5 minutes of seal leakoff exceeding alarm setpoint
	NOTE: When "C" RCP is secured the SGTL size will increase to a SGTR after a delay. This is handled by the next event.	
	Crew initiates evaluation of RCP and seals and returns to 1-E-0.	Validation time: about 4 minutes.

EVENT 8: Given that unit is tripped and a SGTR has developed, the crew will be expected to respond in accordance with 1-E-0, "Reactor Trip and Safety Injection," and 1-E-3, "SGTR."		
TIME	EXPECTED ACTION	INSTRUCTOR REMARKS
SPD Verified: _____ (Initials) <ul style="list-style-type: none"> • RCS pressure and level decrease unexpectedly • "C" SG WR level increases unexpectedly fast • "C" MSTV will not close 		
	RO identifies decrease in RCS pressure and level.	
	BOP identifies an unexpected increase in "A" WR SG level.	
	NOTE: Crew may initially enter 1-AP-16 and maximize charging/isolate letdown.	
	US directs crew to initiate Safety Injection.	
	RO/BOP initiate safety injection.	1-AP-24 is no longer applicable once SI is in service.
	RO checks no CAPs 1-5 apply.	
	US initiates attachments 4(5), and 8.	Attachment 4 initiates attachment 5
	Crew verifies cold leg SI flow.	
	Crew verifies AFW flow.	
	RO checks RCS temperatures.	
	RO checks PRZR PORVs and spray valves.	
	RO checks RCP trip and charging pump recirc criteria.	
	BOP checks SGs not faulted. <ul style="list-style-type: none"> • All SG pressures > 80 psig and under control of operator. (YES) 	
	BOP checks SGs tubes are not ruptured: (NO): Level in any SG increasing in an uncontrolled manner. (If yes, go to 1-E-3)	
	US directs transition to 1-E-3.	
	RO checks RCP trip and charging pump recirc criteria.	

EVENT 8: Given that unit is tripped and a SGTR has developed, the crew will be expected to respond in accordance with 1-E-0, "Reactor Trip and Safety Injection," and 1-E-3, "SGTR."		
TIME	EXPECTED ACTION	INSTRUCTOR REMARKS
	BOP identifies ruptured SG as "A".	
	NOTE: Some steps may have been performed by attachment 8 of 1-E-0 or 1-AP-24.	
CT3	Crew isolates flow to/from ruptured SG. <ul style="list-style-type: none"> • BOP adjusts ruptured SG PORV setpoint to 1050 PSIG. • Check ruptured SG PORV closed. • RO/BOP direct an auxiliary operator to perform attachment to locally close 1-MS-18. • Crew checks Decay Heat Release valve closed. • Crew verifies ruptured SG Blowdown valves closed. • Crew closes ruptured SG MSTV and Bypass valve. (NO) • Crew closes "A" SG NRV. • *Crew verifies ruptured SG level greater than 11%. • Crew closes 1-FW-MOV-100D. 	*Isolate before a transition to ECA-3.1 occurs
	Crew initiates attachment for local turbine building operations.	
	*RO checks PRZR PORV and block valves: <ul style="list-style-type: none"> • Power available to PORV block valves • PORVs closed • At least on PORV block valve open. 	
	*BOP checks intact SG levels: <ul style="list-style-type: none"> • NR level > 11% • Control AFW flow to maintain NR level between 23 and 50%. 	
	RO resets both trains of SI.	

EVENT 8: Given that unit is tripped and a SGTR has developed, the crew will be expected to respond in accordance with 1-E-0, "Reactor Trip and Safety Injection," and 1-E-3, "SGTR."

TIME	EXPECTED ACTION	INSTRUCTOR REMARKS
	Crew manually aligns condenser air ejector discharge to containment. <ul style="list-style-type: none"> • Crew removes air ejector RM instrument fuses • Crew resets Phase A • Crew puts AE divert to cont. SI reset switches to reset (SG panels) • Crew verifies lineup of SV TVs • Crew opens 1-AS-FCV-100A/B (BB2) 	
	BOP verifies outside IA supplying containment.	
	BOP verifies flow isolated from ruptured SG: <ul style="list-style-type: none"> • Procedure step 3 complete AND • Attachment 8 step 3 complete OR • 1-E-0 attachment 8 step 5 complete • Ruptured SG pressure >350 psig. 	
	Crew determines required core exit temperature based on SG pressure.	
	Crew verifies steam dumps available.	
	Crew places steam dumps in steam pressure mode: <ul style="list-style-type: none"> • Put both steam dump interlock switches to OFF/RESET • Put steam dump controller to MANUAL • Put mode selector switch to STEAM PRESS • Verify or reduce steam dump demand to zero • Put both steam dump interlock switches to ON 	

EVENT 8: Given that unit is tripped and a SGTR has developed, the crew will be expected to respond in accordance with 1-E-0, "Reactor Trip and Safety Injection," and 1-E-3, "SGTR."

TIME	EXPECTED ACTION	INSTRUCTOR REMARKS
CT4	Crew initiates RCS cooldown. <ul style="list-style-type: none"> • RO checks panel P-F3 lit. (NO) • RO raises steam dump controller demand and dumps steam to condenser from intact SGs at maximum controllable rate • RO holds both steam dump interlock switches in BYP INTK until panel P-F3 is lit • RO verifies panel P-F4 is lit • RO verifies panel P-G3 is lit (NO) • Crew blocks hi stm flow SI signals • Verify CETCs less than required temperature. • RO stops RCS cooldown by closing steam dumps • Maintain required RCS temperature < required temperature. 	*Cooldown does not cause conditions that require a transition to 1-ECA-3.1
	BOP checks ruptured SG pressure stable or increasing.	
	RO checks RCS subcooling > 45°F.	
	Crew blocks low pressurizer pressure SI, as required.	
	NOTE: The scenario may be terminated after RCS cooldown has been stopped.	Validation time: 29 minutes

REFERENCES

PROCEDURE	REV.
Operating Procedure 1-Op-7.7, "Refueling Water Storage Tank System Operation.	57
Abnormal Procedure 1-AP-44, "Loss of RCS Pressure."	19
Abnormal Procedure 1-AP-16, "Increasing Primary Plant Leakage."	29
Abnormal Procedure 1-AP-19, "Loss of Bearing Cooling Water."	19
Abnormal Procedure 1-AP-5, "Unit 1 Radiation Monitoring System."	37
Abnormal Procedure 1-AP-24, "Steam Generator Tube Leak".	22
Abnormal Procedure 1-AP-2.2, "Fast Load Reduction."	27
Abnormal Procedure 1-AP-33.1, "Reactor Coolant Pump Seal Failure."	16
Emergency Operating Procedure 1-E-0, "Reactor Trip or Safety Injection."	46
Emergency Operating Procedure 1-E-3, "Steam Generator Tube Rupture."	28
Station Annunciator Response Procedures.	N/A
Administrative Procedure PI-AA-5000, "Human Performance."	8
INPO, Guideline for Teamwork and Diagnostic Skill Development: INPO 88-003.	Jan. 1988
INPO, ACAD 07-002 Simulator Training Guidelines	Jan. 2007

ATTACHMENT 1

SIMULATOR OPERATOR'S COMPUTER PROGRAM

**SIMULATOR OPERATOR'S COMPUTER PROGRAM
2014 NRC 4**

Initial conditions

1. Recall IC 371
2. Ensure Tave, Tref, PDTT level, and VCT level are selected on trend recorders.
3. **2H is the protected train.**
4. **Place red sticker** on 2-CC-P-1B switch
5. Copies of AP-5 and AP-24 for booth.
6. Copy of 1-OP-7.7 for booth.

PRELOADS PRIOR TO SCENARIO START

CONDITION	MALFUNCTION/OVERRIDE/ETC.
Tagout of 2-CC-P-1B	Verify 2-CC-P-1A is running Place 2-CC-P-1B in PTL Remote functions: U2_CCP1B_RACKIN = RACKOUT U2_CC_28 = 0
Failure of standby bearing cooling pump to auto-start	Remote function: BCP_AUTO_DEFEAT = T
Failure of "A" MSTV to close	Malfunction: MS0501

SCENARIO EVENTS

EVENT 1	Makeup to RWST
MALFUNCTIONS/OVERRIDES	
<p>Open 1-CH-230 using trigger 1: Remote function: CH_230 = 100, Delay time = 5, Ramp = 30, trigger = 1</p> <p>Close 1-CH-230 by returning remote function to 0 over 10 seconds.</p> <p>The next event can occur once the makeup to the RWST is complete.</p>	
COMMUNICATIONS	
<p>When sent to close 1-CH-232: wait 1 minute and then report that the valve is closed.</p> <p>When sent to open 1-CH-233: wait 2-3 minutes and then report that the valve is open.</p> <p>When sent to open 1-CH-230: use trigger 1 and wait 1-2 minutes and then report that the valve is open.</p> <p>When called to close 1-CH-233 and 1-CH-230: close CH_230 (as directed above), wait 3-4 minutes and then report that the valves are closed and the procedure is on top of the gaitronics near the MCC in front of the blender.</p> <p>When sent to verify 1-CH-233 and 1-CH-230, wait 3-4 minutes and report that the valves have been IV'd closed.</p>	

EVENT 2	"B" SG Median Select level failure
MALFUNCTIONS/OVERRIDES	
Malfunction: FW3202, Delay time = 5, Ramp = 5, Severity = 20, Trigger = 2	
COMMUNICATIONS	

EVENT 3	PRZR master pressure controller failure
MALFUNCTIONS/OVERRIDES	
Malfunction: RC29, Delay time = 5, Ramp = 5, Severity = 2, Trigger = 3 The next event can occur once the crew has stabilized the unit.	
COMMUNICATIONS	

EVENT 4	BC pump failure
MALFUNCTIONS/OVERRIDES	
<p>Remote function: BCP1A_PROTECT = TRUE, Delay time = 5, Trigger = 4</p> <p>The next event will occur after the crew has started the standby BC pump and stabilized the plant, or as directed by the lead evaluator.</p>	
COMMUNICATIONS	
<p>If sent to check pumps: Wait 2 minutes and report that 1-BC-P-1A looks OK, just no longer running. 1-BC-P-1B is running fine.</p> <p>Note that the AP now places the tripped pump in PTL which means the discharge MOV is closed.</p> <p>If sent to breaker for 1-BC-P-1A: Wait for 1 minute and report that 1-EP-BKR-15B8 has an overcurrent drop on it.</p> <p>When sent to check local generator leads bus ducting temperatures, it would take about 20 minutes to get these. Report that all are <120°C.</p>	

EVENT 5	SGTL
MALFUNCTIONS/OVERRIDES	
<p>Malfunction: RC2401, Delay time = 5, Ramp = 30, Severity = .0036 (55 gpd), Trigger = 5 (alarms in ~2 minutes)</p> <p>The next event will occur after the crew consults TS and TRM, or at the direction of the lead evaluator.</p>	
COMMUNICATIONS	
<p>HP surveys should take approximately 5 minutes. Chemistry samples should take approximately 30 minutes. HP will inform the crew that there is a slight increase in contact readings on the "A" MS line.</p> <p>Communication from HP as per AP-24: Total activity – 4.61×10^{-5} μci/ml. Turbine building sumps must be sampled prior to pumping. (This would take at least 30 minutes.)</p>	

EVENT 6	SGTL worsens
MALFUNCTIONS/OVERRIDES	
<p>Set up trigger 6 on trigger screen as follows: IMF RC2401 .007 60</p> <p>Put in Trigger 20 during ramp once control rods have stepped automatically one time.</p> <p>CNTRL_ROD_AUTO = OFF, Trigger = 20</p> <p>The next event will occur after the crew consults TS and TRM, or at the direction of the lead evaluator.</p>	
COMMUNICATIONS	
<p>HP surveys should take approximately 5 minutes. Chemistry samples should take approximately 30 minutes. HP will inform the crew that there is a slight increase in contact readings on the "A" MS line.</p> <p>Communication from HP as per AP-24: Total activity – 4.61×10^{-5} μci/ml. Turbine building sumps must be sampled prior to pumping. (This would take at least 30 minutes.)</p>	

EVENT 7	RCP seal leak
MALFUNCTIONS/OVERRIDES	
Malfunction: RC1203, Delay time = 5, Ramp = 5, Severity = 50, Trigger =7 The next event is on a trigger when the RCP is tripped.	
COMMUNICATIONS	

EVENT 8	SGTR
MALFUNCTIONS/OVERRIDES	
<p>Set up trigger 8 on trigger screen to initiate when "C" RCP is stopped. NOT. RCP1C_BKR = 0 (RC7) IMF RC2401 (8 30) 60 60</p> <p>Remote function: MS_18 = 0, Delay time = 60, Ramp = 60, Trigger = 9</p>	
COMMUNICATIONS	
<p>If directed to use attachment 8 of 1-E-0 or 1-E-3 to locally isolate "A" SG in MSVH: use trigger 9 to close MS-18.</p> <p><i>If using 1-E-0 attachment:</i> Report back that attachment 8 step 5 is complete. Ruptured generator is isolated and non-ruptured generators are available for cooldown. Wait a few minutes and then report that attachment 8 of 1-E-0 is complete.</p> <p><i>If using 1-E-3 attachment:</i> Report back that attachment 8, step 3 is complete. Ruptured generator is isolated and non-ruptured generators are available for cooldown. Wait a few minutes and then report that attachment 8 of 1-E-3 is complete.</p>	

ATTACHMENT 3

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.
- E. During shift operations each crew member will utilize operator fundamentals to ensure Teamwork Effectiveness, High Standards for Controlling Evolutions, Indications Monitored Closely, a Natural Bias for Conservatism, and Knowledge of Plant Design and Theory.

EVENT 1 PERFORMANCE OBJECTIVES

EVENT GOAL: Given that a makeup to the RWST has been requested, the crew will use 1-OP-7.7, "Refueling Water Storage Tank System Operation" to adjust boron concentration

NORTH ANNA SPECIFIC TASKS:

None

CRITICAL TASK:

N/A

EVENT 2 PERFORMANCE OBJECTIVES

EVENT GOAL: Given that the unit is at power and "B" SG median select level has failed, the crew will respond in accordance with the AR for annunciator F-F2.

NORTH ANNA SPECIFIC TASKS:

None

CRITICAL TASK:

N/A

EVENT 3 PERFORMANCE OBJECTIVES

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

NORTH ANNA SPECIFIC TASKS:

R634 Respond to a loss of reactor coolant system pressure

CRITICAL TASK:

See next page

CT Statement:

Crew stops RCS pressure decrease.

Safety Significance:

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

Cues:

Valid indication of pressure decreasing by the presence of various annunciators
Indication of PORV open
RCS pressure indication decreasing.

Performance Indicator:

RO manually closes PORV 1-RC-PCV-1455C
RO manually closes pressurizer spray valves by using the master pressure controller

Feedback:

RCS pressure decrease stopped.

WOG Reference:

Based on Appendix B CT-10.

Conditions:

Prior to receiving an automatic reactor trip on low pressure.

EVENT 4 PERFORMANCE OBJECTIVES

EVENT GOAL: Given that the unit is at power and the running BC pump has tripped with the standby failing to start, the crew will be expected to 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 a SG tube leak, the crew will be expected to respond in accordance with 1-AP-5, "Unit 1 Radiation Monitoring System," and 1-AP-24, "Steam Generator Tube Leak."

NORTH ANNA SPECIFIC TASKS:

None

CRITICAL TASK:

N/A

EVENT 6 PERFORMANCE OBJECTIVES

EVENT GOAL: Given that the unit is at power and indications exist of a SG tube leak requiring a unit ramp, the crew will be expected to respond in accordance with 1-AP-24, "Steam Generator Tube Leak," and 1-AP-2.2, "Fast Ramp."

NORTH ANNA SPECIFIC TASKS:

None

CRITICAL TASK:

N/A

EVENT 7 PERFORMANCE OBJECTIVES

EVENT GOAL: Given that the unit is at power and indications exist of an RCP seal leak , the crew will be expected to respond in accordance with 1-AP-33.1, "Reactor Coolant Pump Seal Failure," and 1-E-0, "Reactor Trip or Safety Injection."

NORTH ANNA SPECIFIC TASKS:

R185 Perform the immediate operator actions in response to a reactor trip or safety injection.
R533 Respond to a reactor coolant pump seal failure.

CRITICAL TASK:

See Next Page

CT Statement:

Crew isolates affected Reactor Coolant Pump seal leakoff.

Safety Significance:

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

Cues:

Indication and annunciation of:

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

Performance Indicator:

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

Feedback:

Indication of:

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

WOG Reference:

Westinghouse RCP vendor manual - addendum #3

Conditions:

Within 5 minutes of seal leakoff exceeding alarm setpoint.

EVENT 8 PERFORMANCE OBJECTIVES

EVENT GOAL: Given that unit is tripped and a SGTR has developed, the crew will be expected to respond in accordance with 1-E-0, "Reactor Trip and Safety Injection," and 1-E-3, "SGTR."

NORTH ANNA SPECIFIC TASKS:

R187 Identify and isolate a ruptured steam generator.

R759 Cool down the Reactor Coolant System during the response to a steam generator tube rupture.

CRITICAL TASK:

See Following Pages

CT Statement:

Crew isolates flow to/from ruptured SG.

Safety Significance:

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

Cues:

Indication and annunciation of:

Increasing SG water level and radiation

A reactor trip

A safety injection.

Performance Indicator:

BOP adjusts ruptured SG PORV setpoint at 1050 PSIG.

BOP checks ruptured SG PORV closed.

RO checks decay heat release valve closed.

BOP checks affected SG blowdown trip valves closed.

BOP closes "A" SG NRV

RO/BOP directs an auxiliary operator to locally close affected SG Steam to the Terry Turbine.

BOP closes affected SG AFW valve

Feedback:

Indication of:

Stable or increasing pressure in the ruptured SG.

Decreasing or zero feedwater flow rate to the ruptured SG.

WOG Reference:

Appendix B CT-18

Conditions:

Isolate before a transition to ECA-3.1 occurs.

CT Statement:

Crew initiates RCS Cooldown.

Safety Significance:

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

Cues:

Procedurally directed by E-3.

Performance Indicator:

RO/BOP dumps steam

Feedback:

Indication of steam flow rate greater than zero

Indication of RCS temperature decreasing

OR

Indication of RCS temperature less than target temperature

WOG Reference:

Appendix B CT-19

Conditions:

Cooldown does not cause conditions that require a transition to 1-ECA-3.1.

ATTACHMENT 2

SIMULATOR PERFORMANCE DATASHEET

Scenario Performance Datasheet

EVENT 1: Given that a makeup to the RWST has been requested, the crew will use 1-OP-7.7, "Refueling Water Storage Tank System Operation" to adjust boron concentration

SPD Verified: _____ (Initials)

- Blender functions as expected

EVENT 2: Given that the unit is at power and "B" SG median select level has failed, the crew will respond in accordance with the AR for annunciator F-F2.

SPD Verified: _____ (Initials)

- Annunciator F-F2 illuminates
- "B" FRV modulates closed
- "B" SG level decreases

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

SPD Verified: _____ (Initials)

- Annunciators B-E6, C-D1, and later B-F7 illuminate
- Master pressure controller fails high
- 1-RC-PCV-1455C indicates open
- 1-RC-PCV-1455A and 1455B indicate open
- RCS pressure decreases

EVENT 4: Given that the unit is at power and the running BC pump has tripped with the standby failing to start, the crew will be expected to respond in accordance with 1-AP-19, "Loss of Bearing Cooling Water."

SPD Verified: _____ (Initials)

- Annunciators F-E4 and F-F4 are illuminated (possibly K-F5)
- "A" BC pump has amber light lit
- "B" BC pump does not auto start

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

SPD Verified: _____ (Initials)

- 1-MS-RI-190, "A" SG N-16, is first in Alert
- Annunciator K-G6 illuminated
- Annunciator K-G6 reflashes
- 1-MS-RI-190 is in hi alarm
- 1-MS-RI-193, Main Steamline header N-16, indication increases to hi alarm
- 1-MS-RI-191 and 1-MS-RI-192 increase to Alert

Scenario Performance Datasheet

EVENT 6: Given that the unit is at power and indications exist of a SG tube leak requiring a unit ramp, the crew will be expected to respond in accordance with 1-AP-24, "Steam Generator Tube Leak," and 1-AP-2.2, "Fast Ramp."

SPD Verified: _____ (Initials)

- Annunciator K-G6 reflash
- 1-MS-RI-190 indication increases to 110 gpd

EVENT 7: Given that the unit is at power and indications exist of an RCP seal leak, the crew will be expected to respond in accordance with 1-AP-33.1, "Reactor Coolant Pump Seal Failure," and 1-E-0, "Reactor Trip or Safety Injection."

SPD Verified: _____ (Initials)

- Annunciator C-G7 is lit
- "C" RCP Seal leakoff > 6 gpm

EVENT 8: Given that unit is tripped and a SGTR has developed, the crew will be expected to respond in accordance with 1-E-0, "Reactor Trip and Safety Injection," and 1-E-3, "SGTR."

SPD Verified: _____ (Initials)

- RCS pressure and level decrease unexpectedly
- "C" SG WR level increases unexpectedly fast
- "C" MSTV will not close

Facility: North Anna Power Station Scenario No.: (2014) NRC-5 (SPARE) Op-Test No.: 1

Examiners: _____ Operators: _____

Initial Conditions: Approximately 10^{-8} amps, BOL. Unit was placed in Mode 4 several days ago to repair a turbine governor valve. A unit startup was performed last shift. 2-CC-P-1B was tagged out last shift for major maintenance and is not expected to be returned to service for several days.

Turnover: Shift orders are to continue raising power to 12% in preparation for placing the turbine in service. A crew is currently attending JITT for placing the turbine in service.

Event No.	Malf. No.	Event Type*	Event Description
1		R (R) (S) N (B)	Raise power to approximately 10-12%. Control SG levels with the MFRV bypasses in Manual
2		C (R) (S)	1-RC-LCV-1459G fails low. Loss of charging flow.
2a	RD0121	TS (S)	IRPI fails low
3	SW0105	C (B) (S) TS (S)	Running SW pump trips
4	CH01	C (R) (S)	Letdown leak between Orifices and Containment
4a		N (R)	Excess letdown placed in service
5	FW0401	M (All)	Running MFP trips and standby pump does not start requiring reactor trip.
6		C (B) (S)	RO trip switch does not work. BOP must trip reactor. (CT)
7	RC2401	C (R) (S)	3 control rods stick out on reactor trip
8		C (R) (S)	Emergency borate valve thermals out (CT)
			The scenario can be terminated once an emergency boration has been started in 1-ES-0.1.
			Event 6 and 7 happens during the reactor trip. (Event 8 happens after reactor trip)
			**Recommend this be the spare as the power increase to 10-12% will take some time. Also, since secondary is not in service there is a limited amount of failures that affect the BOP. Any failures that affect RCS temperature, etc that happen before 10-12% could cause the crew to trip the unit.

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

Facility: North Anna Power Station Scenario No.: (2014) NRC-5 (SPARE) Op-Test No.: 1

Examiners: _____ Operators: _____

Initial Conditions: Approximately 10^{-8} amps, BOL. Unit was placed in Mode 4 several days ago to repair a turbine governor valve. A unit startup was performed last shift. 2-CC-P-1B was tagged out last shift for major maintenance and is not expected to be returned to service for several days.

Turnover: Shift orders are to continue raising power to 12% in preparation for placing the turbine in service. A crew is currently attending JITT for placing the turbine in service.

Event No.	Malf. No.	Event Type*	Event Description
1		R (R) (S) N (B)	Raise power to approximately 10-12%. Control SG levels with the MFRV bypasses in Manual
2		C (R) (S)	1-RC-LCV-1459G fails low. Loss of charging flow.
2a	RD0121	TS (S)	IRPI fails low
3	SW0105	C (B) (S) TS (S)	Running SW pump trips
4	CH01	C (R) (S)	Letdown leak between Orifices and Containment
4a		N (R)	Excess letdown placed in service
5	FW0401	M (All)	Running MFP trips and standby pump does not start requiring reactor trip.
6		C (B) (S)	RO trip switch does not work. BOP must trip reactor. (CT)
7	RC2401	C (R) (S)	3 control rods stick out on reactor trip
8		C (R) (S)	Emergency borate valve thermals out (CT)
			The scenario can be terminated once an emergency boration has been started in 1-ES-0.1.
			Event 6 and 7 happens during the reactor trip. (Event 8 happens after reactor trip)
			**Recommend this be the spare as the power increase to 10-12% will take some time. Also, since secondary is not in service there is a limited amount of failures that affect the BOP. Any failures that affect RCS temperature, etc that happen before 10-12% could cause the crew to trip the unit.

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

DOMINION
NORTH ANNA POWER STATION

INITIAL LICENSED OPERATOR EXAMINATION
SIMULATOR EXAMINATION GUIDE
SCENARIO 2014 NRC 5

SIMULATOR EXAMINATION GUIDE

<u>EVENT</u>	<u>DESCRIPTION</u>
1.	Increase power from 10-8 amps to approximately 12% reactor power BOP controls SG levels in manual using the MFRV bypasses (Normal)
2/2a.	1-CH-LCV-1459G fails low causing a loss of charging flow IRPI fails to zero
3	Running SW pump trips
4/4a.	Letdown leak between Orifices and Containment Excess letdown placed in service (Normal)
5/6.	Running feed pump trips and standby pump does not start. Reactor trip is required by AP and RO reactor trip switch does not work.
7/8.	3 control rods stick out on reactor trip/ Emergency borate valve thermals out

Scenario Recapitulation:

Malfunctions after EOP entry	2	(3 stuck rods, emergency borate valve thermals out)
Total Malfunctions	8	(1-CH-LCV-1459G fails low, IRPI fails low, running SW pump trips, letdown leak between orifices and containment, loss of MFW, failure of RO reactor trip switch, 3 control rods stick out, emergency borate valve thermals out)
Abnormal Events	4	(Loss of charging, loss of SW, letdown leak, loss of MFW)
Major Transients	1	(Loss of MFW)
EOPs Entered	1	(ES-0.1)
EOP Contingencies	0	
Critical Tasks	2	

SCENARIO DURATION

200 Minutes

SIMULATOR EXAMINATION SCENARIO SUMMARY

SCENARIO 2014 NRC 5

The scenario begins with the unit at approximately 10^{-8} amps, BOL. The unit was placed in Mode 4 several days ago to repair a turbine governor valve. A startup was performed last shift. 2-CC-P-1B was tagged out for major maintenance last shift and is not expected to be returned to service for several days. Shift orders are to raise power to approximately 12% in preparation for placing the main turbine in service. A crew is currently attending JITT for placing the turbine in service.

The first event will be a power increase from 10^{-8} amps to approximately 12% power in preparation for placing the main turbine in service. This can be pre-briefed. The BOP will control SG levels with the MFRV bypasses in manual (Normal).

Once power has been stabilized at 12%, Charging control valve, 1-CH-LCV-1459G, will fail low causing charging flow to decrease. Pressurizer level will slowly decrease. The crew will identify the loss of charging flow and take manual control of 1-CH-LCV-1122 and restore pressurizer level to program. At this time, the IRPI for rod K-2 in control bank "A" will drop to zero. The US will review technical specification 3.1.7 and notify the instrument shop. Once both of these failures have been addressed, the next event can occur.

Next, the Unit 2 "B" service water pump, 2-SW-P-1B, will trip. The crew should identify the loss of service water and respond in accordance with 0-AP-12, "Loss of Service Water." The crew will start 1-SW-P-1A to restore flow to the header. Once the crew has verified that the SW System has been restored, the next event can occur.

A letdown leak will occur in containment downstream of the orifice valves. The crew will enter 1-AP-16, "Increasing Primary Plant Leakage," and isolate letdown to stop the leak. After the crew has placed excess letdown (Normal event) in service, the next event can occur.

The running MFW pump will begin losing oil pressure. The pump will trip and the standby pump will not auto start. The crew will enter 1-AP-31, "Loss of Main Feedwater," and trip the reactor. The reactor trip switch on the RO side will not function; the BOP must turn his switch in order to trip the reactor. When the reactor is tripped three control rods will stick out. The crew will transition to 1-ES-0.1, "Reactor Trip Response," and eventually try to emergency borate for the three stuck rods. The emergency borate MOV will thermal out and the crew will dispatch an operator to open it locally. The operator will not be able to open the emergency borate valve locally. The crew will line up the blender and request the manual emergency borate valve be opened. 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 approximately 10^{-8} amps. The unit was placed in Mode 4 several days ago to repair a turbine governor valve. A startup was performed last shift. RCS boron is 1863 ppm and core age is 150 MWD/MTU. Aux steam is on unit 2.

Unit 2 is at 100% power.

Equipment Status:

2-CC-P-1B was tagged out last shift for major maintenance. It is expected to be out for several more days. The maintenance rule window is green. 2H is the protected train.

Shift Orders:

Increase power to approximately 12% in preparation for placing the turbine on line. A crew is currently in JITT for rolling the turbine.

EVENT 1: Given that the unit is at 10^{-8} amps, the crew will ramp the unit to approximately 12% power per 1-OP-1.2, Unit Startup From Mode 3 to Mode 2," and 1-OP-2.1, "Unit Operation From Mode 2 to Mode 1."

TIME	EXPECTED ACTION	INSTRUCTOR REMARKS
SPD Verified: _____ (Initials)		
<ul style="list-style-type: none"> Reactor power increases to approximately 12% 		
	RO withdraws control rods and establishes SUR in preparation for reaching the POAH.	
	RO increases reactor power to < 5% using control rods and stabilizes power.	
	BOP manually controls SG levels on MFRV bypasses.	Normal
	Crew turns off toggle switch on Scaler/Timer drawer.	
	Crew observes steam dumps for proper operation.	
	Crew directs opening of MSR 1" warm-up valves.	
	Crew directs closing of BC valves at Flash Evaporator.	
	Crew transitions to 1-OP-2.1.	
	RO raises power to approximately 12% using control rods.	
	RO blocks low power trips: <ul style="list-style-type: none"> Checks operability of P-10 interlocks Places both IR block switches to BLOCK Places both PR lo setpoint block switches to Block 	
	NOTE: The next event can occur once power is stable at approximately 12%.	Validation time: 42 minutes

EVENT 2/2a: Given that the unit is at power and a failure of 1-RC-LC-1459G and a failed IRPI have occurred, the crew will respond in accordance with the AR for B-F8 (as applicable) and technical specifications.

TIME	EXPECTED ACTION	INSTRUCTOR REMARKS
SPD Verified: _____ (Initials) <ul style="list-style-type: none"> • 1-RC-LCV-1459G fails to manual • 1-RC-LCV-1459G demand decreases to 0 • 1-CH-LCV-1122 demand decreases • Charging flow decreases • A PCS alarm is received on low charging flow • Regen HX temperature increases • VCT level increases • If pressurizer level decreases low enough, B-F8 will illuminate • After several minutes: annunciators A-G2 and AF1 will illuminate • IRPI for rod K-2 in Control Bank A will drop to zero • Rod Bottom Light for K-2 will illuminate 		
	RO identifies that charging flow has decreased and pressurizer level is decreasing.	May take 8 or 9 minutes for annunciator B-F8 to alarm. Crew may identify the failure from the PCS alarms. (Validation) Could also use AR for C-C5.
	RO identifies that 1-RC-LCV-1459G has failed to manual and has 0 demand.	
	RO takes manual control of 1-CH-FCV-1122 and restores charging flow.	
	RO verifies pressurizer level is increasing to program.	
	US informs the WCC of the failure, requests I&C assistance and notifications to management.	
	RO identifies annunciators A-G2, RPI ROD BOT ROD DROP, and A-F1, CMPTR ALARM ROD DEV/SEQ.	3 minutes later.
	NOTE: If unsure of conditions, the crew may enter 1-AP-1.2 for a dropped rod. Steps in this procedure were not included.	
	RO identifies IRPI K-2 in control bank "A" is reading zero.	
	RO checks for other indications of a dropped rod.	
	RO identifies that no rod has dropped, IRPI problem.	

EVENT 2/2a: Given that the unit is at power and a failure of 1-RC-LC-1459G and a failed IRPI have occurred, the crew will respond in accordance with the AR for B-F8 (as applicable) and technical specifications.

TIME	EXPECTED ACTION	INSTRUCTOR REMARKS
	NOTE: If I&C is asked to investigate the K-2 rod, they will report that it is an IRPI problem.	
	US reviews Technical Specification 3.1.7A and determines that a flux map must be done within 8 hours (or power reduced to <50%).	
	NOTE: The next event can occur once charging is in manual control and the US has addressed TS for the IRPI.	Validation time: 5 minutes

EVENT 3: Given the plant in Mode 1 and a loss of Service Water has occurred, the crew will respond in accordance with 0-AP-12, "Loss of Service Water."		
TIME	EXPECTED ACTION	INSTRUCTOR REMARKS
SPD Verified: _____ (Initials) <ul style="list-style-type: none"> Annunciators J-H3, J-B3, then B-B7, B-C8, and B-E8 illuminate Unit 2 "B" SW pump has amber and green lights lit "A" SW header flow decreases 		
	Crew identifies annunciators J-H3, SW PP 1-P1B, 2-P1B AUTO TRIP and J-B3, SERV WTR RETURN HDR LO FLOW.	
	BOP identifies that unit 2 "B" SW pump has tripped.	
	US directs entry into 0-AP-12.	
	BOP checks SW reservoir level > 310 feet. (SG panels ~314.5)	
	Crew checks SW system for integrity and flooding: <ul style="list-style-type: none"> AB sump level normal (H&J SG panel) Chiller room sump level normal (J) Turbine building valve pit sump level normal (no alarms) No reports of flooding. 	
	Crew verifies SW supply headers are intact.	
	Crew verifies at least one SW pump running on each supply header. (NO)	
	BOP starts 1-SW-P-1A.	
	Crew verifies return header flows indicated.	
	Crew verifies SW system is stable.	
	Crew verifies operability of equipment.	
	US refers to Tech Spec 3.7.8 and enters action to verify SW throttled within 72 hours.	
	NOTE: The next event may occur once SW pump has been started, or at the discretion of the lead evaluator.	Validation time: 10 minutes

EVENT 4/4a: Given that the unit is at power and a letdown leak has developed in 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-RC-FI-1150 • 1-CH-PCV-1145 output decreases • VCT level decreases • Containment sump level increases • Containment radiation increases 		
	Crew identifies decreasing letdown flow and VCT level.	
	BOP identifies increasing containment sump level.	
	NOTE: 1-AP-5 will also be applicable when containment rad monitor alarms. Steps included.	
	US directs entry into 1-AP-16.	
	Crew verifies unit in modes 1.	
	RO verifies PRZR level stable or increasing.	
	RO checks 1-CH-LCV-1115A not diverting. 1-CH-LCV-1115A in VCT position (red light lit and yellow light NOT LIT)	
	Crew verifies letdown in service with normal parameters. (NO)	
	RO isolates letdown: <ul style="list-style-type: none"> • RO closes 1-CH-HCV-1200B • RO closes 1-CH-LCV-1460A and 1460B • RO adjusts charging flow control valve 1-CH-FCV-1122 to control PRZR level • RO verifies that PRZR level is increasing with seal injection and minimum or no charging. 	

EVENT 4/4a: Given that the unit is at power and a letdown leak has developed in containment, the crew will be expected to respond in accordance with 1-AP-16, "Increasing Primary Plant Leakage."

TIME	EXPECTED ACTION	INSTRUCTOR REMARKS
	Crew places excess letdown in service using 1-OP-8.5: <ul style="list-style-type: none"> • Verifies 1-CH-HCV-1137 is closed • Verifies 1-CH-MOV 1380 and 1381 are open • Has operator energize loop drains • Places 1-CH-HCV-1389 in PDTT position • Deletes F0134A point from processing, as necessary • Opens a loop drain valve • Opens 1-CH-HCV-1201 • Slowly opens 1-CH-HCV-1137 • Verifies/adjusts parameters • When PDTT level has increased at least 10% - places 1-CH-HCV-1389 in VCT position • Maintains pressurizer level • Logs parameters 	Normal BOP did during validation This will take a few minutes.
	NOTE: Crew will enter 1-AP-5 for hi-hi radiation on containment gaseous and particulate rad monitors (as personnel permits). Steps are included.	
	Crew identifies RM in alarm is 1-RM-RMS-160 and proceeds to correct attachment.	AP-5 steps
	Crew notifies HP to obtain and analyze containment gaseous and particulate samples, if required.	
	Crew determines that unit is not in mode 5 or 6.	
	Crew determines alarm was not caused by an abnormality.	
	Crew determines that alarm was not caused by a fuel handling accident or a decrease in refueling cavity level.	
	Crew refers to EAL matrix, or has WCC refer to EAL matrix.	
	Crew determines cause for alarm and takes corrective actions. (Letdown isolated.)	
	US reviews RCS leakage Tech Spec 3.4.13 Action A (4 hours).	

EVENT 4/4a: Given that the unit is at power and a letdown leak has developed in containment, the crew will be expected to respond in accordance with 1-AP-16, "Increasing Primary Plant Leakage."

TIME	EXPECTED ACTION	INSTRUCTOR REMARKS
	US requests Work Control Center supervisor to inform the OMOC of the failure and to initiate CR.	
	NOTE: The next event can occur once excess letdown is flushing to the PDTT.	Validation time 25 minutes.

EVENT 5: Given the plant is in Mode 1 with indications of a loss of "A" Main Feedwater Pump and a failure of "B" Main Feedwater Pump to automatically start, the crew will respond in accordance with 1-AP-31, "Loss of Main Feedwater," 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 E-H5 illuminates • "A" MFP breakers have amber and green lights lit • "C" MFP does not auto-start • RO reactor trip switch does not work • Three control rods stick out 		
	BOP identifies annunciator 1E-H5, FW PUMP 1A LUBE OIL PRESS LOW.	
	BOP identifies trip of "A" MFP.	
	BOP informs US of MFP trip.	
	BOP identifies start failure of "C" MFP.	
	US direct the BOP to take actions of 1-AP-31.	
	BOP checks reactor power greater than 70%. (NO)	
	BOP checks 1 feed pump running. (NO)	
	US direct crew to enter 1-E-0.	
CT1	RO verifies reactor trip: <ul style="list-style-type: none"> • BOP manually trips reactor (RO switch will not work.) • RO checks reactor trip and bypass breakers open • RO checks Rod Bottom lights LIT • RO checks neutron flux decreasing. 	*Prior to a transition to FR-S.1
	BOP verifies turbine trip. <ul style="list-style-type: none"> • BOP manually depresses turbine trip pb • BOP verifies all stop valves are closed • BOP verifies reheaters reset • BOP verifies G-12 is open 	Note that turbine is not in service.
	Crew verifies emergency power is available.	
	Crew verifies SI is neither actuated nor needed.	

EVENT 5: Given the plant is in Mode 1 with indications of a loss of "A" Main Feedwater Pump and a failure of "B" Main Feedwater Pump to automatically start, the crew will respond in accordance with 1-AP-31, "Loss of Main Feedwater," 1-E-0, "Reactor Trip or Safety Injection," and 1-ES-0.1, "Reactor Trip Response."

TIME	EXPECTED ACTION	INSTRUCTOR REMARKS
	US directs transition to 1-ES-0.1.	
	Crew checks any RCPs running.	
	Crew checks RCS temperature trending to desired temperature.	
	BOP throttles/closes AFW valves, as required.	
	Crew checks FW status.	
	BOP checks SG levels.	
	RO verifies charging in service.	Charging flow is still in manual. Letdown is isolated.
	RO checks pressurizer level control: <ul style="list-style-type: none"> • Level > 15% • CC system in service • Verify letdown in service (NO) Crew elects not to restore letdown due to leak • Level between 20% and 29% • Control level to maintain level on program. 	
	RO checks PRZR pressure control: <ul style="list-style-type: none"> • Pressure > 1780 psig • Pressure at or trending to 2235 psig. 	
	NOTE: The next event was initiated on the reactor trip.	

EVENT 6: Given that the unit is tripped with three control rods stuck out, the crew will initiate emergency boration.		
TIME	EXPECTED ACTION	INSTRUCTOR REMARKS
SPD Verified: _____ (Initials) <ul style="list-style-type: none"> Emergency borate valve thermals out 		
	RO verifies all IRPIs 10 steps or less. (NO)	
	RO identifies that 2 or more IRPIS indicate greater than 10 steps.	
CT2	Crew initiates emergency boration: <ul style="list-style-type: none"> RO places 1-CH-P-2A in FAST RO attempts to open 1-CH-MOV-1350 and identifies valve failed to open Crew directs an operator to locally open 1-CH-MOV-1350 RO lines up blender in borate mode Crew directs an operator to locally open 1-CH-241 Crew notes time boration started and initial BAST level US directs RO/BOP to determine when boration can be secured using the attachment. US refers to TS-3.1.1. 	*Prior to completion of step requiring its performance.
	NOTE: Once crew has started an emergency boration, the scenario can be terminated.	Validation time: 17 minutes. Total validation time: 200 minutes

REFERENCES

PROCEDURE	REV.
Operating Procedure 1-OP-1.5, "Unit Startup From Mode 3 to Mode 2."	85
Operating Procedure 1-OP-2.1, "Unit Startup from Mode 2 to Mode 1."	113
Abnormal Procedure 0-AP-12 "Loss of Service Water."	39
Abnormal Procedure 1-AP-16, "Increasing Primary Plant Leakage."	29
Operating Procedure 1-OP-8.5, "Operation of Excess Letdown."	22
Abnormal Procedure 1-AP-31, "Loss of Main Feedwater."	12
Emergency Procedure 1-E-0, "Reactor Trip or Safety Injection."	46
Emergency Procedure 1-ES-0.1, "Reactor Trip Response."	31
Station Annunciator Response Procedures.	N/A
Guide and Reference Document PI-AA-5000, "Human Performance."	8
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
2014 NRC 5

Initial conditions

1. Recall IC 372 (BOL)
2. Ensure Tave (545-555), Tref, PDTT level, and VCT level are selected on trend recorders.
3. **Place sticker on switch** for 2-CC-P-1B.
4. Designate 2H as the protected train.
5. Select feedwater Venturi Calorimetric.
6. Verify Low Cap blowdown in service at 10, 10, 10 and high cap is 0.
7. D bank rods at 80 steps. C bank rods at 208 steps.

PRELOADS PRIOR TO SCENARIO START

CONDITION	MALFUNCTION/OVERRIDE/ETC.
Tagout of 2-CC-P-1B	Verify 2-CC-P-1A is running Place 2-CC-P-1B in PTL Remote functions: U2_CCP1B_RACKIN = RACKOUT U2_CC_28 = 0
Emergency borate MOV failure	MOV control: CHMOV350_RACKIN = Rackout, Delay time = 1, Trigger = 11 Set up Trigger 11 as follows so that valve will "thermal out": CHMOV350 .GE. 0.001
Stuck rods (E-11, P-6, D-6)	Malfunctions: RD2610, RD2620, RD2630
Failure of "B" MFP to auto-start	Switch override: FWP1C1_ASTOP = OFF FWP1C2_ASTOP = OFF
Failure of auto reactor trip	Malfunction: RD32
Failure of RO trip switch	Switch override: RX_TRIP_TRIP = OFF

SCENARIO EVENTS

EVENT 1	Ramp to 12% power
MALFUNCTIONS/OVERRIDES	
The turbine building operator will be sent to open the MSR 1" warmup valves. These are on the monitor screen for MSR startup. (1-MS-473, -474, -475, -476)	
The 2 BC valves (268 and 269) do not exist on simulator.	
COMMUNICATIONS	
Approximately 5 minutes after being dispatched to open MSR 1" warmup lines: Report back that they are open.	
3 minutes later: report that BC valves are closed.	

EVENT 2	1-RC-LCV-1459G fails low
MALFUNCTIONS/OVERRIDES	
<p>Controller overrides: LC459G_INDMD = 0, Trigger = 2 LC459G_MAN = ON, Trigger = 2 LC459G_LOWER = ON, Trigger = 2 LC459G = 0, Trigger = 2</p> <p>Malfunction: RD0121, Delay time = 185, Severity = -1, Trigger = 2</p> <p>NOTE: The next event can occur once charging flow has been restored.</p>	
COMMUNICATIONS	

EVENT 3	Loss of 2-SW-P-1B
MALFUNCTIONS/OVERRIDES	
<p>Malfunction: SW0105, Delay time = 5, Trigger = 3</p> <p>The next event may occur once SW pump has been started, or at the discretion of the lead evaluator.</p>	
COMMUNICATIONS	
<p>Outsides operator can report after 10 minutes that there is nothing wrong with 2-SW-P-1B locally and that 1-SW-P-1A is running normally.</p> <p>If sent, a Safeguards operator can report after 3 minutes an overcurrent drop on breaker (25J5) for 2-SW-P-1B.</p>	

EVENT 4	Letdown leak in containment/place excess letdown in service
MALFUNCTIONS/OVERRIDES	
<p>Malfunction: CH01, Delay time = 5, Ramp = 300, Severity = 100, Trigger = 4</p> <p>Remote function: RC HCV1557_ENERGIZE, Value = True, Trigger = 10</p> <p>NOTE: The next event can occur once excess letdown is flushing to PDTT.</p>	
COMMUNICATIONS	
<p>When asked to open Loop Drains to place excess letdown in service then use trigger 10 and report back that it is done.</p>	

EVENT 5	Trip of "A" MFP (auto-start of "B" is defeated)
MALFUNCTIONS/OVERRIDES	
Malfunction: FW0401, Delay time = 5, Ramp = 60, Severity = 100, Trigger = 5	
COMMUNICATIONS	
When requested to investigate cause for loss of oil pressure informs US that oil is spraying from a flanged connection on the south end of the MFP. You are going to get out oil soak and get a copy of 0-AP-23.	

EVENT 6	Emergency borate for stuck rods
MALFUNCTIONS/OVERRIDES	
The failure of the emergency borate valve to open is preloaded	
Remote function: CH_241, Delay time = 30, Ramp = 30, Remote value = 100, Trigger = 12	
Scenario can be terminated once emergency boration has been established via 1-CH-241.	
COMMUNICATIONS	
When sent to investigate 1-CH-MOV-1350 , after 2 minutes the operator will report it seems to be mechanically bound.	
When the crew directs an operator to open 1-CH-241 , use trigger 12 and then report back.	

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 10^{-8} amps, the crew will ramp the unit to approximately 12% power per 1-OP-1.2, Unit Startup From Mode 3 to Mode 2," and 1-OP-2.1, "Unit Operation From Mode 2 to Mode 1."

NORTH ANNA SPECIFIC TASKS:

R111 Perform a reactor startup from Mode 2 to approximately 3% power.

CRITICAL TASK:

N/A

EVENT 2 PERFORMANCE OBJECTIVES

EVENT GOAL:

Given that the unit is at power and a failure of 1-RC-LC-1459G and a failed IRPI have occurred, the crew will respond in accordance with the AR for B-F8 (as applicable) and technical specifications.

NORTH ANNA SPECIFIC TASKS:

S70 Evaluate compliance with technical specifications.

CRITICAL TASK:

N/A

EVENT 3 PERFORMANCE OBJECTIVES

EVENT GOAL:

Given the plant in Mode 1 and a loss of Service Water has occurred, the crew will respond in accordance with 0-AP-12, "Loss of Service Water."

NORTH ANNA SPECIFIC TASKS:

R653 Respond to a loss of a service water pump.

S70 Evaluate compliance with technical specifications.

CRITICAL TASK:

N/A

EVENT 4 PERFORMANCE OBJECTIVES

EVENT GOAL:

Given that the unit is at power and a letdown leak has developed in 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 5 PERFORMANCE OBJECTIVES

EVENT GOAL:

Given the plant is in Mode 1 with indications of a loss of "A" Main Feedwater Pump and a failure of "B" Main Feedwater Pump to automatically start, the crew will respond in accordance with 1-AP-31, "Loss of Main Feedwater," 1-E-0, "Reactor Trip or Safety Injection," and 1-ES-0.1, "Reactor Trip Response."

NORTH ANNA SPECIFIC TASKS:

R781 Respond to a loss of main feedwater.

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

CRITICAL TASK:

See Next Page

CT Statement:

Crew manually trips the reactor.

Safety Significance:

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

Cues:

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

Performance Indicator:

BOP opens both reactor trip breakers.

Feedback:

Control rods at bottom of core
Neutron flux decreasing

WOG Reference:

Appendix B.1 CT-1

Conditions:

Prior to a transition to FR-S.1.

EVENT 6 PERFORMANCE OBJECTIVES

EVENT GOAL:

Given that the unit is tripped with three control rods stuck out, the crew will initiate emergency boration.

NORTH ANNA SPECIFIC TASKS:

None

CRITICAL TASK:

See Next page

CT Statement:

Crew initiates emergency boration

Safety Significance:

Failure to initiate emergency boration when required would place the plant in a condition where shut-down margin could not be guaranteed. Thus, failure to perform the critical task constitutes "mis-operation or incorrect crew performance which leads to incorrect reactivity control."

Cues:

Three control rods fully withdrawn by IRPI indication.

Performance Indicator:

RO places boric acid transfer pump in FAST.
RO aligns blender for boration
Crew has 1-CH-241 opened locally.

Feedback:

Boric acid transfer pump indicates running in fast speed.
Blender is correctly aligned for boration
Watchstander reports that 1-CH-241 is open.
Emergency boration flow greater than 10 gpm indicated.

WOG Reference:

Based on Appendix B CT-53

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 10^{-8} amps, the crew will ramp the unit to approximately 12% power per 1-OP-1.2, Unit Startup From Mode 3 to Mode 2," and 1-OP-2.1, "Unit Operation From Mode 2 to Mode 1."

SPD Verified: _____ (Initials)

- Reactor power increases to approximately 12%

EVENT 2: Given that the unit is at power and a failure of 1-RC-LC-1459G and a failed IRPI have occurred, the crew will respond in accordance with the AR for B-F8 (as applicable) and technical specifications.

SPD Verified: _____ (Initials)

- 1-RC-LCV-1459G fails to manual
- 1-RC-LCV-1459G demand decreases to 0
- 1-CH-LCV-1122 demand decreases
- Charging flow decreases
- A PCS alarm is received on low charging flow
- Regen HX temperature increases
- VCT level increases
- If pressurizer level decreases low enough, B-F8 will illuminate
- **After several minutes:** annunciators A-G2 and AF1 will illuminate
- IRPI for rod K-2 in Control Bank A will drop to zero
- Rod Bottom Light for K-2 will illuminate

EVENT 3: Given the plant in Mode 1 and a loss of Service Water has occurred, the crew will respond in accordance with 0-AP-12, "Loss of Service Water."

SPD Verified: _____ (Initials)

- Annunciators J-H3, J-B3, then B-B7, B-C8, and B-E8 illuminate
- Unit 2 "B" SW pump has amber and green lights lit
- "A" SW header flow decreases

EVENT 4: Given that the unit is at power and a letdown leak has developed in 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-RC-FI-1150
- 1-CH-PCV-1145 output decreases
- VCT level decreases
- Containment sump level increases
- Containment radiation increases

EVENT 5: Given the plant is in Mode 1 with indications of a loss of "A" Main Feedwater Pump and a failure of "B" Main Feedwater Pump to automatically start, the crew will respond in accordance with 1-AP-31, "Loss of Main Feedwater," 1-E-0, "Reactor Trip or Safety Injection," and 1-ES-0.1, "Reactor Trip Response."

SPD Verified: _____ (Initials)

- Annunciator E-H5 illuminates
- "A" MFP breakers have amber and green lights lit
- "C" MFP does not auto-start
- RO reactor trip switch does not work
- Three control rods stick out

EVENT 6: Given that the unit is tripped with three control rods stuck out, the crew will initiate emergency boration.

SPD Verified: _____ (Initials)

- Emergency borate valve thermals out