Facility: North Anna Power Station Scenario No.: (2014) NRC-2 Op-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)	"A" 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

DOMINION

NORTH ANNA POWER STATION

INITIAL LICENSED OPERATOR EXAMINATION

SIMULATOR EXAMINATION GUIDE
SCENARIO 2014 NRC 2

EVENT	DESCRIPTION
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.	"A" 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 2 to Mode 1." 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. This will cause the associated steam flow channel to also fail low. 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) • "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, or as directed by the lead examiner.	**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 desire, 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) • Reactor power increases • Turbine power increases • Tavg/Tref increase • Generator megawatts increase		
	BOP ramps down to get off limiter.	Attachment 9 to 1-OP-2.1. Step 6.
	BOP adjusts limiter up.	Step 7
	BOP verifies/sets desired ramp rate (0.3% per minute).	Step 1
	BOP increases turbine setter to desired position.	Step 3
	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.	Attachments
	RO monitors control rods.	AFD
	NOTE: The next event can occur once enough of a power increase has been observed, or as directed by the lead examiner.	**Validation time: 28 minutes to ramp about 10%.** **Make sure all 4 NIs are > 51%.**

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) • 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 IOAs	**Crew stops RCS pressure decrease.** • 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**
IOA	RO checks master controller is controlling properly.	
IOA	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 examiner.	

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) • 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.	
IOA	BOP identifies generator output voltage and MVARS increasing with MW stable.	
IOA	BOP places voltage regulator control switch to OFF.	
IOA	BOP adjusts generator output voltage using base adjust, if required so that: Generator output voltage in the normal range MVARs not greater than 200 MVARs IN	
	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 500kV voltage schedule.	
	US directs condition reports be 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 examiner.	**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) • "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.	
IOA	RO all checks steam dumps closed. (NO)	
CT2 IOA	**RO takes steam dumps to OFF.**	**RNO** **Steam dump will close.** *Prior to receiving an automatic reactor trip on over power
IOA	BOP verifies all SG PORVs closed.	
IOA	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: • 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: • 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: • 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 examiner.	**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) • 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 ΔP SG 1A LO.	
	BOP identifies 1-MS-PI-1475 failing low.	
	US directs the crew to enter 1-AP-3.	
IOA	BOP verifies redundant channels normal.	
IOA	BOP verifies SG level controlling channel normal. (NO) • Steam flow • Feed flow • Steam generator level • Steam pressure	
IOA	BOP takes manual control of the "A" Main Feed Reg Valve to control SG level.	RNO
IOA	Crew verifies first stage pressure indications normal.	
IOA	RO verifies pressurizer level indications are normal.	
	RO verifies systems affected by PRZR level channels normal. • Operable channel is selected • Emergency bus backup heaters are restored • Letdown is in service • Pressurizer level control in auto • Pressurizer control group heaters are not tripped.	
	Crew verifies both first stage pressure channels normal.	
	Crew verifies all SGWLC channels selected to an operable channel. (NO)	
	RO verifies rod control in manual. (NO)	

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
	RO places control rods in manual.	
	RO places steam dumps in OFF or steam pressure mode, as required.	SRO will most likely choose OFF
	BOP checks all MFRV bypass valves are in manual.	
	BOP places "B" and "C" MFRVs to manual.	
	Crew swaps to operable SGWLC channels on feed flow, steam flow and first-stage pressure..	
	BOP verifies all SG levels are on program and returns MFRVs to automatic when they are on program.	
	RO verifies steam dumps are available and places them in Tave Mode, if applicable: • Verifies both channels of first stage pressure are operable • Places both STEAM DUMP INTLK switches to OFF/RESET • Verifies annunciator P-E4 is NOT lit (If it is lit then the steam dump mode selector switch is taken to reset.) • Place mode selector switch to Tave • Ensures steam dump demand is zero • Places both STEAM DUMP INTLK switches to ON.	**This will depend on whether dumps are ready to be returned to service from event 5 failure.**
	Crew verifies auto rod control desired. • Tave and Tref within 1.5 degrees • If not then adjusts Tave or Tref and then returns rods to Automatic.	

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
	US review TS 3.3.2 Function 1e (SI. High delta P between steam lines), Function 1f (SI. High steam line flow with low-low Tave), Function 1g (SI. High steam line flow with low steam line pressure), Function 4d (Steam line isolation. High steam flow with low-low Tave) , and Function 4e (Steam line isolation. High steam line flow with low steam line pressure) Condition D (for all) - channel must be placed in trip within 72 hours 3.3.3 and 3.3.4 do not apply TR 3.3.9 is not applicable	**These channels are not in ASDP** **3.3.9 require 2/3 Steam pressures and 1/2 steam flows per SG.**
	US directs RO to enter 1-MOP-55.77 and 1-MOP-55.79.	
	NOTE: The next event may occur after the crew has identified channel trip requirements and the US has referred to tech specs, or as directed by the lead examiner.	**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) • 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.	
IOA	Crew verifies reactor trip: • 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.	
IOA	BOP verifies turbine trip: • Manually trips turbine • Verifies all turbine stop valves closed • Resets reheaters • Verifies MSR FCVs closed • Verifies generator output breaker open	
IOA	RO verifies both emergency busses are energized.	
IOA	Crew verifies that safety injection has not occurred and is not required. • 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	
	NOTE: Continuous action pages for 1-E-0 and 1-ES-0.1 will direct closing and locking 1-CH-217, PG to the Unit 1 blender.	
	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)	

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 reduces AFW flow between generators to maintain >400 gpm.	
	BOP checks feedwater status: • Checks RCS average temperature < 554°F • Verifies MFRVs closed • Verifies AFW pumps running • Verifies total AFW flow ≥400 gpm.	
	BOP checks SG levels: • 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.	
	RO checks pressurizer level control: • Level greater than 15% • CC system in service • Letdown in service • Level between 20 and 29%.	
	RO checks pressurizer pressure control: • Pressure > 1780 psig • Pressure stable at or trending to 2235 psig	
	NOTE: The next event can occur once the crew has checked pressurizer pressure control, or as directed by the lead examiner.	

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
SPD Verified: _____ (Initials) • RCS pressure and pressurizer level decrease • Charging flow increases • Annunciators A-C1, E-F8, then A-C4 illuminate • Annunciator B-F8 may also 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 6 for manual verification of SI flowpath.	
	NOTE: The following steps are from attachment 6, "Manual Verification of SI Flowpath."	Attachment
	Crew verifies the following:. 1-CH-MOV-1115B/D open 1-CH-MOV-1115C/E closed 1-CH-MOV-1289A and or B closed 1-CH-TV-1884A/B/C closed	
	Crew opens at least one BIT outlet valves 1-CH-MOV-1869C/D	
	Crew attempts to open BIT inlet valves. (NO) 1-CH-MOV-1867A/B	
CT3	**Crew aligns BIT bypass**: • **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.** RNO
	US holds a transient crew brief.	
	US initiates attachment 4(5).	Attachment 5 is initiated by attachment 4. These will most likely be given to the BOP. The SRO will read to the RO.

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 verifies SI flow. HHSI cold leg SI flow indicated RCS pressure < 225 psig (NO)	
	Crew verifies AFW flow. AFW flow to all SGs indicated Total AFW flow > 340 gpm (or level in at least one SG > 11%).	
	RO checks RCS Tave stable at or trending to 547°F.	
	*RO checks PRZR PORVs and spray valves. • PORVs closed • Spray valves responding to control pressure at 2235 psig or demand at zero and closed • At least one PORV block valve open.	
	RO checks RCP trip and charging pump recirc criteria. RCS subcooling < 25°F (NO)	
	BOP checks SGs not faulted. • All SG pressures > 80 psig and under control of operator. (YES)	
	BOP checks SGs tubes are not ruptured: (YES): • Level in any SG increasing in an uncontrolled manner (NO, continue on)	
	Crew checks if RCS is intact inside containment: (YES) • 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. • Vent stack radiation normal. (NO)	
	Crew determines cause of abnormal conditions is loss of RCS inventory outside containment.	

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
	US directs crew to transition to 1-ECA-1.2.	
	BOP verifies LHSI pump hot-leg valves closed: 1-SI-MOV-1890A and 1890B.	
	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.** • **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 examiner.	**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."	19
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 (False) U2_CC_28 = 0
Lower level in "A" BAST	Use tanks and stuff: chm405(1)
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 off	**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.

The next event can occur once the acid transfer is complete, or as directed by the lead examiner.

COMMUNICATIONS

Report back when 1-CH-95 has been opened and also when it has been re-closed.

EVENT 2	Increase power
MALFUNCTIONS/OVERRIDES	
The next event can occur once enough of a power increase has been observed, or as directed by the lead examiner. **Discussion that this can happen once both A-C7 and A-C8 have been cleared. All 4 PR NIs > 51%.**	
COMMUNICATIONS	

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

EVENT 4	Main Generator Voltage Regulator Failure

MALFUNCTIONS/OVERRIDES

Malfunction:
EL09, Delay time = 5, Ramp = 35, Severity = 60, Trigger = 4

If need to reset K-B4:
V2KB4_W_RST = TRUE, Trigger = 12

NOTE: The next event can occur after the crew has stabilized the plant, or at the direction of the lead examiner.

COMMUNICATIONS

The turbine building operator may be sent to look at voltage regulator panel. Can report that there are many messages and need electrical support.

Lead examiner will most likely not wait for any outside the MCR operators to show up. Check before going to get the AR.

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.

When dispatched with AR for K-B4: If need to reset K-B4: Use trigger 12 above.

Circle the following on AR for K-B4: FORCING, MXL, OVERVOLT

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

The next event can occur once the unit is stable, or at the direction of the lead examiner.

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.

When sent to look at SG PORVs and safeties locally: wait 3 of 4 minutes and then report back that all are closed.

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

EVENT 7	G-12 opens causing a reactor/turbine trip
MALFUNCTIONS/OVERRIDES	
Malfunction: EL10, Delay time = 5, Trigger = 7 **The next event can occur once the crew has checked pressurizer pressure control, or as directed by the lead examiner.**	
COMMUNICATIONS	
When sent to close and lock 1-CH-217: use ExremeView to close and report back within 5 minutes. Could also possibly be sent to stand by at valve.	

EVENT 8	Inter-system LOCA

MALFUNCTIONS/OVERRIDES

Malfunction:
SI16, Delay time = 120, Ramp = 100, Severity = 75, Trigger = 8

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

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:

SET SIMOV867_RATE(1) = 450
SET SIMOV867_RATE(2) = 450

The scenario may be terminated after the crew isolates the leak, or as directed by the lead examiner.

COMMUNICATIONS

If sent to Safeguards, wait ~2 minutes and then report that door is hot. (If leak has already been isolated can report that there was a loud noise, but it has now stopped.)

When sent to manually open one of the BIT inlet valves use instructions above and report back when requested valve has been opened. (when timer has timed out)

If asked about cask drying for 0-AP-5.2: No cask drying is occurring.

ATTACHMENT 3

SCENARIO PERFORMANCE OBJECTIVES

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:

Direction is given prior to exiting 1-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:

Before exiting 1-ECA-1.2

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
- Annunciator B-F8 may also illuminate
- Vent stack "B" radiation increases to alarm setpoint
- BIT inlet valves fail to open

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.

Please prebrief the acid transfer and the unit ramp.

The RO has been designated to do the acid transfer.
The auxiliary building operator has been prebriefed to perform his actions in 0-OP-8.8.
He is standing by in the auxiliary building.

Rods are currently at 160 steps on "D" bank
RCS boron is 1537 ppm
Time in life is 150 MWD/MTU
Tavg is 562°F
Tref is 561 °F

The reactor engineer has determined that it will take approximately 3050 gallons of water to reach 100% power, ARO.

*** A Non-Controlled Document ***

Unit 1 OATC

This Sheet updated on: Today

Protected

2H

Power:	49	GV Position	9 %	BLOWDOWNS	
Boron:	1,537 ppm	TURBINE REF:	46.6 1.0% on limiter	CD:	2 GPM
Dilutions:	1-3 7 gal	'A' BAST:	14,043 ppm	SW:	secured
PG/°F Change:	36 Gls.	IN PIPE:	PG	BC:	Secured on U-1
BA/°F Change:	4.4 Gls.	CATION BED:	Secured	S/G:	Hi cap 60/60/60
BLEND RATIO:	8.1 to 1			Aux Stm Supply:	U2 2nd PT

Approximate Outputs	1-RC-PCV-1444J	56 %	1-RC-LCV-1459G	39 %
	1-CH-PCV-1145	80 %	1-CC-TCV-106	27 %

Limiting Actions: *None*

Items Tagged: 2-CC-P-1B

Items OOC:

Annunciators Lit

1-LOG-14:

Problems/OWA:

OD's

OD-555: 1H EDG Mech Stop (Mushroom) Pushbutton may not work to stop 1H EDG

OD-542: AFW Pipe Tunnel Missile Protection

ODM's

ODM-309: B&C RCP seals, < 0.8 seal leakoff (AR 1C-G8), PG < 90°, RCS@175 ppm

MISC

Maintain VCT Pressure < 35 psig per Chemistry request

1-FW-P-2 returned to operable last shift. Previously tagged for work on governor valve.

Open Procedures:

PT's Days:	PT's Nights:
	Normal Nightlies

Reactivity Worksheet

This calculation made on:	**Sunday**	**June 1, 2014**	**13:54:34**
Cycle Data file:	**N1C24**	Cycle Data Updated:	**9/25/2013**

Core Burnup	150.0	MWD/MTU
RCS C_b	1,537	ppm
BAST C_b	14,043	ppm
ITC	-6.3	pcm/°F
PC	-10.9	pcm/%
Boron Coefficient	-5.75	pcm/ppm

PG (blend)	
75	gpm
5.00	pot
Boric Acid (blend)	
9.2	gpm
4.61	pot

(ITEM 1) = ITC/Boron Coefficient = 1.10 **ppm/°F**

(ITEM 2) = PC/Boron Coefficient = 1.90 **ppm/%**

PG needed to raise RCS temperature 1ºF*

50455.4 * ln (RCS C_B/(RCS C_B - ITEM 1)) 36 **gallons of PG**

Boron needed to lower RCS temperature 1ºF

50455.4 * ln ((BAST C_B - RCS C_B) / (BAST C_B – (RCS C_B + ITEM 1)) 4.4 **gallons of acid**

PG needed to raise Reactor Power 1%*

50455.4 * ln (RCS C_B/(RCS C_B - ITEM 2)) 62 **gallons of PG**

Boron needed to lower Reactor Power 1%

50455.4 * ln ((BAST C_B - RCS C_B) / (BAST C_B – (RCS C_B + ITEM 2)) 7.7 **gallons of acid**

BLEND RATIO CALCULATION

(BAST C_B - RCS C_B) / RCS C_B 8.1 **to 1 ratio**

* Denotes Calculations that have been corrected for B-10

RCS Makeup Table

PG		BA		PG		BA		PG		BA	
120	**gpm**	14.7	gpm	**80**	**gpm**	9.8	gpm	**40**	**gpm**	4.9	gpm
8.00	pot	7.37	pot	5.33	pot	4.92	pot	2.67	pot	2.46	pot
PG		BA		PG		BA		PG		BA	
110	**gpm**	13.5	gpm	**70**	**gpm**	8.6	gpm	**30**	**gpm**	3.7	gpm
7.33	pot	6.76	pot	4.67	pot	4.30	pot	2.00	pot	1.84	pot
PG		BA		PG		BA		PG		BA	
100	**gpm**	12.3	gpm	**60**	**gpm**	7.4	gpm	**20**	**gpm**	2.5	gpm
6.67	pot	6.15	pot	4.00	pot	3.69	pot	1.33	pot	1.23	pot
PG		BA		PG		BA		PG		BA	
90	**gpm**	11.1	gpm	**50**	**gpm**	6.1	gpm	**10**	**gpm**	1.2	gpm
6.00	pot	5.53	pot	3.33	pot	3.07	pot	0.67	pot	0.61	pot

Prepared:_____ Reviewed:_____

Dominion **NORTH ANNA POWER STATION**	PROCEDURE NO: **0-OP-8.8** REVISION NO: **10**
PROCEDURE TYPE: **OPERATING PROCEDURE**	UNIT NO: **1 & 2**

PROCEDURE TITLE:

TRANSFERRING BORIC ACID

					RX MAN	

REVISION SUMMARY:

FrameMaker template Rev. 030.

- Incorporated DCP 03-159, Boric Acid and PG Water Flow to Blender Integrator Modification / Unit 1. Added Reference 2.3.21. Added step 5.5.9.f, 5.5.15.b, and 5.5.17.b to operate the Unit 1 integrators.

PROBLEMS ENCOUNTERED: ☐ NO ☐ YES **Note:** If YES, note problems in remarks.

REMARKS: _____

_____

_____

_____

_____

_____ (Use back for additional remarks.)

SRO:	DATE:

CONTINUOUS USE

TABLE OF CONTENTS

1.0 PURPOSE

To provide instructions for transferring boric acid.

The following synopsis is designed as an aid to understanding the procedure, and is not intended to alter or take the place of the actual purpose, instructions, or text of the procedure itself.

This procedure provides instructions for transferring boric acid. If a Boric Acid Storage Tank must be transferred due to increasing level, the Tank should be sampled to verify an unexpected dilution of the Tank is not occurring.

This procedure formerly contained a Section for swapping Boric Acid Storage Transfer Pump alignments. This Section has been deleted and replaced by the following individual procedures for each alignment option:

By procedure number:

- 0-OP-8.10, Alignment of 1-CH-P-2A on “A” Boric Acid Storage Tank To Unit 1
- 0-OP-8.11, Alignment of 1-CH-P-2B on “B” Boric Acid Storage Tank For Recirc Only
- 0-OP-8.12, Alignment of 1-CH-P-2C on “B” Boric Acid Storage Tank For Recirc Only
- 0-OP-8.13, Alignment of 1-CH-P-2D on “C” Boric Acid Storage Tank To Unit 2
- 0-OP-8.14, Alignment of 1-CH-P-2A on “B” Boric Acid Storage Tank To Unit 1
- 0-OP-8.15, Alignment of 1-CH-P-2B on “A” Boric Acid Storage Tank To Unit 1
- 0-OP-8.16, Alignment of 1-CH-P-2B on “B” Boric Acid Storage Tank To Unit 1
- 0-OP-8.17, Alignment of 1-CH-P-2C on “B” Boric Acid Storage Tank To Unit 2
- 0-OP-8.18, Alignment of 1-CH-P-2D on “B” Boric Acid Storage Tank To Unit 2
- 0-OP-8.19, Alignment of 1-CH-P-2C on “C” Boric Acid Storage Tank To Unit 2
- 0-OP-8.20, Alignment of 1-CH-P-2A on “A” Boric Acid Storage Tank For Recirc Only
- 0-OP-8.21, Alignment of 1-CH-P-2D on “C” Boric Acid Storage Tank For Recirc Only

By pump number:

- 0-OP-8.10, Alignment of 1-CH-P-2A on "A" Boric Acid Storage Tank To Unit 1
- 0-OP-8.14, Alignment of 1-CH-P-2A on "B" Boric Acid Storage Tank To Unit 1
- 0-OP-8.20, Alignment of 1-CH-P-2A on "A" Boric Acid Storage Tank For Recirc Only
- 0-OP-8.11, Alignment of 1-CH-P-2B on "B" Boric Acid Storage Tank For Recirc Only
- 0-OP-8.15, Alignment of 1-CH-P-2B on "A" Boric Acid Storage Tank To Unit 1
- 0-OP-8.16, Alignment of 1-CH-P-2B on "B" Boric Acid Storage Tank To Unit 1
- 0-OP-8.12, Alignment of 1-CH-P-2C on "B" Boric Acid Storage Tank For Recirc Only
- 0-OP-8.17, Alignment of 1-CH-P-2C on "B" Boric Acid Storage Tank To Unit 2
- 0-OP-8.19, Alignment of 1-CH-P-2C on "C" Boric Acid Storage Tank To Unit 2
- 0-OP-8.13, Alignment of 1-CH-P-2D on "C" Boric Acid Storage Tank To Unit 2
- 0-OP-8.18, Alignment of 1-CH-P-2D on "B" Boric Acid Storage Tank To Unit 2
- 0-OP-8.21, Alignment of 1-CH-P-2D on "C" Boric Acid Storage Tank For Recirc Only

By tank number:

- 0-OP-8.10, Alignment of 1-CH-P-2A on "A" Boric Acid Storage Tank To Unit 1
- 0-OP-8.15, Alignment of 1-CH-P-2B on "A" Boric Acid Storage Tank To Unit 1
- 0-OP-8.20, Alignment of 1-CH-P-2A on "A" Boric Acid Storage Tank For Recirc Only
- 0-OP-8.11, Alignment of 1-CH-P-2B on "B" Boric Acid Storage Tank For Recirc Only
- 0-OP-8.12, Alignment of 1-CH-P-2C on "B" Boric Acid Storage Tank For Recirc Only
- 0-OP-8.14, Alignment of 1-CH-P-2A on "B" Boric Acid Storage Tank To Unit 1
- 0-OP-8.16, Alignment of 1-CH-P-2B on "B" Boric Acid Storage Tank To Unit 1
- 0-OP-8.17, Alignment of 1-CH-P-2C on "B" Boric Acid Storage Tank To Unit 2
- 0-OP-8.18, Alignment of 1-CH-P-2D on "B" Boric Acid Storage Tank To Unit 2
- 0-OP-8.13, Alignment of 1-CH-P-2D on "C" Boric Acid Storage Tank To Unit 2
- 0-OP-8.19, Alignment of 1-CH-P-2C on "C" Boric Acid Storage Tank To Unit 2
- 0-OP-8.21, Alignment of 1-CH-P-2D on "C" Boric Acid Storage Tank For Recirc Only

2.0 REFERENCES

2.1 Source Documents

2.1.1 UFSAR Section 4.3.2.5.1, Chemical Poison

2.2 **Technical Specifications**

2.2.1 TRM TR 3.1.1

2.2.2 TRM TR 3.1.2

2.3 **Technical References**

2.3.1 WATS 88-07, Surry LER-S2/88-008

2.3.2 11715 FM-95A, Chemical And Volume Control System

2.3.3 11715 FM-95B, Chemical And Volume Control System

2.3.4 11715-FM-86A, Boron Recovery System

2.3.5 11715-FM-87D, Liquid Waste System

2.3.6 11715-FM-88A, Refueling Purification System

2.3.7 12050-FM-95B, Chemical and Volume Control System

2.3.8 1-SC-5.18, Boric Acid Solubility vs Temperature

2.3.9 1-SC-5.22, High and Low Level Waste Drain Tanks 1-LW-TK-2A, B,-3A, B

2.3.10 1-SC-5.3, Boric Acid Tanks 1-CH-TK-1A, B, C

2.3.11 0-OP-16.1, Spent Fuel Pool Cooling And Purification System

2.3.12 1-OP-16.2, Unit 1 Reactor Cavity Purification

2.3.13 1-OP-16.4, Purification of Unit 1 Refueling Water Storage Tank

2.3.14 2-OP-16.2, Unit 2 Reactor Cavity Purification

2.3.15 2-OP-16.4, Purification of Unit 2 Refueling Water Storage Tank

2.3.16 1-OP-8.3, Boron Concentration Control

2.3.17 2-OP-8.3, Boron Concentration Control

2.3.18 DCP 01-008, Phase 2 PCS Installation and P-250 Removal - Unit 2

2.3.19 DCP 01-007, Phase 2 PCS Installation and P-250 Removal - Unit 1

2.3.20 DCP 03-160, Boric Acid and PG Water Flow to Blender Integrator Modification/NAPS/Unit 2

2.3.21 DCP 03-159, Boric Acid and PG Water Flow to Blender Integrator Modification / NAPS / Unit 1

2.4 **Commitment Documents**

2.4.1 CTS Assignment 02-94-0500, Commitment 002, Independent Control Switch Verification

2.4.2 CTS Assignment 02-90-2166, Commitment 001, Revise appropriate procedures to complete batching with the pumps in slow speed, time batching operation and use this time to control pump operation time during batch transfers to prevent pump cavitation and prevent operation of the pumps in fast speed with PG supplied to the pump suction.

2.4.3 Plant Issue N-2003-0800, Grating Slipped from Hand and Hit Operator

2.4.4 SAA009529; SAR000956: Reactivity Management

3.0 INITIAL CONDITIONS

3.1 Review the equipment status to verify station configuration supports the performance of this procedure.

3.2 The Heat Tracing System is in service for all piping and tanks that may be exposed to concentrated boric acid solution.

4.0 PRECAUTIONS AND LIMITATIONS

4.1 Comply with the following guidelines when marking steps N/A:

- IF the conditional requirements of a step do not require the action to be performed, THEN mark the step N/A
- IF any other step is marked N/A, THEN have the SRO (or designee) approve the N/A and justify the N/A on the Procedure Cover Sheet

4.2 All operations should be performed in accordance with RWPs. Every effort should be made to maximize personnel safety while minimizing personnel exposure and area contamination, both surface and airborne. ALARA concepts should be used.

4.3 The time that a boric acid pump is stopped MUST be minimized unless it is the standby pump.

4.4 The Recirculation hand control valve for the boric acid pump and tank in service should be positioned in a manner to allow for sufficient recirculation flow for pump heat removal, but not so open that proper flow of boric acid, when in the emergency borate mode, would be hindered.

4.5 Minimize the time that a Boric Acid Transfer Pump is operated in FAST speed. This will prevent excessive shaft deflection and limit the wear on the seal face of the pump. **(Reference 2.4.2)**

4.6 WHEN transferring boric acid to the BASTs, THEN the appropriate unit OATC should monitor tank level to avoid receiving the Hi level alarm at 93%.

4.7 The following Tech Specs apply:

- TRM 3.1.1, Boration Flow Paths - Operating
- TRM 3.1.2, Boration Flow Paths - Shutdown

Init Verif

5.0 INSTRUCTIONS

5.1 Transferring Boric Acid From "B" BAST To The "A" Or "C" BAST

_____ 5.1.1 Verify Initial Conditions are satisfied.

_____ 5.1.2 Review Precautions and Limitations.

NOTE: This procedure could cause the "B" BAST to be pumped below Tech Spec level. SRO permission is required to perform this procedure and Tech Spec actions must be entered as required.

_____ 5.1.3 IF "B" BAST is in service to Unit 1 OR Unit 2, THEN obtain SRO approval for this transfer.

5.1.4 IF "B" BAST is in standby AND it is desired to transfer to the "A" BAST, THEN open the following valves:

_____ • 1-CH-95, Unit 1 BA Fltr Recirc to 1B Boric Acid Tk Isol Vv

_____ • 1-CH-HCV-1110, BORIC ACID TK A RECIRC VALVE CONT

5.1.5 IF "B" BAST is in service to Unit 1 AND it is desired to transfer to the "A" BAST, THEN open the following valves:

_____ • 1-CH-96, Unit 1 BA Fltr Recirc to 1A Boric Acid Tk Isol Vv

_____ • 1-CH-HCV-1110, BORIC ACID TK A RECIRC VALVE CONT

5.1.6 IF "B" BAST is in standby AND it is desired to transfer to "C" BAST, THEN open the following valves:

_____ • 1-CH-137, Unit 2 BA Fltr Recirc to 1B Boric Acid Tk Isol Vv

_____ • 1-CH-HCV-1104, BORIC ACID RECIRC FLOW

5.1.7 IF "B" BAST is in service to Unit 2 AND it is desired to transfer to "C" BAST, THEN open the following valves:

_____ • 1-CH-136, Unit 2 BA Fltr Recirc to 1C Boric Acid Tk Isol Vv

_____ • 1-CH-HCV-1104, BORIC ACID RECIRC FLOW

_____ 5.1.8 Close 1-CH-HCV-1105, BORIC ACID TK B RECIRC VALVE CONT.

_____ 5.1.9 Review transfer termination criteria:

- IF "B" BAST is in service to Unit 1 or Unit 2 with the Unit in Mode 1-4, THEN level should be maintained above 71% to prevent entry into the Action Statement of TRM 3.1.1.
- IF "B" BAST is in service to Unit 1 or Unit 2 with the Unit in Mode 5 or 6, THEN level should be maintained above 5% to prevent entry into the Action Statement of TRM 3.1.2.
- Level in "A" or "C" BAST should not exceed 98%, to prevent overflow.

5.1.10 Place the control switch for the transfer pump aligned to the "B" BAST in FAST. Mark the remaining pump N/A:

_____ • 1-CH-P-2B, B Boric Acid Storage Transfer Pump

_____ • 1-CH-P-2C, C Boric Acid Storage Transfer Pump

5.1.11 WHEN the transfer is complete, THEN do the following:

a. Place the control switch for the transfer pump aligned to the "B" BAST in OFF. Mark the remaining pump N/A:

_____ • 1-CH-P-2B, B Boric Acid Storage Transfer Pump

_____ • 1-CH-P-2C, C Boric Acid Storage Transfer Pump

_____ b. Open 1-CH-HCV-1105, Boric Acid Tk B Recirc Valve Cont, to 20%.

_____ c. IF "B" BAST is in standby AND transfer was to the "A" BAST, THEN close 1-CH-95, Unit 1 BA Fltr Recirc to 1B Boric Acid Tk Isol Vv.

_____ d. IF "B" BAST is in service to Unit 1 AND transfer was to the "A" BAST, THEN close 1-CH-96, Unit 1 BA Fltr Recirc to 1A Boric Acid Tk Isol Vv.

_____ e. IF "B" BAST is in standby AND transfer was to "C" BAST, THEN close 1-CH-137, Unit 2 BA Fltr Recirc to 1B Boric Acid Tk Isol Vv.

_____ f. IF "B" BAST is in service to Unit 2 AND transfer was to the "C" BAST, THEN close 1-CH-136, Unit 2 BA Fltr Recirc to 1C Boric Acid Tk Isol Vv.

5.1.12 Place the control switch for the transfer pump that is aligned to "B" BAST in the required position:

a. IF "B" BAST is in standby, THEN place control switch in SLOW. Mark the remaining pump N/A: **(Reference 2.4.1)**

_____ _____ • 1-CH-P-2B, B BORIC ACID STORAGE TRANSFER PUMP

_____ _____ • 1-CH-P-2C, C BORIC ACID STORAGE TRANSFER PUMP

b. IF "B" BAST is in service, THEN place control switch in AUTO. Mark the remaining pump N/A: **(Reference 2.4.1)**

_____ _____ • 1-CH-P-2B, B Boric Acid Storage Transfer Pump

_____ _____ • 1-CH-P-2C, C Boric Acid Storage Transfer Pump

5.1.13 Verify the level of the affected BAST is stable. Mark the remaining indicators N/A:

_____ • 1-CH-LI-1106, 1A Boric Acid Tank Level Indicator

_____ • 1-CH-LI-1161, 1A Boric Acid Tank Level Indicator

_____ • 1-CH-LI-1102, 1C Boric Acid Tank Level Indicator

_____ • 1-CH-LI-1165, 1C Boric Acid Tank Level Indicator

5.1.14 Align the affected BAST for sampling as follows:

a. Ensure the control switch(es) for the on-service pump(s) is(are) in AUTO. Mark the remaining pumps N/A: **(Reference 2.4.2)**

_____ • 1-CH-P-2A, A Boric Acid Storage Transfer Pump

_____ • 1-CH-P-2B, B Boric Acid Storage Transfer Pump

_____ • 1-CH-P-2C, C Boric Acid Storage Transfer Pump

_____ • 1-CH-P-2D, D Boric Acid Storage Transfer Pump

b. Adjust the recirc valve for the affected BAST to 20%. Mark the remaining valve N/A:

_____ • 1-CH-HCV-1110, Boric Acid Tk A Recirc Valve Cont

_____ • 1-CH-HCV-1104, Boric Acid Tk C Recirc Valve

_____ c. Have Chemistry Department sample the affected BAST.

Completed by: _____ Date: _____

5.2 Transferring Boric Acid From "A" BAST To "B" BAST

_____ 5.2.1 Verify Initial Conditions are satisfied.

_____ 5.2.2 Review Precautions and Limitations.

NOTE: This procedure could cause the "A" BAST to be pumped below Tech Spec level. SRO permission is required to perform this procedure and Tech Spec actions must be entered as required.

_____ 5.2.3 Obtain SRO approval for this transfer.

5.2.4 IF the "A" BAST is in service to Unit 1, THEN open the following:

_____ • 1-CH-95, Unit 1 BA Fltr Recirc to 1B Boric Acid Tk Isol Vv

_____ • 1-CH-HCV-1105, BORIC ACID TK B RECIRC VALVE CONT

5.2.5 IF 1-CH-P-2A is running on the A BAST for RECIRC ONLY, THEN open the following:

_____ • 1-CH-96, Unit 1 BA Fltr Recirc to 1A Boric Acid Tk Isol Vv

_____ • 1-CH-HCV-1105, Boric Acid Tk B Recirc Valve Cont

_____ 5.2.6 Close 1-CH-HCV-1110, Boric Acid Tk A Recirc Valve Cont.

_____ 5.2.7 Review transfer termination criteria:

- IF "A" BAST is in service to Unit 1 with the Unit in Mode 1-4, THEN level should be maintained above 71% to prevent entry into the Action Statement of TRM 3.1.1.
- IF "A" BAST is in service to Unit 1 with the Unit in Mode 5 or 6, THEN level should be maintained above 5% to prevent entry into the Action Statement of TRM 3.1.2.
- Level in "B" BAST should not exceed 98%, to prevent overflow.

5.2.8 Place the control switch for the transfer pump aligned to the "A" BAST in FAST. Mark the remaining pump N/A:

_____ • 1-CH-P-2A, A Boric Acid Storage Transfer Pump

_____ • 1-CH-P-2B, B Boric Acid Storage Transfer Pump

5.2.9 When transfer is complete, THEN place the transfer pump aligned to the A BAST in OFF. Mark the remaining pump N/A:

_____ • 1-CH-P-2A, A Boric Acid Storage Transfer Pump

_____ • 1-CH-P-2B, B Boric Acid Storage Transfer Pump

_____ 5.2.10 Adjust 1-CH-HCV-1110, Boric Acid Tk A Recirc Valve Cont, to 20%.

_____ 5.2.11 IF "A" BAST is in service to Unit 1, THEN close 1-CH-95, Unit 1 BA Fltr Recirc to 1B Boric Acid Tk Isol Vv.

_____ 5.2.12 IF 1-CH-P-2A is aligned to the A BAST for RECIRC ONLY, THEN close 1-CH-96, Unit 1 BA Fltr Recirc to 1A Boric Acid Tk Isol Vv.

5.2.13 Align the transfer pumps as follows:

a. IF in service to Unit 1, THEN place the control switch for the transfer pump aligned to A BAST in AUTO. Mark the remaining pump N/A: **(Reference 2.4.1)**

_____ _____ • 1-CH-P-2A, A Boric Acid Storage Transfer Pump

_____ _____ • 1-CH-P-2B, B Boric Acid Storage Transfer Pump

_____ _____ b. IF 1-CH-P-2A, A BORIC ACID STORAGE TRANSFER PUMP, is aligned for RECIRC ONLY, THEN place the control switch in SLOW. **(Reference 2.4.1)**

5.2.14 Verify the level of "B" BAST is stable:

_____ • 1-CH-LI-1108, 1B Boric Acid Tank Level Indicator

_____ • 1-CH-LI-1163, 1B Boric Acid Tank Level Indicator

5.2.15 Align "B" BAST for sampling as follows:

_____ _____ a. IF 1-CH-P-2B is aligned to B BAST in service to Unit 1, THEN place control switch in AUTO. **(Reference 2.4.1)**

b. IF B BAST is aligned for recirc only, THEN ensure the control switch for the pump aligned to B BAST is in SLOW. Mark the remaining pump N/A:

_____ _____ • 1-CH-P-2B, Boric Acid Storage Transfer Pump

_____ _____ • 1-CH-P-2C, C Boric Acid Storage Transfer Pump

_____ c. Adjust 1-CH-HCV-1105, Boric Acid Tk B Recirc Valve Cont, to 20%.

_____ d. Have Chemistry Department sample “B” BAST.

Completed by: _____ Date: _____

5.3 Transferring Boric Acid From "C" BAST To "B" BAST

_____ 5.3.1 Verify Initial Conditions are satisfied.

_____ 5.3.2 Review Precautions and Limitations.

NOTE: This procedure could cause "C" BAST to be pumped below Tech Spec level. SRO permission is required to perform this procedure and Tech Spec actions must be entered as required.

_____ 5.3.3 Obtain SRO approval for this transfer.

5.3.4 IF "C" BAST is in service to Unit 2, THEN open the following:

_____ • 1-CH-137, Unit 2 BA Fltr Recirc to 1B Boric Acid Tk Isol Vv

_____ • 1-CH-HCV-1105, BORIC ACID TK B RECIRC VALVE CONT

5.3.5 IF 1-CH-P-2D is running on "C" BAST for RECIRC ONLY, THEN open the following:

_____ • 1-CH-136, Unit 2 BA Fltr Recirc to 1C Boric Acid Tk Isol Vv

_____ • 1-CH-HCV-1105, Boric Acid Tk B Recirc Valve Cont

_____ 5.3.6 Close 1-CH-HCV-1104, Boric Acid Recirc Flow.

_____ 5.3.7 Review transfer termination criteria:

- IF "C" BAST is in service to Unit 2 with the Unit in Mode 1-4, THEN level should be maintained above 71% to prevent entry into the Action Statement of TRM 3.1.1.
- IF "C" BAST is in service to Unit 2 with the Unit in Mode 5 or 6, THEN level should be maintained above 5% to prevent entry into the Action Statement of TRM 3.1.2.
- Level in "B" BAST should not exceed 98%, to prevent overflow.

5.3.8 Place the control switch for the transfer pump aligned to "C" BAST in FAST. Mark the remaining pump N/A:

_____ • 1-CH-P-2D, D Boric Acid Storage Transfer Pump

_____ • 1-CH-P-2C, C Boric Acid Storage Transfer Pump

5.3.9 When transfer is complete, THEN place the transfer pump aligned to C BAST in OFF. Mark the remaining pump N/A:

_____ • 1-CH-P-2D, D Boric Acid Storage Transfer Pump

_____ • 1-CH-P-2C, C Boric Acid Storage Transfer Pump

_____ 5.3.10 Adjust 1-CH-HCV-1104, Boric Acid Recirc Flow, to 20%.

_____ 5.3.11 IF "C" BAST is in service to Unit 2, THEN close 1-CH-137, Unit 2 BA Fltr Recirc to 1B Boric Acid Tk Isol Vv.

_____ 5.3.12 IF 1-CH-P-2D is aligned to C BAST for RECIRC ONLY, THEN close 1-CH-136, Unit 2 BA Fltr Recirc to 1C Boric Acid Tk Isol Vv.

5.3.13 Align the transfer pumps as follows:

a. IF in service to Unit 2, THEN place the control switch for the transfer pump aligned to "C" BAST in AUTO. Mark the remaining pump N/A: **(Reference 2.4.1)**

_____ _____ • 1-CH-P-2D, D Boric Acid Storage Transfer Pump

_____ _____ • 1-CH-P-2C, C Boric Acid Storage Transfer Pump

_____ _____ b. IF 1-CH-P-2D, D BORIC ACID STORAGE TRANSFER PUMP, is aligned for RECIRC ONLY, THEN place the control switch in SLOW. **(Reference 2.4.1)**

5.3.14 Verify the level of "B" BAST is stable:

_____ • 1-CH-LI-1108, 1B Boric Acid Tank Level Indicator

_____ • 1-CH-LI-1163, 1B Boric Acid Tank Level Indicator

5.3.15 Align "B" BAST for sampling as follows:

_____ _____ a. IF 1-CH-P-2C is aligned to "B" BAST in service to Unit 2, THEN place control switch in AUTO. **(Reference 2.4.1)**

b. IF "B" BAST is aligned for recirc only, THEN ensure the control switch for the pump aligned to B BAST is in SLOW. Mark the remaining pump N/A:

_____ _____ • 1-CH-P-2B, Boric Acid Storage Transfer Pump

_____ _____ • 1-CH-P-2C, C Boric Acid Storage Transfer Pump

_____ c. Adjust 1-CH-HCV-1105, Boric Acid Tk B Recirc Valve Cont, to 20%.

_____ d. Have Chemistry Department sample “B” BAST.

Completed by: _____ Date: _____

5.4 Transferring The Contents Of "A", "B", Or "C" BAST To The High Level Liquid Waste Tanks

_____ 5.4.1 Verify Initial Conditions are satisfied.

_____ 5.4.2 Review Precautions and Limitations.

5.4.3 Have Chemistry sample the boron concentration (C_b) for the designated BAST and record results, date, and time below. Mark remaining BAST N/A:

_____ • C_b for A BAST:_____ ppm

_____ • C_b for B BAST:_____ ppm

_____ • C_b for C BAST:_____ ppm

_____ • Date: _____ Time: _____

5.4.4 Have Chemistry sample the Initial C_b for the High Level Liquid Waste Tanks. Record results, date, and time below:

_____ • Initial C_b for HLLWT:_____ ppm

_____ • Date: _____ Time: _____

5.4.5 Record the level in the following High Level Liquid Waste Tanks:

_____ • 1-LW-TK-2A level:_____%

_____ • 1-LW-TK-2B level:_____%

5.4.6 Using 1-SC-5.22, High And Low Level Waste Drain Tanks 1-LW-TK-2A, B,-3A, B, AND the values recorded in Step 5.4.5, determine the volumes of the following tanks. Record the volumes below:

_____ • 1-LW-TK-2A volume:_____ gal

_____ • 1-LW-TK-2B volume:_____ gal

_____ 5.4.7 Using the values determined in Step 5.4.6, calculate the TOTAL initial volume (H) of the High Level Liquid Waste Tanks. Record the volume below:

_____ gals. + _____ gals. = _____ gal
1-LW-TK-2A 1-LW-TK-2B H

_____ _____ 5.4.8 Determine the maximum allowable BAST volume (P) that may be transferred by completing the following calculation:

$$H\left[1n\left(\frac{B-i}{B-7500}\right)\right] = P$$

Where:

H= TOTAL initial volume in gallons (Step 5.4.7)

B= C_b for the affected BAST in ppm (Step 5.4.3)

i= Initial C_b for HLLWT in ppm (Step 5.4.4)

P= Maximum allowable BAST volume to be transferred in gallons

_____ gals.$\left[1n\left(\frac{\text{ppm} - \text{_____ ppm}}{\text{_____} - 7500}\right)\right]$ = _____ gals.

5.4.9 Determine minimum allowed BAST level due to C_b in the HLLWT:

_____ a. Record level in the BAST being transferred:_____%

_____ b. Using 1-SC-5.3, Boric Acid Tanks 1-CH-TK-1A, B, C, convert level in step 5.4.9.a to gallons: _____ gal

_____ c. Subtract (P) from step 5.4.8 from the value in step 5.4.9.b:

_____ gal - _____ gal = _____ gal
from step 5.4.9.b from step 5.4.8

_____ d. Using 1-SC-5.3, Boric Acid Tanks 1-CH-TK-1A, B, C, convert level in step 5.4.9.c to percent:_____%

CAUTION

Boric Acid Storage Tank level should be closely monitored during the transfer evolution. Avoid entry into TRM action statements based on low level.

_____ 5.4.10 Review transfer termination criteria:

- IF the BAST being drained is in service to Unit 1 or Unit 2 with the Unit in Mode 1-4, THEN level should be maintained above 71% to prevent entry into the Action Statement of TRM 3.1.1.
- IF the BAST being drained is in service to Unit 1 or Unit 2 with the Unit in Mode 5 or 6, THEN level should be maintained above 5% to prevent entry into the Action Statement of TRM 3.1.2.
- Level in the HLLWT should not exceed 97%
- Level in the BAST being drained should be maintained above the minimum level calculated in step 5.4.9.d.

5.4.11 IF "A" BAST will be transferred to the High Level Liquid Waste Tanks, THEN do the following:

_____ a. Establish communications between the Auxiliary Building Operator located at 1-CH-67, 1A Boric Acid Tank Drain To High Lvl Waste Isol Vv, and the Unit 1 OATC.

_____ b. Slowly open 1-CH-67.

_____ _____ c. WHEN the desired volume of the "A" BAST has been transferred OR any transfer termination criteria is met, THEN close 1-CH-67.

5.4.12 IF "B" BAST will be transferred to the High Level Liquid Waste Tanks, THEN do the following:

_____ a. Establish communications between the Auxiliary Building Operator located at 1-CH-108, 1B Boric Acid Tank Drain To High Lvl Waste Isol Vv, and the Unit 1 OATC.

_____ b. Slowly open 1-CH-108.

_____ _____ c. WHEN the desired volume of the "B" BAST has been transferred OR any transfer termination criteria is met, THEN close 1-CH-108.

5.4.13 IF C BAST will be transferred to the High Level Liquid Waste Tanks, THEN do the following:

_____ a. Establish communications between the Auxiliary Building Operator located at 1-CH-126, 1C Boric Acid Tank Drain To High Lvl Waste Isol Vv, and the Unit 2 OATC.

_____ b. Slowly open 1-CH-126.

_____ _____ c. WHEN the desired volume of the "C" BAST has been transferred OR any transfer termination criteria is met, THEN close 1-CH-126.

5.4.14 Do the following to flush the BAST drain line with PG:

a. Verify the following valves are closed:

_____ • 1-CH-67, 1A Boric Acid Tank Drain To High Lvl Waste Isol Vv

_____ • 1-CH-108, 1B Boric Acid Tank Drain To High Lvl Waste Isol Vv

_____ • 1-CH-126, 1C Boric Acid Tank Drain To High Lvl Waste Isol Vv

_____ b. Close 1-CH-434, Boric Acid Batch Tank To High Lvl Waste Isol Vv.

_____ c. Connect a hose between 1-CH-435, Boric Acid Batch Tk Ovfl Hose Conn Isol Valve, and 1-PG-334, Primary Grade Water Hose Conn Isol Valve.

_____ d. Open 1-PG-334, Primary Grade Water Hose Conn Isol Valve.

CAUTION

To ensure boron dilution does not occur through the loop seals, the Boric Acid Storage Tank levels should be closely monitored during the flushing evolution.

_____ e. Slowly open 1-CH-435, Boric Acid Batch Tk Ovfl Hose Conn Isol Valve.

_____ _____ f. WHEN a 1% to 2% level increase is observed in the High Level Liquid Waste Tanks, THEN close 1-PG-334, Primary Grade Water Hose Conn Isol Valve.

_____ _____ g. Open 1-CH-434, Boric Acid Batch Tank To High Lvl Waste Isol Vv, to drain hose to Batch Tank.

_____ h. Break hose connection at 1-PG-334, Primary Grade Water Hose Conn Isol Valve, and drain hose to Batch Tank.

_____ _____ i. Close 1-CH-435, Boric Acid Batch Tk Ovfl Hose Conn Isol Valve.

_____ j. Remove the PG supply hose from 1-CH-435 and store the hose.

Completed by: _____ Date: _____

5.5 Transferring The Contents Of "A", "B", Or "C" BAST To The Boron Recovery Tanks

_____ 5.5.1 Verify Initial Conditions are satisfied.

_____ 5.5.2 Review Precautions and Limitations.

5.5.3 Ensure all of the following conditions are met:

_____ • The BAST to be transferred is the on-service tank

_____ • The RP IX is available for service

_____ • Resin Transfer is not in progress

_____ • Resin Transfer lines have been flushed with PG to remove any resin fines

5.5.4 IF the RP system is in operation, THEN secure using the applicable procedure. Mark the procedures not used N/A:

_____ • 0-OP-16.1, Spent Fuel Pool Cooling And Purification System

_____ • 1-OP-16.2, Unit 1 Reactor Cavity Purification

_____ • 1-OP-16.4, Purification of Unit 1 Refueling Water Storage Tank

_____ • 2-OP-16.2, Unit 2 Reactor Cavity Purification

_____ • 2-OP-16.4, Purification of Unit 2 Refueling Water Storage Tank

_____ _____ 5.5.5 Complete Attachment 1, Cross Connect Valve Lineup.

_____ 5.5.6 Ensure 1-RP-127, Spent Fuel Pit Inlet Isolation Valve (Fuel Bldg SW Corner, under grating) is sealed closed. **(Reference 2.4.3)**

_____ 5.5.7 Remove seal and close 1-RP-128, Spent Fuel Pit Inlet Isolation Valve (Fuel Bldg SW Corner, under grating). **(Reference 2.4.3)**

5.5.8 Align RP system as follows:

_____ a. Close 1-RP-65, 1B Refueling Purification Filter Outlet Isol Valve.

_____ b. Open 1-RP-66, 1B Refuel Prfcn Fltr To RP Ion Exch Isol Valve.

_____ c. Close 1-RP-74, Refuel Prfcn Ion Exch To 1A RP Filter Isol Valve.

_____ d. Open 1-RP-68, Refueling Purification Ion Exch Inlet Isol Valve.

_____ e. Close 1-RP-41, 1B Refuel Purification Filter Bypass Valve.

_____ f. Open 1-RP-80, Refuel Prfch Filters to Spent Fuel Pit Isol Vv.

_____ g. Open 1-RP-77, 1B Refueling Purification Filter Outlet Isol Valve. (outside Nonregenerative HX cubicle)

5.5.9 Prepare the Unit Blender to be used for transfer. This will be the Blender which is being supplied by the BAST which will be transferred.

_____ a. Verify the blender will not be needed for the time needed for BAST transfer.

b. To prevent automatic actuation, do the following:

_____ 1. Place the BLENDER MODE selector switch in STOP.

_____ 2. Place the control switch for 1-CH-FCV-1113A (2-CH-FCV-2113A), BORIC ACID TO BLENDER, in CLOSE.

c. IF Unit 1 Blender will be used, THEN do the following valve alignment:

_____ 1. Record the As-Found Blender Controller settings below:

Controller	Name	Auto / Manual (circle one)	Controller Output	Pot Setting
1-CH-FC-1113A	Boric Acid To Blender Flow Controller	Auto / Manual	_____ %	_____
1-CH-FC-1114A	Primary Water To Blender Flow Controller	Auto / Manual	_____ %	_____
1-CH-HFC-1114	Primary Water To Blender Flow Controller (Half Station)		_____ %	

_____ 2. Close 1-CH-FCV-1113B, Blender Makeup To Chg Pp Suction

_____ 3. Close 1-CH-FCV-1114B, Blender Makeup To VCT

_____ 4. Close 1-CH-233, Boric Acid Blender to RWST High Hdr Isol Valve

_____ 5. Open 1-CH-232, Spent Fuel Pit Boric Acid Makeup Isol Valve

_____ 6. Open 1-CH-230, Boric Acid Blender To RWST And Fuel Pit Isol Vv

_____ 7. IF in Modes 3, 4, 5, or 6, THEN unlock AND open 1-CH-217, PG Supply To Boric Acid Blender Isolation Valve.

d. IF Unit 2 Blender will be used, THEN do the following valve alignment:

_____ 1. Record the As-Found Blender Controller settings below:

Controller	Name	Auto / Manual (circle one)	Controller Output	Pot Setting
2-CH-FC-2113A	Boric Acid To Blender Flow Controller	Auto / Manual	_____ %	_____
2-CH-FC-2114A	Primary Water To Blender Flow Controller	Auto / Manual	_____ %	_____
2-CH-HFC-2114	Primary Water To Blender Flow Controller (Half Station)		_____ %	

_____ 2. Close 2-CH-FCV-2113B, Blender Makeup To Chg Pp Suction

_____ 3. Close 2-CH-FCV-2114B, Blender Makeup To VCT

_____ 4. Close 2-CH-148, Boric Acid Blender to RWST High Hdr Isol Valve

_____ 5. Open 2-CH-147, Spent Fuel Pit Boric Acid Makeup Isol Valve

_____ 6. Open 2-CH-145, Boric Acid Blender To RWST And Fuel Pit Isol Vv

_____ 7. IF in Modes 3, 4, 5, or 6, THEN unlock AND open 2-CH-140, PG Supply To Boric Acid Blender Isolation Valve.

NOTE: The Boron Concentration in the following Step is based on expected Auxiliary Building, Pipe Tunnel, and BRT Enclosure temperatures of at least 60°F. Abnormally low temperatures in any of these areas may require a lower Boron Concentration in the blend and will result in additional PG usage.

_____ e. Using the Station Curves, determine the flow rates for Boric Acid and PG to establish a Boron Concentration of approximately 7000 ppm.

NOTE: Integrator operation for 1-CH-DCC-1113, Boric Acid and PG Digital Controller, is provided in the Attachment of 1-OP-8.3, Boron Concentration Control.

f. IF Unit 1 Blender will be used, THEN adjust the integrator on 1-CH-DCC-1113, Boric Acid and PG Digital Controller, as follows:

- IF automatic integrator make-up termination is desired, THEN Set AND Enable [RUN] the following applicable integrator setpoint (SP) values to the required quantity to be added:

_____ •• Boric Acid

_____ •• PG Water

- IF automatic integrator make-up termination is NOT desired, THEN ensure the following applicable integrator setpoint (SP) values are Set AND Enabled [RUN] above the required quantity to be added:

_____ •• Boric Acid (maximum 3000)

_____ •• PG Water (maximum 30,000)

NOTE: Integrator operation for 2-CH-DCC-2113, Boric Acid and PG Digital Controller, is provided in the Attachment of 2-OP-8.3, Boron Concentration Control.

g. IF Unit 2 Blender will be used, THEN adjust the integrator on 2-CH-DCC-2113, Boric Acid and PG Digital Controller, as follows:

- IF automatic integrator make-up termination is desired, THEN Set AND Enable [RUN] the following applicable integrator setpoint (SP) values to the required quantity to be added:

_____ •• Boric Acid

_____ •• PG Water

- IF automatic integrator make-up termination is NOT desired, THEN ensure the following applicable integrator setpoint (SP) values are Set AND Enabled [RUN] above the required quantity to be added:

_____ •• Boric Acid (maximum 3000)

_____ •• PG Water (maximum 30,000)

_____ 5.5.10 Open 1-RP-70, 1-RP-I-1 Top Flushing Water Isol Valve.

5.5.11 Open valve for in-service Cesium Removal IX:

_____ • 1-LW-518, 1-BR-I-1A Top Flushing Water Isolation Valve

_____ • 1-LW-523, 1-BR-I-1B Top Flushing Water Isol Valve

CAUTION

Boric Acid Storage Tank level should be closely monitored during the transfer evolution. Avoid entry into TRM action statements based on low level.

_____ 5.5.12 Review transfer termination criteria:

- IF the BAST being transferred is in service to a Unit in Mode 1-4, THEN level should be maintained above 71% to prevent entry into the Action Statement of TRM 3.1.1.
- IF the BAST being transferred is in service to a Unit in Mode 5 or 6, THEN level should be maintained above 5% to prevent entry into the Action Statement of TRM 3.1.2.

NOTE: Transfer will be expedited if the Gas Stripper Discharge Pumps are not running during the transfer.

5.5.13 Start transfer using blender as follows:

_____ a. Place BLENDER MODE selector switch in MANUAL.

_____ b. Place the BLENDER CONTROL switch in START.

_____ c. Place control switch for 1-CH-FCV-1113A (2-CH-FCV-2113A), Boric Acid To Blender, in AUTO.

_____ d. Place control switch for 1-CH-FCV-1114A (2-CH-FCV-2114A), Primary Wtr To Blender Flow, in AUTO.

e. Monitor Boric Acid and PG flow on the recorder or on PCS and adjust as necessary:

_____ • Boric Acid, using 1-CH-FC-1113A (2-CH-FC-2113A), Boric Acid To Blender Flow

_____ • PG, using 1-CH-FC-1114A (2-CH-FC-2114A), Primary Wtr To Blender Flow

NOTE: IF the blend must be terminated, THEN transition should be made to Step 5.5.14.

_____ 5.5.14 Monitor BAST level and BRT level during transfer.

NOTE: The purpose of the following Step is to ensure the RP IX and piping are of a Boron Concentration that will not adversely affect RWST operability once the transfer has been completed.

5.5.15 WHEN BAST level is approximately one percent higher than desired, THEN adjust Blender concentration for approximately 2100 ppm as follows:

_____ a. Using the Station Curves, determine the flow rates for Boric Acid and PG to establish a Boron Concentration of approximately 2100 ppm.

NOTE: Integrator operation for 1-CH-DCC-1113, Boric Acid and PG Digital Controller, is provided in the Attachment of 1-OP-8.3, Boron Concentration Control.

b. IF Unit 1 Blender will be used, THEN adjust the integrator on 1-CH-DCC-1113, Boric Acid and PG Digital Controller, as follows:

- IF automatic integrator make-up termination is desired, THEN Set AND Enable [RUN] the following applicable integrator setpoint (SP) values to the required quantity to be added:

_____ •• Boric Acid

_____ •• PG Water

- IF automatic integrator make-up termination is NOT desired, THEN ensure the following applicable integrator setpoint (SP) values are Set AND Enabled [RUN] above the required quantity to be added:

_____ •• Boric Acid (maximum 3000)

_____ •• PG Water (maximum 30,000)

NOTE: Integrator operation for 2-CH-DCC-2113, Boric Acid and PG Digital Controller, is provided in the Attachment of 2-OP-8.3, Boron Concentration Control.

c. IF Unit 2 Blender will be used, THEN adjust the integrator on 2-CH-DCC-2113, Boric Acid and PG Digital Controller, as follows:

- IF automatic integrator make-up termination is desired, THEN Set AND Enable [RUN] the following applicable integrator setpoint (SP) values to the required quantity to be added:

_____ •• Boric Acid

_____ •• PG Water

- IF automatic integrator make-up termination is NOT desired, THEN ensure the following applicable integrator setpoint (SP) values are Set AND Enabled [RUN] above the required quantity to be added:

_____ •• Boric Acid (maximum 3000)

_____ •• PG Water (maximum 30,000)

_____ d. Monitor Boric Acid and PG flow on the recorder or PCS and adjust as necessary:

_____ • Boric Acid, using 1-CH-FC-1113A (2-CH-FC-2113A), Boric Acid To Blender Flow

_____ • PG, using 1-CH-FC-1114A (2-CH-FC-2114A), Primary Wtr To Blender Flow

5.5.16 WHEN BAST reaches desired level OR the desired amount of Boric Acid has been transferred, THEN secure blend as follows:

_____ a. Place the BLENDER CONTROL switch in STOP.

_____ b. Place control switch for 1-CH-FCV-1113A (2-CH-FCV-2113A), Boric Acid To Blender, in CLOSE.

_____ c. Place control switch for 1-CH-FCV-1114A (2-CH-FCV-2114A), Primary Wtr To Blender Flow, in CLOSE.

d. IF Unit 1 Blender was used, THEN do the following valve alignment:

_____ _____ 1. IF in Modes 3, 4, 5, or 6, THEN within 15 minutes of completing makeup, close AND lock 1-CH-217, PG Supply To Boric Acid Blender Isolation Valve.

_____ _____ 2. Close 1-CH-232, Spent Fuel Pit Boric Acid Makeup Isol Valve

_____ _____ 3. Close 1-CH-230, Boric Acid Blender To RWST And Fuel Pit Isol Vv

e. IF Unit 2 Blender was used, THEN do the following valve alignment:

_____ _____ 1. IF in Modes 3, 4, 5, or 6, THEN within 15 minutes of completing makeup, close AND lock 2-CH-140, PG Supply To Boric Acid Blender Isolation Valve.

_____ _____ 2. Close 2-CH-147, Spent Fuel Pit Boric Acid Makeup Isol Valve

_____ _____ 3. Close 2-CH-145, Boric Acid Blender To RWST And Fuel Pit Isol Vv

5.5.17 Return affected Blender to AUTO or condition requested by the Unit SRO. To return to AUTO, do the following:

a. Place the following valves in AUTO:

_____ • 1-CH-FCV-1113B (2-CH-FCV-2113B), Blender Makeup To Chg Pp Suction

_____ • 1-CH-FCV-1114B (2-CH-FCV-2114B), Blender Makeup To VCT

_____ • 1-CH-FCV-1113A (2-CH-FCV-2113A), Boric Acid To Blender

NOTE: Integrator operation for 1-CH-DCC-1113, Boric Acid and PG Digital Controller, is provided in the Attachment of 1-OP-8.3, Boron Concentration Control.

b. IF Unit 1 Blender was used, THEN ensure the following 1-CH-DCC-1113, Boric Acid and PG Digital Controller, integrator setpoint (SP) values are Set sufficiently high AND Enabled [RUN] to prevent stopping non-automatic make-up operations:

_____ • Boric Acid (maximum 3000)

_____ • PG Water (maximum 30,000)

NOTE: Integrator operation for 2-CH-DCC-2113, Boric Acid and PG Digital Controller, is provided in the Attachment of 2-OP-8.3, Boron Concentration Control.

c. IF Unit 2 Blender was used, THEN ensure the following 2-CH-DCC-2113, Boric Acid and PG Digital Controller, integrator setpoint (SP) values are Set sufficiently high AND Enabled [RUN] to prevent stopping non-automatic make-up operations:

_____ • Boric Acid (maximum 3000)

_____ • PG Water (maximum 30,000)

_____ d. Ensure that the switch for the on-service Boric Acid Transfer Pump is in AUTO.

_____ _____ e. Ensure the Blender Controller is returned to the As-Found settings recorded in Step 5.5.9.c.1 or 5.5.9.d.1.

_____ f. Perform Manual Makeup using 1(2)-OP-8.3, Boron Concentration Control for sufficient time period to adjust flow in Step 5.5.17.g.

g. Monitor Boric Acid and PG flow on the recorder or PCS and adjust as necessary:

_____ • Boric Acid, using 1-CH-FC-1113A (2-CH-FC-2113A), BORIC ACID TO BLENDER FLOW

_____ • PG, using 1-CH-FC-1114A (2-CH-FC-2114A), PRIMARY WTR TO BLENDER FLOW

_____ h. If desired, place Blender in Auto Makeup Mode using 1(2)-OP-8.3, Boron Concentration Control.

5.5.18 Close applicable valve for in-service Cesium Removal IX:

_____ _____ • 1-LW-518, 1-BR-I-1A Top Flushing Water Isolation Valve

_____ _____ • 1-LW-523, 1-BR-I-1B Top Flushing Water Isol Valve

_____ _____ 5.5.19 Close 1-RP-70, 1-RP-I-1 Top Flushing Water Isol Valve

_____ 5.5.20 Open 1-LW-493, Flush Water Supply Header Isolation Valve.

5.5.21 Return RP lineup to normal secured condition as follows:

_____ _____ • Close 1-RP-80, Refuel Prfch Filters to Spent Fuel Pit Isol Vv.

_____ _____ • Close 1-RP-77, 1B Refueling Purification Filter Outlet Isol Valve. (outside Nonregenerative HX cubicle)

_____ _____ • Open 1-RP-65, 1B Refueling Purification Filter Outlet Isol Valve.

_____ _____ • Open 1-RP-74, Refuel Prfcn Ion Exch To 1A RP Filter Isol Valve.

_____ _____ SV • Open and seal 1-RP-128, Spent Fuel Pit Inlet Isolation Valve, located in the Fuel Bldg Southwest corner of the Spent Fuel Pool under the floor grating. **(Reference 2.4.2)**

_____ 5.5.22 Return the RP System to the status desired by the Unit SRO.

Completed by: _____ Date: _____

(Page 1 of 4)

Attachment 1
Cross Connect Valve Lineup

1. Ensure the following valves are closed:

_____ _____ • 1-LW-500, 3B Deborating Demin Resin Disch Flush Wtr Sply Vv

_____ _____ • 1-CH-37, 3B Deborating Demin Outlet Backflush Isol Vv

_____ _____ • 1-CH-59, Deborating Demins Flush Water Isolation Valve

_____ _____ • 1-CH-54, 3A Deborating Demin Outlet Backflush Isol Vv

_____ _____ • 1-LW-496, 3A Deborating Demin Resin Disch Flush Wtr Sply Vv

_____ _____ • 1-LW-502, 1A Mixed Bed Demin Resin Disch Flush Wtr Sply Isol

_____ _____ • 1-CH-25, 1A Mixed Bed Demin Disch Backflush Isolation Valve

_____ _____ • 1-CH-26, 1A Mixed Bed Demin Flush Water Inlet Isol Valve

_____ _____ • 1-LW-505, 1B Mixed Bed Demin Resin Disch Flush Wtr Sply Isol

_____ _____ • 1-CH-17, 1B Mixed Bed Demin Flush Water Inlet Isol Valve

_____ _____ • 1-CH-16, 1B Mixed Bed Demin Disch Backflush Isolation Valve

_____ _____ • 1-LW-493, Flush Water Supply Header Isolation Valve

_____ _____ • 1-LW-508, 1-RP-I-1 Bottom Flushing Water Isol Valve

_____ _____ • 1-RP-72, RP Ion Exchanger Resin Flush Isolation Valve

(Page 2 of 4)

Attachment 1
Cross Connect Valve Lineup

Ensure the following valves are closed (Cont):

_____ _____ • 1-LW-509, 1-RP-I-1 Flushing Water Isol Vv

_____ _____ • 1-LW-511, 1-RP-I-1 Flushing Water Recirc Isol Valve

_____ _____ • 1-LW-512, Cation Bed Demin Resin Disch Flush Wtr Sply Isol

_____ _____ • 1-CH-7, Cation Bed Demin Disch Backflush Isolation Valve

_____ _____ • 1-CH-8, Cation Bed Demin Flushing Water Supply Isol Valve

_____ _____ • 1-LW-516, 1-BR-I-1A Resin Disch Flushing Water Isol Valve

_____ _____ • 1-LW-518, 1-BR-I-1A Top Flushing Water Isolation Valve

_____ _____ • 1-LW-515, 1-BR-I-1A Bottom Flushing Water Isol Valve

_____ _____ • 1-LW-521, 1-BR-I-1B Resin Disch Flushing Water Isol Valve

_____ _____ • 1-LW-523, 1-BR-I-1B Top Flushing Water Isol Valve

_____ _____ • 1-LW-520, 1-BR-I-1B Bottom Flushing Water Isol Valve

_____ _____ • 1-LW-524, 1-BR-I-1B Flushing Water Recirc Isol Valve

_____ _____ • 1-BR-123, 1B Cesium Removal Ion Exch Outlet Isol Valve

_____ _____ • 2-LW-1, 1A Mixed Bed Demin Resin Disch Flush Wtr Sply Isol

(Page 3 of 4)

Attachment 1
Cross Connect Valve Lineup

Ensure the following valves are closed (Cont):

_____ _____ • 2-CH-3, 1A Mixed Bed Demin Disch Backflush Isolation Valve

_____ _____ • 2-CH-4, 1A Mixed Bed Demin Flush Water Inlet Isol Valve

_____ _____ • 2-CH-13, 1B Mixed Bed Demin Flush Water Inlet Isol Valve

_____ _____ • 2-LW-4, 1B Mixed Bed Demin Resin Disch Flush Wtr Sply Isol

_____ _____ • 2-CH-12, 1B Mixed Bed Demin Disch Backflush Isolation Valve

_____ _____ • 1-LW-527, Liquid Waste Flush Water Supply Header Isol Valve

_____ _____ • 2-LW-7, Cation Bed Demin Resin Disch Flush Wtr Sply Isol

_____ _____ • 2-CH-24, Cation Bed Demin Disch Backflush Isolation Valve

_____ _____ • 2-CH-25, Cation Bed Demin Flushing Water Supply Isol Valve

_____ _____ • 2-LW-10, 3A Deborating Demin Resin Disch Flush Wtr Sply Vv

_____ _____ • 2-CH-37, 3A Deborating Demin Outlet Backflush Isol Vv

_____ _____ • 2-LW-13, 3B Deborating Demin Resin Disch Flush Wtr Sply Vv

_____ _____ • 2-CH-51, 3B Deborating Demin Outlet Backflush Isol Vv

_____ _____ • 2-CH-38, Deborating Demins Flushwater Isolation Valve

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Attachment 1
Cross Connect Valve Lineup

Ensure the following valves are closed (Cont):

_____ _____ • 1-LW-525, Flush Water Supply To West Resin Disch Hdr

Facility: North Anna Power Station Scenario No.: (2014) NRC-3 Op-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 in.
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 the crew has transitioned out of 1-FR-H.1
			(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

DOMINION

NORTH ANNA POWER STATION

INITIAL LICENSED OPERATOR EXAMINATION

SIMULATOR EXAMINATION GUIDE
SCENARIO 2014 NRC 3

EVENT	DESCRIPTION
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 in. 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	**3**	

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 as been cleared to increase power to 100%. 1-FW-P-2 (terry 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 there 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 reseat. 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 reseat 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. The scenario can be terminated once the crew has transitioned out of FR-H.1.

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 (terry 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) • 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) • Reactor power increases • Turbine power increases • Tavg/Tref increase • Generator megawatts increase		
	BOP ramps down to get off limiter.	Attachment 9 to 1-OP-2.1 attached. Step 6.
	BOP adjusts limiter up.	Step 7
	BOP verifies/sets desired ramp rate (0.3% per minute).	Step 1
	BOP increases turbine setter to desired position.	Step 3
	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.	GOPs attached
	RO monitors control rods.	AFD
	NOTE: The next event can occur once enough of a power increase has been observed, or as directed by the lead examiner.	**Validation time: 28 minutes to ramp about 10%.** **Make sure all 4 NIs are >51%.**

EVENT 3/3a: Given that the unit is 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) • 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.	
IOA	BOP stops power increase by holding the ramp.	
IOA	RO verifies N-44 not failed. (NO) RO places control rods in MANUAL.	
IOA	BOP verifies MFRV bypass valves in MANUAL.	
	NOTE: The RO will stop the dilution.	
	Crew verifies the other three power-range instruments operable.	
	Crew verifies unit in mode 1.	
	Crew checks reactor trip interlocks: • 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.	
	BOP defeats N-44 • BOP selects N44 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**

EVENT 3/3a: Given that the unit is 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
	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 Function 2a/2b (Power range neuron flux high/low) Conditions D Function 3a/3b (Flux rate high positive/high negative) Condition E Conditions D Channel in trip within 72 hours and ≤ 75% power Condition E Channel in trip within 72 hours. (Done by AP) (Functions 18b (P-7),c (P-8),d (P-10) 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 examiner.	**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) • 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 IOA	**BOP starts all available air compressors.** **Crew starts IA/SA compressors by placing them in HAND**.	***Prior to reaching the (manual reactor) trip set point of 70 PSIG.**
	*BOP checks IA pressure <70 psig. (NO)	
	US directs BOP to continue monitoring IA pressure.	RNO
	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.	
	BOP closes 1-IA-TV-102A to isolate IA to containment.	This will isolate the containment IA header. The relief valve will reseat.
	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.	
	Crew checks RCPs running.	

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 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 examiner.	**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) • 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, or as determined by the lead examiner.	**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) • 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. TR 7.5 Condition A for MRule Defense In Depth Risk Management Actions (72 hours) and Mrule fire zones U1/U2 ESGR, U1&/2 Cable vault and tunnel and the Aux buildg.(14 days) and return to functional within 30 days.	

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
	NOTE: The next event can occur once the CC system has been returned to normal, or at the discretion of the lead examiner.	**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) • 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.	
IOA	RO/BOP trip the reactor. • RO checks reactor trip and bypass breakers are open • RO checks rod bottom lights lit • RO checks neutron flux decreasing	
CT3 IOA	**Crew manually trips the turbine by performing the following:** • 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.** RNO
IOA	RO verifies power to AC emergency busses.	
	NOTE: If SI actuates, crew will continue in 1-E-0 while securing secondary equipment.	

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
IOA	Crew verifies that safety injection has not occurred and is not required. • 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 (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.	
	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) • 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.	
	*Crew checks bleed and feed is required. (NO) • Any 2 SG WR levels < 14%[24%]	
	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.	

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
	Crew tries to establish AFW flow. • Crew checks SG blowdown and sample isolation valves closed • Crew reviews control room indications to determine cause of AFW failure • Crew starts at least one AFW pump from the control room • Crew checks AFW flow to SGs > 340 gpm (NO)	
	NOTE: Crew may place 1-FW-P-3B in PTL. AMSAC will have to be reset first.	
CT4	**Crew stops reactor coolant pumps.**	***Prior to being required to initiate RCS bleed and feed.**
	RO places both spray valves in manual and closes them.	
	Crew dispatches an operator to locally restore or realign AFW using 1-AP-22 series.	
	Crew attempts to establish main feed flow to the SGs. (NO) • Crew verifies one condensate pump is running or starts one (NO) • Crew proceeds to step 14.	
	BOP checks SG wide range levels in 2/3 SGs less the 14%. (NO)	
	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).

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
	NOTE: The scenario can be terminated once the crew has transitioned out of FR-H.1, or as directed by the lead examiner.	**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_Defeat = 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, or at the direction of the lead evaluator.	
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	
The next event can occur once enough of a power increase has been observed, or as directed by the lead examiner. **Discussion that this can happen once both A-C7 and A-C8 have been cleared. All 4 PR NIs > 51%.**	
COMMUNICATIONS	
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.	

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 restores control rods to AUTO, or as directed by the lead examiner.**	
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 to162 steps on D.

EVENT 4	Loss of Instrument Air

MALFUNCTIONS/OVERRIDES

Malfunctions:
CA0402, Delay time = 5, Ramp = 60, Severity =20, Trigger = 4
CA02, Delay time = 5, Ramp = 60, Severity = 100, Trigger = 4

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.

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

(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

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.

The next event can occur after the crew returns air pressure to normal, or as directed by the lead examiner.

COMMUNICATIONS

Operators dispatched to investigate loss of IA will report that nothing abnormal was noted**.**

If asked to restore IA to containment using 1-IA-304, this is available on ExtremeView.

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, or as directed by the lead examiner.**	
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	
Malfunction: CC0201, Delay time = 5, Trigger = 6 **The next event can occur once the CC system has been returned to normal, or as directed by the lead examiner.**	
COMMUNICATIONS	
When sent to look at CC pump breaker (15H13), wait 3 minutes and report that it has an instantaneous overcurrent drop. **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. **When asked to check CC heat exchanger delta Ps**, they are unchanged from when you took logs (4 psid)	

EVENT 7/8	Loss of MFW, reactor trip

MALFUNCTIONS/OVERRIDES

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.)

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

Event 8, failure of turbine to trip automatically or manually, is pre-loaded.

The following will trip the terry turbine when flux has decreased to 10%. Verify that the pump trips before a heat sink is established.
Remote function:
MSTV115 = 0, Delay time = 60, Trigger =11 (RX23)

The following will cause a leak on AFW to "C" SG in the MSVH:
Malfunction:
FW1403, Delay time = 30, Ramp = 30, Severity = 100, Trigger = 7

Event 9 is pre-loaded on trigger 7 and will occur after 3 minutes.

COMMUNICATIONS

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.

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.

The operator dispatched to reset the overspeed trip valve will report that the throttle valve linkage is broken. Mechanics have been notified.

EVENT 8	Loss of heat sink
MALFUNCTIONS/OVERRIDES	
Malfunction: FW1103, Delay time =180, Ramp = 300, Severity = 80, Trigger = 7 **When crew has returned to step 1 of FR-H.1 and ready to return TT to service:** MSTV115 = 100, Ramp = 30 **The scenario can be terminated once the crew has transitioned out of FR-H.1, or as directed by the lead examiner.**	
COMMUNICATIONS	
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. **If sent: Mechanics think it probably has a cracked impeller.** **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. **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. **The operator dispatched to reset the overspeed trip valve** will report that the throttle valve linkage is broken. Mechanics have been contacted. When TT trip valve has been repaired: **Report that linkage is repaired and the valve has been reset.**	

ATTACHMENT 3

SCENARIO PERFORMANCE OBJECTIVES

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 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:

N/A

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 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

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:
!-FW-P-2 (terry 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

Please prebrief the charging pump swap and the unit ramp.

The RO has been designated to place 1-CH-P-1B in service and place 1-CH-P-1A in Auto.

Mike Brophy has a copy of 1-OP-8.9 and is available for the pump swap evolution. He has already done an initial look at 1-CH-P-1B and it has no obvious problems.

The purge of 1-CH-P-1B to the VCT was completed last shift

Rods are currently at 160 steps on "D" bank
RCS boron is 1537 ppm
Time in life is 150 MWD/MTU
Tave is currently 562°F
Tref is currently 561°F

The reactor engineer has determined that it will take approximately 3050 gallons of water to reach 100% power, ARO.

*** A Non-Controlled Document ***

Unit 1 OATC

This Sheet updated on: Today

Protected

2H

Power:	49	GV Position	9 %	BLOWDOWNS	
Boron:	1,537 ppm	TURBINE REF:	46.6 1.0% on limiter	CD:	2 GPM
Dilutions:	1-3 7 gal	'A' BAST:	14,043 ppm	SW:	secured
PG/°F Change:	36 Gls.	IN PIPE:	PG	BC:	Secured on U-1
BA/°F Change:	4.4 Gls.	CATION BED:	Secured	S/G:	Hi cap 60/60/60
BLEND RATIO:	8.1 to 1			Aux Stm Supply:	U2 2nd PT

Approximate Outputs	1-RC-PCV-1444J	56 %	1-RC-LCV-1459G	39 %
	1-CH-PCV-1145	80 %	1-CC-TCV-106	27 %

Limiting Actions: *None*

Items Tagged: 2-CC-P-1B

Items OOC:

Annunciators Lit

1-LOG-14:

Problems/OWA:

OD's

OD-555: 1H EDG Mech Stop (Mushroom) Pushbutton may not work to stop 1H EDG

OD-542: AFW Pipe Tunnel Missile Protection

ODM's

ODM-309: B&C RCP seals, < 0.8 seal leakoff (AR 1C-G8), PG < 90°, RCS@175 ppm

MISC

Maintain VCT Pressure < 35 psig per Chemistry request

1-FW-P-2 returned to operable last shift. Previously tagged for work on governor valve.

Open Procedures:

PT's Days:	PT's Nights:
	Normal Nightlies

Reactivity Worksheet

This calculation made on:	**Sunday**	**June 1, 2014**	**14:18:36**
Cycle Data file:	**N1C24**	Cycle Data Updated:	**9/25/2013**

Core Burnup	150.0	MWD/MTU
RCS C_b	1,537	ppm
BAST C_b	14,043	ppm
ITC	-6.3	pcm/°F
PC	-10.9	pcm/%
Boron Coefficient	-5.75	pcm/ppm

PG (blend)	
75	gpm
5.00	pot
Boric Acid (blend)	
9.2	gpm
4.61	pot

(ITEM 1) = ITC/Boron Coefficient = 1.10 **ppm/°F**

(ITEM 2) = PC/Boron Coefficient = 1.90 **ppm/%**

PG needed to raise RCS temperature 1ºF*

50455.4 * ln (RCS C_B/(RCS C_B - ITEM 1)) 36 **gallons of PG**

Boron needed to lower RCS temperature 1ºF

50455.4 * ln ((BAST C_B - RCS C_B) / (BAST C_B – (RCS C_B + ITEM 1)) 4.4 **gallons of acid**

PG needed to raise Reactor Power 1%*

50455.4 * ln (RCS C_B/(RCS C_B - ITEM 2)) 62 **gallons of PG**

Boron needed to lower Reactor Power 1%

50455.4 * ln ((BAST C_B - RCS C_B) / (BAST C_B – (RCS C_B + ITEM 2)) 7.7 **gallons of acid**

BLEND RATIO CALCULATION

(BAST C_B - RCS C_B) / RCS C_B 8.1 **to 1 ratio**

* Denotes Calculations that have been corrected for B-10

RCS Makeup Table

PG		BA		PG		BA		PG		BA	
120	**gpm**	14.7	gpm	**80**	**gpm**	9.8	gpm	**40**	**gpm**	4.9	gpm
8.00	pot	7.37	pot	5.33	pot	4.92	pot	2.67	pot	2.46	pot
PG		BA		PG		BA		PG		BA	
110	**gpm**	13.5	gpm	**70**	**gpm**	8.6	gpm	**30**	**gpm**	3.7	gpm
7.33	pot	6.76	pot	4.67	pot	4.30	pot	2.00	pot	1.84	pot
PG		BA		PG		BA		PG		BA	
100	**gpm**	12.3	gpm	**60**	**gpm**	7.4	gpm	**20**	**gpm**	2.5	gpm
6.67	pot	6.15	pot	4.00	pot	3.69	pot	1.33	pot	1.23	pot
PG		BA		PG		BA		PG		BA	
90	**gpm**	11.1	gpm	**50**	**gpm**	6.1	gpm	**10**	**gpm**	1.2	gpm
6.00	pot	5.53	pot	3.33	pot	3.07	pot	0.67	pot	0.61	pot

Prepared:_____ Reviewed:_____

Dominion	PROCEDURE NO: 1-OP-8.9
NORTH ANNA POWER STATION	REVISION NO: 11
PROCEDURE TYPE: **OPERATING PROCEDURE**	UNIT NO: 1

PROCEDURE TITLE:

TRANSFERRING RUNNING CHARGING PUMPS

					REACT MGT	

REVISION SUMMARY:

Revised the procedure as follows for OP 14-0018 and OP 14-0116:

- Added a Note prior to Step 5.1.3 that 'It is not necessary to wait on sample results prior to continuing. Sample is for trending only.'
- Added new Step 5.1.3.c that If VCT level does not decrease as expected, indicating that the sample line is plugged, terminate the purge and enter a CR.
- Made similar changes for Sections 5.2 and 5.3.
- On cover page special review bar, changed RX MAN to REACT MGT for consistency.

PROBLEMS ENCOUNTERED: ☐ NO ☐ YES **Note:** If YES, note problems in remarks.

REMARKS: _____

(Use back for additional remarks.)

SRO:	DATE:

CONTINUOUS USE

1.0 PURPOSE

To provide instructions for transferring Charging Pumps when the pump to be started is operable. **(References 2.4.1 and 2.4.3)**

The following synopsis is designed as an aid to understanding the procedure, and is not intended to alter or take the place of the actual purpose, instructions, or text of the procedure itself.

To ensure the proper Charging Pump procedure selection, note the following:

- 1-OP-8.1, Chemical and Volume Control System, is used to align the Prestart Auxiliary Equipment for Charging Pumps, starting or transferring Charging Pumps when any RCS T_c is ≤ 280°F (including when on a VCT Float). Necessary breaker manipulations are directed to 0-OP-26.9.
- 1-OP-8.9, Transferring Running Charging Pumps, is used to start and stop Charging Pumps when ALL RCS T_cs are > 280°F and when the Charging Pump being placed in service is already operable.
- 1-MOP-8.01, 8.02, and 8.03 (Charging Pump maintenance procedures), are used to remove/return Charging Pumps A, B, and C (respectively) from service for maintenance.
- 1-PT-14.1, 14.2, and 14.3 (Charging Pump periodic test procedures), are used to test Charging Pumps A, B, and C (respectively) for operability following major maintenance or as scheduled by surveillance test requirements.

This OP is designed to allow the Operator to quickly transfer the Operable Charging Pump to another Charging Pump. It has been accepted that for normal Charging Pump transfers, verification of Service Water, Auxiliary Building Central Area Exhaust System, and Charging Pump MOV alignments are not required. This acceptance is based on operability requirements being already verified in the appropriate MOPs and no Action Statements or Abnormal Status conditions being recorded that could impede operation of the selected Charging Pump (Generic Step _____ of procedure).

2.0 REFERENCES

2.1 Source Documents

2.1.1 UFSAR Section 9.3.4.1, Chemical and Volume Control System, Design Basis

2.2 Technical Specifications

2.2.1 Tech Spec 3.5.2

2.2.2 Tech Spec 3.5.3

2.2.3 TRM 3.1.1

2.3 Technical References

2.3.1 Memo from R. P. Brodie and J. Goerge to CH PP Task Team and Associates, dated 12-02-93, STREAMLINED CH PP TRANSFER PROCEDURE OP-8.9

2.3.2 REA 93-310, DCP 95-226, Charging Pump Interlock Removal

2.3.3 ET N-00-033, Rev. 0, Charging Pump Dilution/Boration

2.3.4 DCP 01-007, Phase 2 PCS Installation and P-250 Removal – Unit 1

2.4 Commitment Documents

2.4.1 OP-163, develop a Charging Pump package for review incorporating all the findings of Charging Pump Task Team.

2.4.2 CTS Assignment 02-94-0500, Commitment 003, Independent Verification of control switch position

2.4.3 CTS Assignment 02-93-2503, Commitment 002, Make CVCS procedures more specific and user friendly

2.4.4 License Amendment 242, Tech Spec Change N-029, Heat Up and Cooldown operating limits, PORV lift setpoints, LTOPS enable temperature

2.4.5 PI S-1998-2462, Boron Concentration in Charging Pump Different from RCS

2.4.6 TRM Change 094, Boration Flow Path

2.4.7 SAA009529; SAR000956: Reactivity Management

2.4.8 CA270886, Revise Procedures to Flush Iron From Charging Pumps

3.0 INITIAL CONDITIONS

_____ 3.1 Review the equipment status to check station configuration supports the performance of this procedure.

_____ 3.2 ALL RCS T_cs are > 280°F.

4.0 PRECAUTIONS AND LIMITATIONS

4.1 Comply with the following guidelines when marking steps N/A:

_____ • IF the conditional requirements of a step do not require the action to be performed, THEN mark the step N/A.

_____ • IF any other step is marked N/A, THEN have the SRO (or designee) approve the N/A and justify the N/A on the Procedure Cover Sheet.

_____ 4.2 This procedure should only be used to transfer Charging Pumps when the pump to be placed in service is already operable, or for transferring power supplies for C Charging Pump when C Charging Pump is available for service. IF breaker racking will be required for A or B Charging Pump starts, THEN 1-OP-8.1 Chemical and Volume Control System, should be used. **(Reference 2.4.1)**

_____ 4.3 The following Charging Pump motor starting limits must be observed:

- Motor cold — 2 consecutive starts
- Motor hot — 1 consecutive start
- Subsequent starts with motor running between starts — 15 minutes apart
- Subsequent starts with motor idle between starts — 60 minutes apart

_____ 4.4 The suction temperature of the Charging Pumps MUST NOT exceed 130°F.

_____ 4.5 One Seal Water Injection Filter MUST be in service at all times.

_____ 4.6 The total normal flow on any one Charging Pump is between 60 and 150 gpm.

_____ 4.7 Before a Charging Pump is started, PCS Group Display should be set on a short interval to trend bearing temperatures.

_____ 4.8 The following Tech Specs/TRM apply:

- Tech Spec 3.5.2
- Tech Spec 3.5.3
- TRM 3.1.1

_____ 4.9 Piping associated with a Charging Pump that has been secured for a significant period of time (60 days) could contain liquid that has a significant difference in Boron Concentration from current RCS Conditions. This difference can be eliminated by flushing the Charging Pump piping with liquid from the VCT. **(Reference 2.4.5)**

_____ 4.10 The following chart will provide guidance to evaluate the impact on reactor power when starting a Charging Pump that has been idle for an extended period of time (60 days) and the boron concentration between the pump and RCS is different. **(Reference 2.4.5)**

Time In Core Life	RCS Boron	CH Pp Boron	% Core Power Change
BOL	1500 ppm	± 240 ppm of RCS	± 0.098%
MOL	800 ppm	± 240 ppm of RCS	± 0.071%
EOL	0 ppm	+ 240 ppm of RCS	- 0.062%
BOL	1500 ppm	2600 ppm	- 0.447%
EOL	0 ppm	2600 ppm	-0.668%

Init Verif

5.0 INSTRUCTIONS

5.1 Transferring To 1-CH-P-1A

CAUTION

This procedure should only be used to transfer Charging Pumps when the pump to be placed in service is already operable. **(Reference 2.4.1)**

CAUTION

The following Charging Pump motor starting limits must be observed:

- Motor cold — two (2) consecutive starts
- Motor hot — one (1) consecutive start
- Subsequent starts with motor running between starts — 15 minutes apart
- Subsequent starts with motor idle between starts — 60 minutes apart

_____ 5.1.1 Check Initial Conditions are satisfied.

_____ 5.1.2 Review Precautions and Limitations.

NOTE: If this procedure is being performed under emergency conditions the following step may be marked N/A.

NOTE: Thirty gallons of water will be flushed through the charging pump casing. VCT level should be sufficiently high to accommodate an approximately 2 percent level decrease.

NOTE: It is not necessary to wait on sample results prior to continuing. Sample is for trending iron content.

5.1.3 Purge 1-CH-P-1A as follows: **(Reference 2.4.8)**

_____ a. Have Chemistry Department perform CH-11.250, Charging Pump Discharge: Sampling By Purging To Gas Stripper.

_____ b. Monitor VCT level for an approximately 2 percent level change.

c. IF VCT level does not decrease as expected, indicating that the sample line is plugged, THEN do the following:

_____ 1. Notify Chemistry Department to terminate sampling purge using CH-11.250, Charging Pump Discharge: Sampling By Purging To Gas Stripper.

_____ 2. Enter a Condition Report.

_____ 5.1.4 Place a PCS Group Display on a short interval to trend charging pump bearing temperatures.

_____ SRO 5.1.5 Have the Unit SRO determine if the boron concentration in 1-CH-P-1A will adversely affect Reactor Power. **(Reference 2.4.5)**

_____ SRO 5.1.6 IF Reactor Power will be adversely affected, THEN take action to minimize affect: **(Reference 2.4.5)**

- Adjust RCS boron to compensate.
- Adjust Reactor Power.
- Purge affected Charging Pump to Sample Sink using 1-MOP-8.01, 1-CH-P-1A, A Charging Pump.

_____ 5.1.7 Check the control switch for 1-CH-P-1A1, A Chg Pump Aux Oil Pump, is in AUTO and the pump is running.

_____ 5.1.8 Start 1-CH-P-1A.

NOTE: Regulating the temperature of the oil out of the oil cooler at less than 128°F will maintain a satisfactory thrust bearing temperature of less than 171°F.

_____ 5.1.9 Check temperature at 1-SW-TI-103A, CHG A LO OUT TEMP, is < 128°F.

5.1.10 Stop the previously running Charging Pump by placing the control switch in AUTO-AFTER-STOP for 1-CH-P-1B or AFTER STOP for 1-CH-P-1C. Mark the remaining pump N/A: **(Reference 2.4.2)**

_____ _____ IV
- 1-CH-P-1B

_____ _____ IV
- 1-CH-P-1C (NORM)

_____ _____ IV
- 1-CH-P-1C (ALT)

_____ 5.1.11 WHEN bearing temperatures have stabilized, THEN return the PCS Group Display to a normal interval.

Completed by: _____ Date: _____

5.2 Transferring To 1-CH-P-1B

CAUTION

This procedure should only be used to transfer Charging Pumps when the pump to be placed in service is already operable. **(Reference 2.4.1)**

CAUTION

The following Charging Pump motor starting limits must be observed:

- Motor cold — two (2) consecutive starts
- Motor hot — one (1) consecutive start
- Subsequent starts with motor running between starts — 15 minutes apart
- Subsequent starts with motor idle between starts — 60 minutes apart

_____ 5.2.1 Check Initial Conditions are satisfied.

_____ 5.2.2 Review Precautions and Limitations.

NOTE: If this procedure is being performed under emergency conditions the following step may be marked N/A.

NOTE: Thirty gallons of water will be flushed through the charging pump casing. VCT level should be sufficiently high to accommodate an approximately 2 percent level decrease.

NOTE: It is not necessary to wait on sample results prior to continuing. Sample is for trending iron content.

5.2.3 Purge 1-CH-P-1B as follows: **(Reference 2.4.8)**

_____ a. Have Chemistry Department perform CH-11.250, Charging Pump Discharge: Sampling By Purging To Gas Stripper.

_____ b. Monitor VCT level for an approximately 2 percent level change.

c. IF VCT level does not decrease as expected, indicating that the sample line is plugged, THEN do the following:

_____ 1. Notify Chemistry Department to terminate sampling purge using CH-11.250, Charging Pump Discharge: Sampling By Purging To Gas Stripper.

_____ 2. Enter a Condition Report.

_____ 5.2.4 Place a PCS Group Display on a short interval to trend charging pump bearing temperatures.

_____ SRO 5.2.5 Have the Unit SRO determine if the boron concentration in 1-CH-P-1B will adversely affect Reactor Power. **(Reference 2.4.5)**

_____ SRO 5.2.6 IF Reactor Power will be adversely affected, THEN take action to minimize affect: **(Reference 2.4.5)**

- Adjust RCS boron to compensate.
- Adjust Reactor Power.
- Purge affected Charging Pump to Sample Sink using 1-MOP-8.02, 1-CH-P-1B, B Charging Pump.

_____ 5.2.7 Check the control switch for 1-CH-P-1B1, B Chg Pump Aux Oil Pump, is in AUTO and the pump is running.

_____ 5.2.8 Start 1-CH-P-1B.

NOTE: Regulating the temperature of the oil out of the oil cooler at less than 128°F will maintain a satisfactory thrust bearing temperature of less than 171°F.

_____ 5.2.9 Check temperature at 1-SW-TI-103B, CHG B LO OUT TEMP, is < 128°F.

5.2.10 Stop the previously running Charging Pump by placing the control switch in AUTO-AFTER-STOP for 1-CH-P-1A or AFTER STOP for 1-CH-P-1C. Mark the remaining pump N/A: **(Reference 2.4.2)**

_____ _____ IV
- 1-CH-P-1A

_____ _____ IV
- 1-CH-P-1C (NORM)

_____ _____ IV
- 1-CH-P-1C (ALT)

_____ 5.2.11 WHEN bearing temperatures have stabilized, THEN return the PCS Group Display to a normal interval.

Completed by: _____ Date: _____

5.3 Transferring To 1-CH-P-1C

CAUTION

This procedure should only be used to transfer Charging Pumps when the pump to be placed in service is already operable, or for transferring power supplies for C Charging Pump when C Charging Pump is available for service.

CAUTION

The following Charging Pump motor starting limits must be observed:

- Motor cold — two (2) consecutive starts
- Motor hot — one (1) consecutive start
- Subsequent starts with motor running between starts — 15 minutes apart
- Subsequent starts with motor idle between starts — 60 minutes apart

_____ 5.3.1 Check Initial Conditions are satisfied.

_____ 5.3.2 Review Precautions and Limitations.

NOTE: If this procedure is being performed under emergency conditions the following step may be marked N/A.

NOTE: Thirty gallons of water will be flushed through the charging pump casing. VCT level should be sufficiently high to accommodate an approximately 2 percent level decrease.

NOTE: It is not necessary to wait on sample results prior to continuing. Sample is for trending iron content.

5.3.3 Purge 1-CH-P-1C as follows: **(Reference 2.4.8)**

_____ a. Have Chemistry Department perform CH-11.250, Charging Pump Discharge: Sampling By Purging To Gas Stripper.

_____ b. Monitor VCT level for an approximately 2 percent level change.

c. IF VCT level does not decrease as expected, indicating that the sample line is plugged, THEN do the following:

_____ 1. Notify Chemistry Department to terminate sampling purge using CH-11.250, Charging Pump Discharge: Sampling By Purging To Gas Stripper.

_____ 2. Enter a Condition Report.

_____ 5.3.4 Place a PCS Group Display on a short interval to trend charging pump bearing temperatures.

_____ SRO 5.3.5 Have the Unit SRO determine if the boron concentration in 1-CH-P-1C will adversely affect Reactor Power. **(Reference 2.4.5)**

_____ SRO 5.3.6 IF Reactor Power will be adversely affected, THEN take action to minimize affect: **(Reference 2.4.5)**

- Adjust RCS boron to compensate.
- Adjust Reactor Power.
- Purge affected Charging Pump to Sample Sink using 1-MOP-8.03, 1-CH-P-1C, C Charging Pump.

_____ 5.3.7 IF 1-CH-P-1C is NOT being supplied by the desired Bus, THEN transfer power supplies using Subsection 5.4.

_____ 5.3.8 Check the control switch for 1-CH-P-1C1, C Chg Pump Aux Oil Pump, is in AUTO and the pump is running.

5.3.9 Start 1-CH-P-1C using appropriate control switch for Bus supplying pump:

_____ • IF H Bus is supplying power, THEN C (NORM).

_____ • IF J Bus is supplying power, THEN C (ALT).

NOTE: Regulating the temperature of the oil out of the oil cooler at less than 128°F will maintain a satisfactory thrust bearing temperature of less than 171°F.

_____ 5.3.10 Check temperature at 1-SW-TI-103C, CHG C LO OUT TEMP, is < 128°F.

5.3.11 Stop the previously running Charging Pump by placing the control switch in AUTO-AFTER-STOP. Mark the remaining pump N/A: **(Reference 2.4.2)**

_____ _____ IV • 1-CH-P-1A

_____ _____ IV • 1-CH-P-1B

_____ 5.3.12 WHEN bearing temperatures have stabilized, THEN return the PCS Group Display to a normal interval.

Completed by: _____ Date: _____

5.4 Transferring Power Supplies for 1-CH-P-1C

CAUTION

This procedure should only be used to transfer Charging Pumps when the pump to be placed in service is already operable, or for transferring power supplies for C Charging Pump when C Charging Pump is available for service.

_____ 5.4.1 Check Initial Conditions are satisfied.

_____ 5.4.2 Review Precautions and Limitations.

_____ 5.4.3 IF 1-CH-P-1C is operating, THEN transfer to 1-CH-P-1A using Subsection 5.1 OR to 1-CH-P-1B using Subsection 5.2.

5.4.4 Ensure both control switches for 1-CH-P-1C are in PULL-TO-LOCK:

_____ • 1-CH-P-1C (NORM)

_____ • 1-CH-P-1C (ALT)

5.4.5 Ensure both breakers for 1-CH-P-1C are racked out to DISCONNECT using 0-OP-26.9 or 0-GOP-26.9, 4160 Volt Breaker Operation:

_____ _____ IV • 1-EE-BKR-15H7

_____ _____ IV • 1-EE-BKR-15J7

5.4.6 Rack in the desired breaker for 1-CH-P-1C to CONN using 0-OP-26.9 or 0-GOP-26.9, 4160 Volt Breaker Operation:

_____ _____ IV • 1-EE-BKR-15H7

_____ _____ IV • 1-EE-BKR-15J7

5.4.7 Place the C Charging Pump control switch in the AFTER - STOP for the breaker racked to CONN. Mark the remaining switch N/A:
(Reference 2.4.2)

_____ _____ IV
- 1-CH-P-1C (NORM)

_____ _____ IV
- 1-CH-P-1C (ALT)

Completed by: _____ Date: _____

Facility: North Anna Power Station Scenario No.: (2014) NRC-4 Op-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
			Event 9 happens during event 8 and is numbered only for use on subsequent forms.
			The scenario can be terminated once safety injection has been terminated in 1-E-3.

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

DOMINION

NORTH ANNA POWER STATION

INITIAL LICENSED OPERATOR EXAMINATION

SIMULATOR EXAMINATION GUIDE
SCENARIO 2014 NRC4

EVENT	DESCRIPTION
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 (4 CTs)
9.	"A" MSTV cannot be closed

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 500 gallons at 3000 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 cooldown and depressurize the RCS and then terminate safety injection. At this time the scenario will 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 Unit 1 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) • 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.	
	NOTE: The crew may set up a blend at the current RCS boron concentration and perform a short blend to flush the blender. This is not required.	

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 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).	
	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 RWST makeup has been completed, or as directed by the lead examiner.	**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) • 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, or as directed by the lead examiner.	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) • 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 IOAs	**Crew stops RCS pressure decrease.** • **RO closes 1-RC-PCV-1455C.** • RO checks master pressure controller controlling properly. (NO) • **RO places master pressure controller to manual and adjusts to stabilize and restore pressure.**	***Prior to receiving an automatic reactor trip on low pressure**
IOA	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 T.S are discussed, or as directed by the lead examiner.	**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) • 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.	
IOA	BOP checks one bearing cooling pump running with normal amps. (NO)	
IOA	BOP starts "B" BC pump.	RNO
	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 ~20 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 examiner.**	**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) • 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.	
	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: • Turn off Unit 1 and Common sump pumps (turbine building) • Place caution tags to direct samples be taken before pumping sumps • Determine is 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 can occur once the crew has made appropriate notifications and requests, or as directed by the lead examiner.	**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 Load Reduction."		
TIME	EXPECTED ACTION	INSTRUCTOR REMARKS
SPD Verified: _____ (Initials) • Annunciator K-G6 reflashes • 1-MS-RI-190 indication increases to 110 gpd • Control rods stop moving in automatic		
	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 ≤ 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 Load Reduction."		
TIME	EXPECTED ACTION	INSTRUCTOR REMARKS
	BOP reduces plant load at 5%/minute or less as follows: • 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 Attachment 4 of 1-AP-2.2
	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.	
	NOTE: After rods have initially stepped in auto, a failure will be put in that stops them from stepping in auto.	
	*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.	

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 Load Reduction."		
TIME	EXPECTED ACTION	INSTRUCTOR REMARKS
	RO monitors steam dumps for proper operation.	
	*RO maintains rod bank lo/lo-lo limit and AFD to keep within limits.	
	US makes required notifications to MOC and evaluates EPIPs 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 can 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) • 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.	
IOA	RO/BOP trip the reactor. • RO checks reactor trip and bypass breakers are open • RO checks rod bottom lights lit • RO checks neutron flux decreasing	
IOA	BOP verifies turbine trip: • Manually trips turbine • Verifies all turbine stop valves closed • Resets reheaters • Verifies MSR FCVs closed • Verifies generator output breaker open.	
IOA	Crew verifies both emergency busses are engerzied.	
IOA	Crew verifies that safety injection has not occurred and is not required. • 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 (NO)	

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
CT2	**Crew isolates affected Reactor Coolant Pump seal leakoff** • 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) • RCS pressure and level decrease unexpectedly • "A" SG WR level increases unexpectedly fast • "A" 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. The BOP will likely be given the attachments. All are included in package.
	NOTE: CAP of 1-E-0, and attachment 4 both contain direction to close and lock 1-CH-217, PG to U-1 blender.	
	Crew verifies SI flow. HHSI cold leg SI flow indicated (YES) RCS pressure < 225 psig (NO)	
	Crew verifies AFW flow. AFW flow to all SGs indicated Total AFW flow > 340 gpm (or level in at least one SG > 11%)	

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
	*RO checks RCS temperatures: • Steam dumps controlling: Stable or trending to 547°F • PORVs controlling: Stable or trending to 551°F. • If temperature not under control:: Stop dumping steam. Adjust AFW flow to maintain >340 gpm until at least one SG > 11% NR. If cooldown continues: close MSTVs. (or NRVs) • If temperature is under control: Adust AFW flow to maintain > 340 GPM until at least one SG > 11% NR.	
	*RO checks PRZR PORVs and spray valves. • PORVs closed • Spray valves responding to control pressure at 2235 psig or demand at zero and closed • At least one PORV block valve open.	
	RO checks RCP trip and charging pump recirc criteria. RCS subcooling < 25°F (NO)	
	BOP checks SGs not faulted. • 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. RCS subcooling < 25°F (NO)	
	BOP identifies ruptured SG as "A". Unexpected increase in any SG NR level.	
	NOTE: Some steps may have been performed by attachment 8 of 1-E-0 or 1-AP-24.	

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
CT3	**Crew isolates flow to/from ruptured SG.** • **BOP adjusts ruptured SG PORV setpoint to 1050 PSIG.** • Check ruptured SG PORV closed. • **RO/BOP direct an 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: • Power available to PORV block valves • PORVs closed • At least one PORV block valve open.	
	*BOP checks intact SG levels: • NR level > 11% • Control AFW flow to maintain NR level between 23 and 50%.	
	RO resets both trains of SI.	
	Crew manually aligns condenser air ejector discharge to containment. • 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.	

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 verifies flow isolated from ruptured SG: • 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: • 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	
	Crew initiates RCS cooldown. • 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.	
	BOP checks ruptured SG pressure stable or increasing.	
	RO checks RCS subcooling > 45°F.	

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 blocks low pressurizer pressure SI: • Pressurizer pressure < 1950 psig • Panel P-G4 LIT (NO) • Place both low PRZR pressure SI block switches to block • Verify Panel P-G4 LIT.	
	NOTE: The following is written assuming the ruptured SG level is off scale high. If not, pressurizer sprays will be used to depressurize instead of a PORV.	
	RO depressurizes RCS to minimize break flow and refill pressurizer. • Places PRZR heaters in PTL • Check ruptured SG NR level on scale (NO) • Check a PRZR PORV is available (YES) • Open one PRZR PORV until one of the following is met: • PRZR level > 69% OR • RCS subcooling < 25°F OR • Both of the following: RCS pressure < ruptured SG pressure AND PRZR level > 21%. • Close PRZR PORV	
	RO checks RCS pressure stable or increasing.	
	RO checks if SI can be terminated: • Secondary heat sink: Total AFW flow to SGs >340 gpm available OR SG NR level in at least one intact SG > 11% • RCS pressure stable or increasing • RCS subcooling > 25°F • PRZR level > 21%.	
	RO stops all but one charging pump and places in PTL.	

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 terminates safety injection:** • Checks 1-SI-MOV-1860A/B closed • Opens 1-CH-MOV-1373 (CHP recirc) • Opens charging pump recircs: 1-CH-MOV-1275A/B/C • **Closes BIT inlet isolation valves (1-SI-MOV-1867A/B)** • **Closes BIT outlet isolation valves (1-SI-MOV-1867C/D**) • Verifies 1-SI-MOV-1836, 1-SI-MOV-1869A/B are closed.	***Prior to water entering the steam header**
	NOTE: The scenario may be terminated after SI has been terminated, or as directed by the lead examiner.	

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

Open 1-CH-230 using trigger 1:
Remote function:
CH_230 = 100, Delay time = 5, Ramp = 30, trigger = 1

Close 1-CH-230 by returning remote function to 0 over 10 seconds.

The next event can occur once the makeup to the RWST is complete.

COMMUNICATIONS

When sent to close 1-CH-232: wait 1 minute and then report that the valve is closed. (Step 5.1.5)

When sent to open 1-CH-233: wait 2-3 minutes and then report that the valve is open. (Step 5.1.7)

When sent to open 1-CH-230: use trigger 1 and wait 1-2 minutes and then report that the valve is open.

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.

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.

EVENT 2	"B" SG Median Select level failure
MALFUNCTIONS/OVERRIDES	
Malfunction: FW3202, Delay time = 5, Ramp = 5, Severity = 20, Trigger = 2 **The next event can occur once "B" SG level has been restored to normal, or as directed by the lead examiner.**	
COMMUNICATIONS	

EVENT 3	PRZR master pressure controller failure
MALFUNCTIONS/OVERRIDES	
Malfunction: RC29, Delay time = 5, Ramp = 5, Severity = 2, Trigger = 3 **The next event will occur once T.S are discussed, or as directed by the lead examiner.**	
COMMUNICATIONS	

EVENT 4	BC pump failure
MALFUNCTIONS/OVERRIDES	
Remote function: BCP1A_PROTECT = TRUE, Delay time = 5, Trigger = 4 **The next event will occur after the crew has started the standby BC pump and stabilized the plant, or as directed by the lead examiner.**	
COMMUNICATIONS	
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. **Note** that the AP now places the tripped pump in PTL which means the discharge MOV is closed. **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. **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. **When sent to look at BC loads:** wait 10 minutes and then report back that all BC loads are operating normally.	

EVENT 5	SGTL
MALFUNCTIONS/OVERRIDES	
Malfunction: RC2401, Delay time = 5, Ramp = 30, Severity = .0036 (55 gpd), Trigger = 5 (alarms in ~2 minutes) **The next event can occur once the crew has made appropriate notifications and requests, or as directed by the lead examiner.**	
COMMUNICATIONS	
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**.** **Communication from HP as per AP-24: Total activity – 4.61 x 10^{-5} μci/ml. Turbine building sumps must be sampled prior to pumping. (This would take at least 30 minutes.)**	

EVENT 6	SGTL worsens
MALFUNCTIONS/OVERRIDES	
Set up trigger 6 on trigger screen as follows: IMF RC2401 .007 60 **Put in Trigger 20 during ramp once control rods have stepped automatically one time.** CNTRL_ROD_AUTO = OFF, Trigger = 20 **The next event can occur once enough of a ramp down has been observed. Includes manual rod insertion for RO.**	
COMMUNICATIONS	
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**.** **Communication from HP as per AP-24: Total activity – 4.61 x 10^{-5} μci/ml. Turbine building sumps must be sampled prior to pumping. (This would take at least 30 minutes.)**	

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

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

Remote function:
MS_18 = 0, Delay time = 60, Ramp = 60, Trigger = 9

Note the "A" SG level is not in the steam line when the depressurization is stopped and again when SI is terminated.

_____ "A" SG level when depressurization stopped

_____ "A" SG level when SI is terminated

The scenario may be terminated after SI has been terminated, or as directed by the lead examiner.

COMMUNICATIONS

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.

If using 1-E-0 attachment: 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.

If using 1-E-3 attachment: 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.

ATTACHMENT 3

SCENARIO PERFORMANCE OBJECTIVES

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 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 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 terminates SI.

Safety Significance:

Failure to terminate SI and control RCS pressure and makeup flow during a SGTR needlessly complicates the mitigation strategy. It also constitutes a "significant reduction of safety margin beyond that irreparably introduced by the scenario."

Cues:

Procedurally directed by E-3

Performance Indicator:

BOP isolates BIT.

Feedback:

Cold leg SI flow indicates zero.

WOG Reference:

Appendix B CT-21

Conditions:

Prior to water entering the steam header.

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 Load Reduction."

SPD Verified: _____ (Initials)

- Annunciator K-G6 reflashes
- 1-MS-RI-190 indication increases to 110 gpd
- Control rods stop moving in automatic

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
- "A" SG WR level increases unexpectedly fast
- "A" MSTV will not close

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.

Prebrief
The OATC (RO) has been designate to perform the RWST makeup.

At this time, please prebrief the RWST makeup.

BARS is not in service
RP is NOT in service to the RWST
BAST boron concentration is 14,043 ppm
AB operator (Mike Brophy) has a copy of the OP and has been briefed.
An extra (Dave Huff) has been designated to be the AB IV'er and has been briefed.

*** A Non-Controlled Document ***

Unit 1 OATC

Protected

2H

This Sheet updated on: Today

Power:	100	GV Position	56 %	BLOWDOWNS	
Boron:	988 ppm	TURBINE REF:	95 1.0% on limiter	CD:	2 GPM
Dilutions:	1-3 50 gal	'A' BAST:	14,043 ppm	SW:	secured
PG/°F Change:	190 Gls.	IN PIPE:	PG	BC:	Secured on U-1
BA/°F Change:	13.8 Gls.	CATION BED:	Secured	S/G:	Hi cap 60/60/60
BLEND RATIO:	13.2 to 1			Aux Stm Supply:	U2 2nd PT

Approximate Outputs	1-RC-PCV-1444J	54 %	1-RC-LCV-1459G	40 %
	1-CH-PCV-1145	77 %	1-CC-TCV-106	25 %

Limiting Actions:	***None***
Items Tagged:	2-CC-P-1B
Items OOC:	
Annunciators Lit	
1-LOG-14:	
Problems/OWA:	
OD's	**OD-555: 1H EDG Mech Stop (Mushroom) Pushbutton may not work to stop 1H EDG**
	OD-542: AFW Pipe Tunnel Missile Protection
ODM's	
	ODM-309: B&C RCP seals, < 0.8 seal leakoff (AR 1C-G8), PG < 90°, RCS@175 ppm
MISC	Maintain VCT Pressure < 35 psig per Chemistry request
	1-FW-P-2 returned to operable last shift. Previously tagged for work on governor valve.
Open Procedures:	

PT's Days:	PT's Nights:
	Normal Nightlies

Reactivity Worksheet

This calculation made on: **Sunday** **June 1, 2014** **14:22:34**
Cycle Data file: **N1C24** Cycle Data Updated: **9/25/2013**

Core Burnup	9,000.0	MWD/MTU
RCS C_b	988	ppm
BAST C_b	14,043	ppm
ITC	-23.6	pcm/°F
PC	-20.7	pcm/%
Boron Coefficient	-6.63	pcm/ppm

PG (blend)	
75	gpm
5.00	pot
Boric Acid (blend)	
5.7	gpm
2.84	pot

(ITEM 1) = ITC/Boron Coefficient = 3.56 **ppm/°F**

(ITEM 2) = PC/Boron Coefficient = 3.12 **ppm/%**

PG needed to raise RCS temperature 1ºF*
50455.4 * ln (RCS C_B/(RCS C_B - ITEM 1)) 190 **gallons of PG**

Boron needed to lower RCS temperature 1ºF
50455.4 * ln ((BAST C_B - RCS C_B) / (BAST C_B – (RCS C_B + ITEM 1)) 13.8 **gallons of acid**

PG needed to raise Reactor Power 1%*
50455.4 * ln (RCS C_B/(RCS C_B - ITEM 2)) 166 **gallons of PG**

Boron needed to lower Reactor Power 1%
50455.4 * ln ((BAST C_B - RCS C_B) / (BAST C_B – (RCS C_B + ITEM 2)) 12.1 **gallons of acid**

BLEND RATIO CALCULATION
(BAST C_B - RCS C_B) / RCS C_B 13.2 **to 1 ratio**

* Denotes Calculations that have been corrected for B-10

RCS Makeup Table

PG		BA		PG		BA		PG		BA	
120	**gpm**	9.1	gpm	**80**	**gpm**	6.1	gpm	**40**	**gpm**	3.0	gpm
8.00	pot	4.54	pot	5.33	pot	3.03	pot	2.67	pot	1.51	pot
PG		BA		PG		BA		PG		BA	
110	**gpm**	8.3	gpm	**70**	**gpm**	5.3	gpm	**30**	**gpm**	2.3	gpm
7.33	pot	4.16	pot	4.67	pot	2.65	pot	2.00	pot	1.14	pot
PG		BA		PG		BA		PG		BA	
100	**gpm**	7.6	gpm	**60**	**gpm**	4.5	gpm	**20**	**gpm**	1.5	gpm
6.67	pot	3.78	pot	4.00	pot	2.27	pot	1.33	pot	0.76	pot
PG		BA		PG		BA		PG		BA	
90	**gpm**	6.8	gpm	**50**	**gpm**	3.8	gpm	**10**	**gpm**	0.8	gpm
6.00	pot	3.41	pot	3.33	pot	1.89	pot	0.67	pot	0.38	pot

Prepared:_____ Reviewed:_____

Dominion	PROCEDURE NO: 1-OP-7.7
NORTH ANNA POWER STATION	REVISION NO: 57
PROCEDURE TYPE: **OPERATING PROCEDURE**	UNIT NO: 1

PROCEDURE TITLE:

REFUELING WATER STORAGE TANK SYSTEM OPERATION

				EOP AP		**LICS**

REVISION SUMMARY:

Incorporated EPAR P1 changing Step 5.1.2 to make specific to Unit 1 only.

Incorporated OP 13-0448 and CA273395, CR532638, Engineering Evaluate Feasibility to Perform Blended Flow Makeup to Unit 1 or Unit 2 RWST while Refueling Purification System is in Service to the Affected RWST.

- Added P&L 4.14, Step 5.1.2 Caution and Step 5.1.6 Note to applicably address: Engineering has determined blended makeup to the RWST may be performed with RP in service to the RWST. The Reverse Osmosis Unit for Silica Reduction (BARS) is secured before the makeup to prevent having two separate volume manipulations occurring simultaneously.
- Modified Step 5.1.2 to make conditional for Reverse Osmosis Unit for Silica Reduction (BARS) is in service on the Unit 1 RWST and Shutdown using 0-OP-16.9.
- Changed Step 5.1.6 to address if RP is in service on the Unit 1 RWST AND securing the RP system is desired
- Added Step 5.1.23 to address if RP was secured on the Unit 1 RWST in Step 5.1.6 AND return to service is desired.
- Added Step 5.1.24 to address if desired to place the Reverse Osmosis Unit for Silica Reduction in service on the Unit 1 RWST, then place the BARS in service using 0-OP-16.9.

PROBLEMS ENCOUNTERED: ☐ NO ☐ YES **Note:** If YES, note problems in remarks.

REMARKS: _____

(Use back for additional remarks.)

SRO:	DATE:

CONTINUOUS USE

TABLE OF CONTENTS

1.0 PURPOSE

1.1 To provide instructions for making up to the No. 1 RWST using the No. 1 blender.

1.2 To provide instructions for placing the RWST in service on the Chilled Water Coolers.

1.3 To provide instructions for removing the RWST from service on the Chilled Water Coolers.

1.4 To provide instructions for placing the RWST Mechanical Refrigeration Units in Service.

1.5 To provide instructions for removing the RWST Mechanical Refrigeration Units from Service.

1.6 To provide instructions for swapping the RWST Recirc Pumps.

The following synopsis is designed as an aid to understanding this procedure and is not intended to alter or take the place of the actual purpose, instructions, or text of the procedure itself.

IF the Unit is in Modes 3 - 6, THEN Tech Spec 3.1.8 and Tech Spec 3.9.2 as applicable, requires the PG isolation valve to the blender to be shut and locked, or four alternative valves to be shut and locked, except during the case of boron dilutions or makeup. Since an RWST makeup is not intended to affect the boron concentration of the RCS, a recent Tech Spec interpretation in the interest of reactivity management is that the four alternative valves are provided to allow for just such a makeup to the RWST, without affecting the RCS boron concentration.

2.0 REFERENCES

2.1 Source Documents

2.1.1 UFSAR, Section 6, Engineered Safety Features

2.1.2 Response Providing Information Regarding Implementation Details for the Phase 2 and 3 Mitigation Strategies dated February 12, 2007 (Serial No. 07-0004) **(Reference 2.4.11)**

2.1.3 Supplemental Response Providing Information Regarding Implementation Details for the Phase 2 and 3 Mitigation Strategies dated May 12, 2007 (Serial No. 07-0004B) **(Reference 2.4.11)**

2.2 **Technical Specifications**

2.2.1 Tech Spec 3.1.8

2.2.2 Tech Spec 3.3.3

2.2.3 Tech Spec 3.5.2

2.2.4 Tech Spec 3.5.3

2.2.5 Tech Spec 3.5.4

2.2.6 Tech Spec 3.9.2

2.2.7 TRM 3.1.1

2.2.8 TRM 3.1.2

2.2.9 TRM 3.10.1

2.3 **Technical References**

2.3.1 NCRODP-52, Safety Injection System

2.3.2 NCRODP-53, Quench Spray System

2.3.3 Operating Procedures:

- 0-OP-16.1, Spent Fuel Pit Cooling and Purification System
- 1-OP-51.2, Chilled Water System: Steam Chiller Operation
- 0-OP-51.5, Operation Of The Chilled Water Systems: Mechanical Chiller

2.3.4 This procedure is referenced by the following Emergency Procedures:

- 1-ECA-1.1, Loss of Emergency Coolant Recirculation
- 1-ECA-3.2, SGTR with Loss of Reactor Coolant-Saturated Recovery Desired

2.3.5 Flow Diagrams:

- 11715-FM-88A, Fuel Pit and Refueling Purification
- 11715-FM-91A, Quench and Recirc Spray
- 11715-FM-94A, Residual Heat Removal System
- 11715-FM-95B, Chemical and Volume Control System
- 11715-FM-96A, Safety Injection System
- 11715-FM-96B, Safety Injection System
- 12050-FM-95B, Chemical and Volume Control System

2.3.6 VPAP-2103N, Offsite Dose Calculation Manual (North Anna)

2.3.7 STD-GN-0008, Equipment Mark Numbers

2.3.8 Memo from James Breeden to Count Room Technicians dated 02-19-91, verified still applicable on 05-04-95

2.3.9 Fax Message from Michael Holtz, Joseph Oat Corporation, to Ed Wells, VEPCO, dated 07/09/97, Refueling Water Storage Tank Coolers (Rev 32)

2.3.10 DCP 03-160, Boric Acid and PG Water Flow to Blender Integrator Modification/NAPS/Unit 2

2.3.11 DCP 03-159, Boric Acid and PG Water Flow to Blender Integrator Modification / NAPS / Unit 1

2.3.12 Temporary Modification N1-2004-1749

2.3.13 DCP 04-116, Replacement of RWST Refrigeration Units / NAPS / Unit 1

2.3.14 VTM 59-Y058-00009, RWST Refrigeration Units, Air Cooled Liquid Chillers Hermetic Scroll, York

2.3.15 DCP 08-100, Modification of RWST Chiller Controls

2.3.16 DC NA-12-00019, Reverse Osmosis Unit for Silica Reduction

2.4 **Commitment Documents**

2.4.1 CTS Assignment 02-91-1800 Commitment 001, Technical Specification Change Number 244

2.4.2 CTS Assignment 02-90-18-11, Commitment 005, Technical Specification Change Number 114

2.4.3 Engineering Transmittal CE 96-014, Rev. 0, Mode 5 & 6 Compensatory Measures Recommended for Problem Reported in DR N-96-0278 (see Rev 29)

2.4.4 CTS Assignment 02-96-2169 Commitment 002, Compensatory Actions Required for Operation of the RP System During a Seismic Event (see Rev 30)

2.4.5 DR N-97-1608, Ops procedures for aligning Chilled Water to the RWST coolers do not contain maximum Chilled Water flow criteria

2.4.6 ET SE 99-044, Rev 0, Revision to the Compensatory Actions Required by CTS Assignment 02-96-2169 Commitment 002 for Operation of the Refueling Purification (RP) System During a Seismic Event, NAPS Units 1 and 2.

2.4.7 Plant Issue N-2003-0800, Grating Slipped from Hand and Hit Operator

2.4.8 Plant Issue N-2003-3417, Failure to Notify Health Physics Count Room prior to RWST Make-up

2.4.9 Plant Issue N-2006-1335-E1, To maintain normal flow through the RWST recirculation pumps with reduced RWST inventory, the low return flow path is opened when the low suction flow path is open

2.4.10 CA008653, Unit 2 Containment Refueling Cavity Clarity is Poor Following Placing Reactor Purification (RP) System in Operation on the Cavity

2.4.11 LA000528, Revise 0-AP-48, 1/2-FR-H.1 and 1/2-OP-7.7 as identified in ID#2 (The procedure fulfills the commitment to refill the RWST for long term makeup to the RCS.)

2.4.12 CA181833, CR397144, Procedures to Suspend Procedures Relating to NRC Question on RP System Alignment to the RWST

2.4.13 CA273395, CR532638, Engineering Evaluate Feasibility to Perform Blended Flow Makeup to Unit 1 or Unit 2 RWST while Refueling Purification System is in Service to the Affected RWST

Init **Verif**

3.0 INITIAL CONDITIONS

None

4.0 PRECAUTIONS AND LIMITATIONS

4.1 Comply with the following guidelines when marking steps N/A:

_____ • IF the conditional requirements of a step do not require the action to be performed, THEN mark the step N/A.

_____ • IF any other step is marked N/A, THEN have the SRO (or designee) approve the N/A and justify the N/A on the Procedure Cover Sheet.

_____ 4.2 VPAP-2103N: A minimum of one RWST level indicator shall be operable and must be Channel Checked at least daily during additions to tank.

_____ 4.3 Monitor RWST level to avoid tank overflow.

_____ 4.4 IF the Blender is needed for normal boric acid control for CVCS, THEN do NOT use the Blender for RWST makeup.

_____ 4.5 Prior to makeup to the RWST, HP should be notified so they can obtain an air sample at the RWST vent if required. (Cubic feet displaced = Number of gallons makeup x 0.13368) **(Reference 2.3.8)**

_____ 4.6 A large volume RWST makeup from the Blender will add a significant amount of heat to the RWST. To prevent RWST high temperature concerns when in Modes 1 - 4, makeups should be terminated prior to reaching 50°F at the RWST Tank Temp Top, 1-QS-TI-100A. Makeup to RWST at slower rates will result in slower heatup of the RWST.

_____ 4.7 Since portions of the RP system are not seismically qualified, the potential for loss of RWST or Reactor Cavity inventory exists from a seismic event. Therefore, making up to the No. 1 RWST using the No. 2 blender and making up to the No. 1 RWST using the Spent Fuel Pit is prohibited. **(Reference 2.4.12)**

4.8 The following Tech Specs apply:

_____ • Tech Spec 3.1.8, Primary Grade Water Flow Path Isolation Valves

_____ • Tech Spec 3.3.3, Post Accident Monitoring (PAM) Instrumentation

_____ • Tech Spec 3.5.2, ECCS — Operating

_____ • Tech Spec 3.5.3, ECCS — Shutdown

_____ • Tech Spec 3.5.4, Refueling Water Storage Tank (RWST)

_____ • Tech Spec 3.9.2, Primary Grade Water Flow Path Isolation Valves — Mode 6

_____ • TRM 3.1.1, Boron Flow Paths — Operating

_____ • TRM 3.1.2, Boron Flow Paths — Shutdown

_____ • TRM 3.10.1, Liquid Holdup Tanks

_____ 4.9 Each RWST Cooler has a shell side design flowrate of 600 gpm. Chilled Water flow should NOT exceed this value. **(Reference 2.4.5)**

_____ 4.10 For 1-QS-MR-1A, Refueling Water Refrigeration Unit, and 1-QS-MR-1B, Refueling Water Refrigeration Unit, IF power has been OFF more than 2 hours, THEN the compressor heaters must be energized for a minimum of 24 hours prior to starting a compressor. This is to ensure that the oil is hot enough to drive the refrigerant out of solution.

_____ 4.11 It is desired to minimize the time 1-QS-40, RWST Low Header To Refuel Wtr Recirc Pps Isol Valve, is open in Modes 1-4 to minimize the possibility of losing RWST level through a break in the piping downstream of 1-QS-40. This piping was reclassified NSQ by DCP 04-116.

_____ 4.12 Information related to the York Control Center Display is available on Attachment 2, York Control Center Display Information.

_____ 4.13 If 1-QS-40, RWST Low Header To Refuel Wtr Recirc Pps Isol Valve, is opened, then 1-QS-60, RWST Coolers To RWST Low Header Isol Valve, should be opened. This will prevent unnecessary wear to 1-QS-P-2A, Refueling Water Storage Tk Recirc Pump, and 1-QS-P-2B, Refueling Water Storage Tk Recirc Pump. **(Reference 2.4.9)**

_____ 4.14 Engineering has determined blended makeup to the RWST may be performed with RP in service to the RWST. The Reverse Osmosis Unit for Silica Reduction (BARS) is secured before the makeup to prevent having two separate volume manipulations occurring simultaneously. **(Reference 2.4.13)**

5.0 INSTRUCTIONS

5.1 Makeup To The No. 1 RWST From The No. 1 Blender

_____ 5.1.1 Review Precautions and Limitations.

CAUTION

The Reverse Osmosis Unit for Silica Reduction (BARS) is secured before the makeup to prevent having two separate volume manipulations occurring simultaneously. **(Reference 2.4.13)**

_____ 5.1.2 IF the Reverse Osmosis Unit for Silica Reduction (BARS) is in service on the Unit 1 RWST, THEN shutdown the BARS System in accordance with 0-OP-16.9, Operation of the Reverse Osmosis Unit for Silica Reduction.

_____ 5.1.3 Inform HP of makeup to the RWST and the anticipated volume addition. **(Reference 2.3.8)**

_____ 5.1.4 Check the Blender will be needed only for the RWST makeup.

_____ 5.1.5 Close 1-CH-232, Spent Fuel Pit Boric Acid Makeup Isol Valve (by NRHX Cube).

NOTE: Engineering has determined blended makeup to the RWST may be performed with RP in service to the RWST. **(Reference 2.4.13)**

5.1.6 IF RP is in service on the Unit 1 RWST AND securing the RP system is desired, THEN do the following:

_____ a. Secure RP in accordance with the applicable procedure.

_____ _____ IV b. Ensure 1-RP-24, Refuel Purification Fltrs To Unit 1 RWST Isol Valve, located in the Unit 1 Penetration Area, is closed.

_____ 5.1.7 Open 1-CH-233, Boric Acid Blender To RWST High Hdr Isol Valve, located in the Unit 1 Penetration Area.

5.1.8 Have the OATC do the following:

_____ a. Record the As-Found Blender Controller settings below:

Controller	Name	Auto / Manual (circle one)	Controller Output	Pot Setting
1-CH-FC-1113A	Boric Acid To Blender Flow Controller	Auto / Manual	_____%	_____
1-CH-FC-1114A	Primary Water To Blender Flow Controller	Auto / Manual	_____%	_____
1-CH-HFC-1114	Primary Water To Blender Flow Controller (Half Station)		_____%	

_____ b. Place the BLENDER CONTROL switch in STOP.

c. Close the following valves:

_____ _____ IV • 1-CH-FCV-1113A, BORIC ACID TO BLENDER VALVE

_____ _____ IV • 1-CH-FCV-1113B, BLENDER MAKEUP TO CHG PP SUCTION HDR

_____ _____ IV • 1-CH-FCV-1114B, BLENDER MAKEUP TO VCT

_____ d. Have a second qualified person independently verify that the valves in Substep 5.1.8.c are closed.

_____ e. Determine required flow for desired concentration of the blend using the latest boron sample of the BAST and RWST.

NOTE: Integrator operation for 1-CH-DCC-1113, Boric Acid and PG Digital Controller, is provided in the Attachment of 1-OP-8.3, Boron Concentration Control.

f. Adjust the integrator on 1-CH-DCC-1113, Boric Acid and PG Digital Controller, as follows:

- IF automatic integrator make-up termination is desired, THEN Set AND Enable [RUN] the following applicable integrator setpoint (SP) values to the required quantity to be added:

_____ •• Boric Acid

_____ •• PG Water

- IF automatic integrator make-up termination is NOT desired, THEN ensure the following applicable integrator setpoint (SP) values are Set AND Enabled [RUN] above the required quantity to be added:

_____ •• Boric Acid (maximum 3000)

_____ •• PG Water (maximum 30,000)

5.1.9 IF Unit 1 is in Modes 3 - 6, THEN do the following in accordance with Tech Spec 3.1.8 or Tech Spec 3.9.2 as applicable:

_____ a. Ensure chemical addition to Unit 1 RCS is not in progress.

b. Close and lock the following valves:

_____ _____ IV 1. 1-CH-220, PG to Charging Pump Suction (near chem mixing tk at blender)

_____ _____ IV 2. 1-CH-241, Manual Emergency Borate Valve (at blender)

c. Close the following valves, and vent the regulators to fail the blender outlet valves closed:

_____ _____ IV 1. 1-IA-755, IA to 1-CH-FCV-1113B, Blender Outlet to Ch Pump Suction

_____ _____ IV 2. 1-IA-704, IA to 1-CH-FCV-1114B, Blender Outlet to Top of VCT

_____ d. Ensure Substeps 5.1.9.b and 5.1.9.c have been independently verified.

_____ e. Unlock AND open 1-CH-217, PG Supply To Boric Acid Blender Isolation Valve.

_____ 5.1.10 At the Unit 1 Blender, open 1-CH-230, Boric Acid Blender To RWST And Fuel Pit Isol Vv.

_____ 5.1.11 Notify the Health Physics Count Room that makeup to the RWST will commence. **(Reference 2.3.8 and 2.4.8)**

NOTE: The RWST should NOT be filled above the high level alarm (98.5 percent). Total Gallons from low level to high level is approximately 8500 gallons.

NOTE: A large volume RWST makeup from the Blender will add a significant amount of heat to the RWST. To prevent RWST high temperature concerns when in Modes 1 - 4, makeups should be terminated prior to reaching 50 °F at the RWST Tank Temp Top, 1-QS-TI-100A. Makeup to RWST at slower rates will result in slower heatup of the RWST.

5.1.12 Have OATC start makeup to the RWST as follows:

_____ a. Place BLENDER MODE switch in MANUAL.

_____ b. Place BLENDER CONTROL switch in START.

_____ c. Place 1-CH-FCV-1113A, BORIC ACID TO BLENDER VALVE in AUTO, or operate in manual as desired.

5.1.13 Have OATC obtain the desired flow rates by adjusting the following controllers:

_____ • 1-CH-FC-1113A, BORIC ACID TO BLENDER FLOW CONTROLLER

_____ • 1-CH-FC-1114A, PRIMARY WATER TO BLENDER FLOW CONTROLLER

5.1.14 Perform CHANNEL CHECK on RWST level indicators as follows: **(Reference 2.3.6)**

a. Record the levels for the following indicators:

_____ • 1-QS-LI-100A: _____%

_____ • 1-QS-LI-100B: _____%

_____ • 1-QS-LI-100C: _____%

_____ • 1-QS-LI-100D: _____%

_____ b. Check level channels agree within 3 percent.

_____ c. Check levels are increasing.

5.1.15 WHEN makeup to the RWST is complete, OR the makeup is stopped, THEN have OATC do the following:

_____ a. Place 1-CH-FCV-1113A, BORIC ACID TO BLENDER VALVE, in CLOSE.

_____ b. Place BLENDER CONTROL switch in STOP.

_____ c. IF continuing the RWST makeup is desired, THEN return to Step 5.1.12.

5.1.16 IF Unit 1 is in Modes 3 - 6, THEN do the following in accordance with Tech Spec 3.1.8 or Tech Spec 3.9.2 as applicable:

_____ _____ a. Close AND lock 1-CH-217, PG Supply To Boric Acid Blender Isolation Valve.
IV

_____ b. Ensure Substep 5.1.16.a has been independently verified.

c. Open the following valves to restore IA to the blender outlet valves:

_____ _____ IV 1. 1-IA-755, IA to 1-CH-FCV-1113B, Blender Outlet to Ch Pump Suction

_____ _____ IV 2. 1-IA-704, IA to 1-CH-FCV-1114B, Blender Outlet to Top of VCT

d. Remove the locks from the following valves:

_____ _____ IV 1. 1-CH-220, PG to Charging Pump Suction (near chem mixing tk at blender)

_____ _____ IV 2. 1-CH-241, Manual Emergency Borate Valve (at blender)

5.1.17 Do the following to prevent Blender flow from entering the Spent Fuel Pit or the RWST:

a. Close the following valves:

_____ _____ IV • 1-CH-233, Boric Acid Blender To RWST High Hdr Isol Valve (Unit 1 Pen Area)

_____ _____ IV • 1-CH-230, Boric Acid Blender To RWST And Fuel Pit Isol Vv (by Unit 1 Blender)

_____ b. Have a second qualified person independently verify that the valves in Substep 5.1.17.a are closed.

5.1.18 IF required, THEN have OATC place the following valves in AUTO:

_____ _____ IV • 1-CH-FCV-1113A, BORIC ACID TO BLENDER VALVE

_____ _____ IV • 1-CH-FCV-1113B, BLENDER MAKEUP TO CHG PP SUCTION HDR

_____ _____ IV • 1-CH-FCV-1114B, BLENDER MAKEUP TO VCT

5.1.19 Do the following to ensure proper Blender settings:

_____ _____ IV

a. Ensure the Blender Controller is returned to the As-Found settings recorded in Step 5.1.8.a.

_____

b. IF desired, THEN perform an RCS make-up to adjust Blender Controller settings in accordance with 1-OP-8.3, Boron Concentration Control.

_____ 5.1.20 IF required, THEN have OATC return the Blender to AUTO in accordance with 1-OP-8.3, Boron Concentration Control.

NOTE: Integrator operation for 1-CH-DCC-1113, Boric Acid and PG Digital Controller, is provided in the Attachment of 1-OP-8.3, Boron Concentration Control.

5.1.21 Ensure the following 1-CH-DCC-1113, Boric Acid and PG Digital Controller, integrator setpoint (SP) values are Set sufficiently high AND Enabled [RUN] to prevent stopping non-automatic make-up operations:

_____ • Boric Acid (maximum 3000)

_____ • PG Water (maximum 30,000)

_____ 5.1.22 Notify Chemistry Department to sample the RWST.

_____ 5.1.23 IF RP was secured on the Unit 1 RWST in Step 5.1.6 AND return to service is desired, THEN return RP to service in accordance with the applicable procedure.

_____ 5.1.24 IF desired to place the Reverse Osmosis Unit for Silica Reduction in service on the Unit 1 RWST, THEN place the BARS in service using 0-OP-16.9, Operation of the Reverse Osmosis Unit for Silica Reduction.

Completed by: _____ Date: _____

5.2 Placing The RWST On The Chilled Water Coolers

NOTE: It is desired to minimize the time 1-QS-40, RWST Low Header To Refuel Wtr Recirc Pps Isol Valve, is open in Modes 1-4 to minimize the possibility of losing RWST level through a break in the piping downstream of 1-QS-40. This piping was reclassified NSQ by DCP 04-116.

_____ 5.2.1 Review Precautions and Limitations.

5.2.2 Align Chilled Water to the desired Chilled Water Cooler as follows:

a. For 1-CD-E-2A, 2A Chilled Wtr Refueling Water Storage Tank Cooler, open the following valves:

_____ • 1-CD-27, 2A RWST Cooler Chilled Water Supply Isol Valve

_____ • 1-CD-35, 2A RWST Cooler Chilled Water Outlet Isol Valve

b. For 1-CD-E-2B, 2B Chilled Wtr Refueling Water Storage Tank Cooler, open the following valves:

_____ • 1-CD-30, 2B RWST Cooler Chilled Water Supply Isol Valve

_____ • 1-CD-40, 2B RWST Cooler Chilled Water Outlet Isol Valve

CAUTION

The maximum design flowrate of each RWST Cooler is 600 gpm. **(Reference 2.4.5)**

5.2.3 Align the Chilled Water System to the coolers using one of the following:

_____ • 1-OP-51.2, Chilled Water System: Steam Chiller Operation

_____ • 0-OP-51.5, Operation Of The Chilled Water Systems: Mechanical Chiller

_____ • 2-OP-51.2, Chilled Water System: Steam Chiller Operation

5.2.4 Ensure that the proper flowpath is aligned to and from the RWST: **(Reference 2.4.9)**

_____ a. Ensure that 1-QS-40, RWST Low Header To Refuel Wtr Recirc Pps Isol Valve, is Open.

_____ b. Ensure that 1-QS-60, RWST Coolers To RWST Low Header Isol Valve, is Open.

5.2.5 Align the RWST to the desired Chilled Water Cooler as follows:

a. For 1-CD-E-2A, 2A Chilled Wtr Refueling Water Storage Tank Cooler, open the following valves:

_____ • 1-QS-58, 2A RWST Cooler Outlet Header Isolation Valve

_____ • 1-QS-48, 2A RWST Cooler Inlet Header Isolation Valve

b. For 1-CD-E-2B, 2B Chilled Wtr Refueling Water Storage Tank Cooler, open the following valves:

_____ • 1-QS-59, 2B RWST Cooler Outlet Header Isolation Valve

_____ • 1-QS-47, 2B RWST Cooler Inlet Header Isolation Valve

5.2.6 Isolate both Mechanical Refrigeration units by closing the following valves:

_____ _____ IV • 1-QS-49, Refuel Wtr Refrigeration Unit 1A Inlet Hdr Isol Vv

_____ _____ IV • 1-QS-52, Refuel Wtr Refrigeration Unit 1A Out Hdr Isol Vv

_____ _____ IV • 1-QS-53, Refuel Wtr Refrigeration Unit 1B Inlet Hdr Isol Vv

_____ _____ IV • 1-QS-56, Refuel Wtr Refrigeration Unit 1B Out Hdr Isol Vv

5.2.7 IF 1-QS-P-2A, Refueling Water Storage Tk Recirc Pump, or 1-QS-P-2B, Refueling Water Storage Tk Recirc Pump, have NOT been ran since the RWST was drained for cavity fill, THEN vent the pump to be started as follows:

a. IF 1-QS-P-2A will be started, THEN do the following:

_____ 1. Open 1-QS-96, 2A Refuel Wtr Recirc Pump Disch Sample Isol Valve

_____ 2. Crack open 1-QS-119, 2A Refuel Wtr Recirc Pump Disch Sample Isol Valve, to vent pump.

_____ 3. WHEN a steady stream of water issues, THEN close 1-QS-119.

_____ 4. Close 1-QS-96.

5. Have a qualified person independently verify the following valves are closed:

_____ IV • 1-QS-96, 2A Refuel Wtr Recirc Pump Disch Sample Isol Valve

_____ IV • 1-QS-119, 2A Refuel Wtr Recirc Pump Disch Sample Isol Valve

b. IF 1-QS-P-2B will be started, THEN do the following:

_____ 1. Open 1-QS-97, 2B Refuel Wtr Recirc Pump Disch Sample Isol Valve

_____ 2. Crack open 1-QS-120, 2B Refuel Wtr Recirc Pump Disch Sample Isol Valve, to vent pump.

_____ 3. WHEN a steady stream of water issues, THEN close 1-QS-120.

_____ 4. Close 1-QS-97.

5. Have a qualified person independently verify the following valves are closed:

_____ IV • 1-QS-97, 2B Refuel Wtr Recirc Pump Disch Sample Isol Valve

_____ IV • 1-QS-120, 2B Refuel Wtr Recirc Pump Disch Sample Isol Valve

5.2.8 Place one of the following pumps in FAST:

_____ • 1-QS-P-2A, Refueling Water Storage Tk Recirc Pump

_____ • 1-QS-P-2B, Refueling Water Storage Tk Recirc Pump

Completed by: _____ Date: _____

5.3 Removing The RWST From The Chilled Water Coolers

_____ 5.3.1 Review Precautions and Limitations.

5.3.2 Stop the following pumps:

_____ • 1-QS-P-2A, Refueling Water Storage Tk Recirc Pump

_____ • 1-QS-P-2B, Refueling Water Storage Tk Recirc Pump

5.3.3 Isolate the RWST from the desired Chilled Water Heat Exchanger as follows:

a. For 1-CD-E-2A, 2A Chilled Wtr Refueling Water Storage Tank Cooler, close the following valves:

_____ _____ IV • 1-QS-58, 2A RWST Cooler Outlet Header Isolation Valve

_____ _____ IV • 1-QS-48, 2A RWST Cooler Inlet Header Isolation Valve

b. For 1-CD-E-2B, 2B Chilled Wtr Refueling Water Storage Tank Cooler, close the following valves:

_____ _____ IV • 1-QS-59, 2B RWST Cooler Outlet Header Isolation Valve

_____ _____ IV • 1-QS-47, 2B RWST Cooler Inlet Header Isolation Valve

_____ _____ IV 5.3.4 Close 1-QS-40, RWST Low Header To Refuel Wtr Recirc Pps Isol Valve.

_____ _____ IV 5.3.5 Close 1-QS-60, RWST Coolers To RWST Low Header Isol Valve.

5.3.6 IF required, THEN remove the Chilled Water System from the coolers using one of the following:

_____ • 1-OP-51.2, Chilled Water System: Steam Chiller Operation

_____ • 0-OP-51.5, Operation Of The Chilled Water Systems: Mechanical Chiller

_____ • 2-OP-51.2, Chilled Water System: Steam Chiller Operation

5.3.7 IF required to isolate the coolers, THEN close the following valves:

_____ • 1-CD-27, 2A RWST Cooler Chilled Water Supply Isol Valve

_____ • 1-CD-35, 2A RWST Cooler Chilled Water Outlet Isol Valve

_____ • 1-CD-30, 2B RWST Cooler Chilled Water Supply Isol Valve

_____ • 1-CD-40, 2B RWST Cooler Chilled Water Outlet Isol Valve

Completed by: _____ Date: _____

5.4 Placing RWST Mechanical Refrigeration Unit In Service OR Swapping Units

_____ 5.4.1 Review Precautions and Limitations.

5.4.2 IF a Refueling Water Refrigeration Unit is in service, THEN stop the unit in service by placing the toggle switch to OFF:

_____ • 1-QS-MR-1A, Refueling Water Refrigeration Unit

_____ • 1-QS-MR-1B, Refueling Water Refrigeration Unit

CAUTION

- For 1-QS-MR-1A, Refueling Water Refrigeration Unit, and 1-QS-MR-1B, Refueling Water Refrigeration Unit, IF power to a refrigeration unit has been OFF more than 2 hours, THEN the compressor heaters must be energized for a minimum of 24 hours prior to starting a compressor. This is to ensure that the oil is hot enough to drive the refrigerant out of solution.
- Do NOT run both chillers at the same time. There is not sufficient recirc flow to run both chillers at once.

5.4.3 Place the desired Mechanical Refrigeration unit in service as follows. Mark steps for the unit NOT started N/A:

a. For 1-QS-MR-1A, Refueling Water Refrigeration Unit, do the following:

1. Open the following valves:

_____ • 1-QS-49, Refuel Wtr Refrigeration Unit 1A Inlet Hdr Isol Vv

_____ • 1-QS-52, Refuel Wtr Refrigeration Unit 1A Out Hdr Isol Vv

2. Ensure the following valves are closed:

_____ _____ IV
- 1-QS-53, Refuel Wtr Refrigeration Unit 1B Inlet Hdr Isol Vv

_____ _____ IV
- 1-QS-56, Refuel Wtr Refrigeration Unit 1B Out Hdr Isol Vv

b. For 1-QS-MR-1B, Refueling Water Refrigeration Unit, do the following:

1. Open the following valves:

_____
- 1-QS-53, Refuel Wtr Refrigeration Unit 1B Inlet Hdr Isol Vv

_____
- 1-QS-56, Refuel Wtr Refrigeration Unit 1B Out Hdr Isol Vv

2. Ensure the following valves are closed:

_____ _____ IV
- 1-QS-49, Refuel Wtr Refrigeration Unit 1A Inlet Hdr Isol Vv

_____ _____ IV
- 1-QS-52, Refuel Wtr Refrigeration Unit 1A Out Hdr Isol Vv

NOTE: It is desired to minimize the time 1-QS-40, RWST Low Header To Refuel Wtr Recirc Pps Isol Valve, is open in Modes 1-4 to minimize the possibility of losing RWST level through a break in the piping downstream of 1-QS-40. This piping was reclassified NSQ by DCP 04-116.

c. IF low suction to Recirc Pumps is required, THEN do the following:

_____ 1. Open 1-QS-40, RWST Low Header To Refuel Wtr Recirc Pps Isol Valve.

_____ 2. Close 1-QS-39, RWST Hi Header To Refuel Wtr Recirc Pps Isol Valve.

d. IF high suction to Recirc Pumps is required, THEN do the following:

_____ 1. Check adequate RWST level to support high suction.

_____ 2. Ensure 1-QS-39, RWST Hi Header To Refuel Wtr Recirc Pps Isol Valve is open.

_____ 3. Ensure 1-QS-40, RWST Low Header To Refuel Wtr Recirc Pps Isol Valve is closed.

NOTE: Refrigeration Unit discharge is always aligned to the upper portion of RWST.

_____ e. IF low suction to recirc pumps is required, THEN open 1-QS-60, RWST Coolers To RWST Low Header Isol Valve, to provide a low discharge path. **(Reference 2.4.9)**

_____ f. IF the low suction is placed in service, THEN enter a Mode 4 info action that the chillers are aligned to the low suction.

5.4.4 IF NOT already running, THEN start one of the following pumps in SLOW:

_____ • 1-QS-P-2A, Refueling Water Storage Tk Recirc Pump

_____ • 1-QS-P-2B, Refueling Water Storage Tk Recirc Pump

5.4.5 Start the desired Mechanical Refrigeration Unit by placing the toggle switch for the chiller to be started to ON:

_____ • 1-QS-MR-1A, Refueling Water Refrigeration Unit

_____ • 1-QS-MR-1B, Refueling Water Refrigeration Unit

Completed by: _____ Date: _____

5.5 Removing RWST Mechanical Refrigeration Unit From Service

_____ 5.5.1 Review Precautions and Limitations.

5.5.2 Secure the running Mechanical Refrigeration Unit by placing the toggle switch to OFF:

_____ • 1-QS-MR-1A, Refueling Water Refrigeration Unit

_____ • 1-QS-MR-1B, Refueling Water Refrigeration Unit

5.5.3 IF BOTH Mechanical Chillers will be removed from service AND pump will NOT have a flow path, THEN place the operating pump in OFF:

_____ • 1-QS-P-2A, Refueling Water Storage Tk Recirc Pump

_____ • 1-QS-P-2B, Refueling Water Storage Tk Recirc Pump

5.5.4 Isolate the applicable Mechanical Refrigeration unit as follows:

a. For 1-QS-MR-1A, Refueling Water Refrigeration Unit, close the following valves:

_____ _____ IV • 1-QS-49, Refuel Wtr Refrigeration Unit 1A Inlet Hdr Isol Vv

_____ _____ IV • 1-QS-52, Refuel Wtr Refrigeration Unit 1A Out Hdr Isol Vv

b. For 1-QS-MR-1B, Refueling Water Refrigeration Unit, close the following valves:

_____ _____ IV • 1-QS-53, Refuel Wtr Refrigeration Unit 1B Inlet Hdr Isol Vv

_____ _____ IV • 1-QS-56, Refuel Wtr Refrigeration Unit 1B Out Hdr Isol Vv

_____ _____
IV

5.5.5 IF low return to the RWST is not required, THEN ensure that 1-QS-60, RWST Coolers To RWST Low Header Isol Valve, is closed.

Completed by: _____ Date: _____

5.6 **Swapping RWST Recirc Pumps**

_____ 5.6.1 Review Precautions and Limitations.

5.6.2 IF swapping to 1-QS-P-2A, Refueling Water Storage Tk Recirc Pump, THEN do the following:

_____ a. Circle As Found speed of 1-QS-P-2B: SLOW / FAST

_____ b. Place control switch for 1-QS-P-2A in speed of 1-QS-P-2B.

_____ c. Place control switch for 1-QS-P-2B in OFF.

5.6.3 IF swapping to 1-QS-P-2B, Refueling Water Storage Tk Recirc Pump, THEN do the following:

_____ a. Circle As Found speed of 1-QS-P-2A: SLOW / FAST

_____ b. Place control switch for 1-QS-P-2B in speed of 1-QS-P-2A.

_____ c. Place control switch for 1-QS-P-2A in OFF.

Completed by: _____ Date: _____

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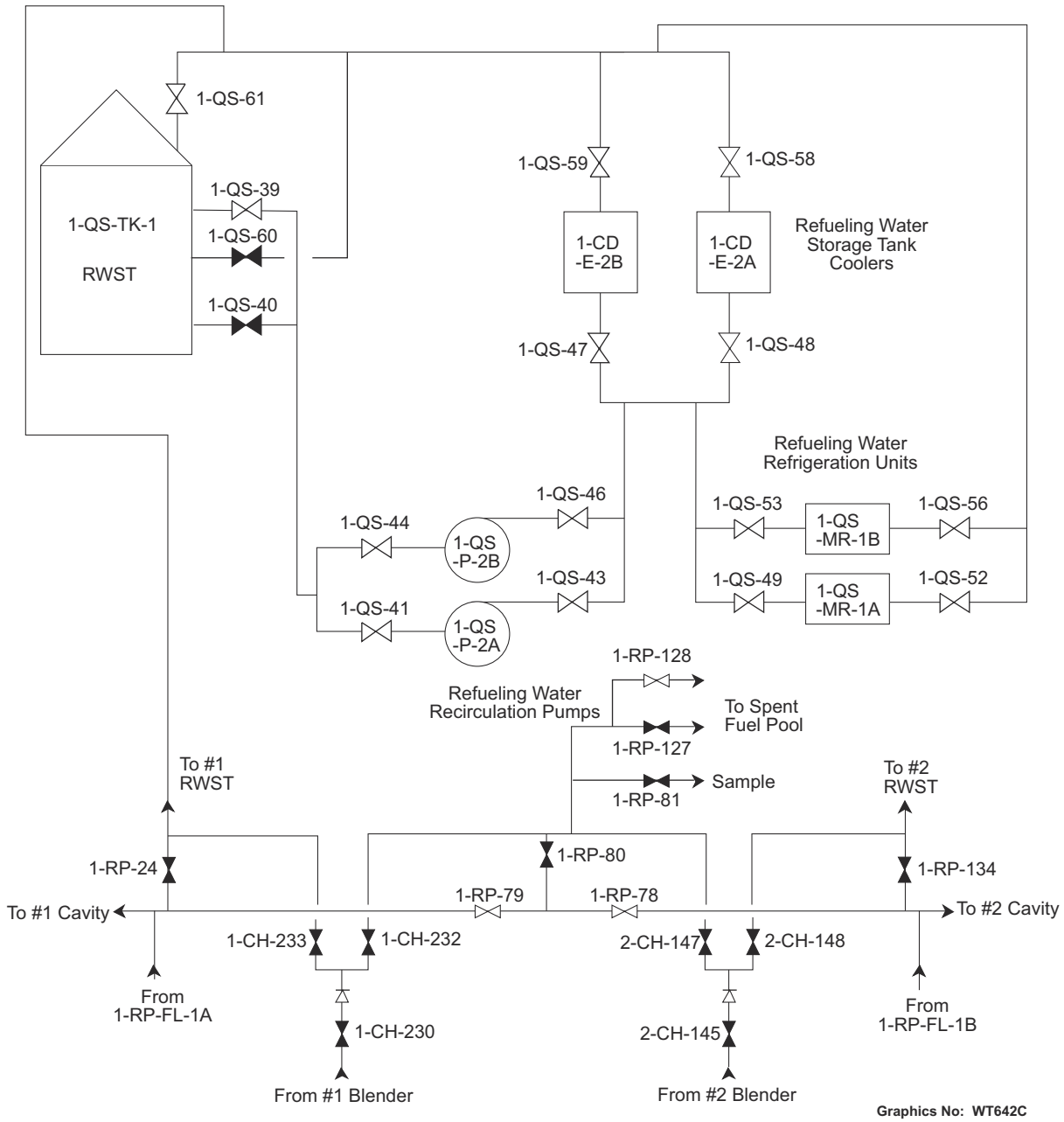
Attachment 1
Unit 1 RWST Operations Diagram



UNIT 1 RWST OPERATIONS

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Attachment 2
York Control Center Display Information

NOTE: In addition to the listed displays, Printouts, History displays, and setpoint displays are also available but are not included here because of limited use to Operators. Data and History printout is obtained by hooking up printer supplied by vendor. See vendor manual for instructions if access to these functions are required.

Status Messages

Display Message	Meaning / Action
STATUS Messages - Possible messages when STATUS button is pressed:	
General Status Messages	
UNIT SWITCH OFF SHUTDOWN	Unit switch on control panel is in OFF position. Unit will not run.
REMOTE CONTROLLED SHUTDOWN	Should not appear at North Anna. We have no remote controls on this system.
DAILY SCHEDULE SHUTDOWN	Should not appear at North Anna. We have system scheduled to run 24 hours a day, 7 days a week.
FLOW SWITCH / REM STOP NO RUN PERM	Water flow switch is open, preventing chiller from running.
SYS 1 SYS SWITCH OFF SYS 2 SYS SWITCH OFF	System switch under OPTIONS is turned off. System will not be allowed to run until switch is turned back on.
SYS 1 NO COOL LOAD SYS 2 NO COOL LOAD	Inlet water temperature below 40°F. Prevents system operation.
SYS 1 COMPS RUN X SYS 2 COMPS RUN X	Indicates the number of compressors running. X will be replaced by the actual number of compressors running.
SYS 1 AR TIMER XX S SYS 2 AR TIMER XX S	Shows amount of time left on the anti-recycle timer. Displayed when the system is unable to start due to the anti-recycle timer being active.
SYS 1 DSCH LIMITING SYS 2 DSCH LIMITING	Discharge pressure limiting is in effect. Due to high load or pull down conditions. Stops one compressor. Allows restart when discharge pressure drops to 85% of unload pressure and 10 minutes have elapsed.
SYS 1 LOAD LIMIT XX% SYS 2 LOAD LIMIT XX%	Load limiting is in effect. Should not appear at North Anna.
MANUAL OVERRIDE	Daily Schedule is being ignored and system will start if controls and interlocks permit. Priority message that cannot be overridden by other messages. Only use for emergencies and servicing. Override automatically disables itself after 30 minutes.

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Attachment 2
York Control Center Display Information

Status Messages

Display Message	Meaning / Action
SYS 1 PUMPING DOWN SYS 2 PUMPING DOWN	A compressor is pumping the system down on shutdown. Compressor shuts off when suction pressure decreases to suction pressure cutout setpoint, or 180 seconds, whichever comes first.
Fault Status Messages	
System Safeties - System shutdown if a safety threshhold is exceeded for 3 seconds. Auto reset. However, if 3 faults occur within 90 minutes, system is locked out on last fault and requires manual reset. the system switch (under OPTIONS key) must be turned off and then back on to clear the lockout fault.	
SYS 1 HIGH DSCH PRES SYS 2 HIGH DSCH PRES	System will shutdown when the discharge pressure programmable cutout is exceeded and will be allowed to restart when the discharge pressure falls 40 psig below the cutout.
SYS 1 LOW SUCT PRESS SYS 2 LOW SUCT PRESS	Stops the system if suction pressure falls to 23 psig and resets at 35 psig. Ignored for first 30 seconds after system startup.
SYS 1 MP/HPCO INHIB SYS 2 MP/HPCO INHIB	Compressor shutdown to protect motor from overheating, protect compressor from dangerously high discharge pressure, or protect compressor scroll from overheating. The system will NOT be locked out.
SYS 1 MP/HPCO FAULT SYS 2 MP/HPCO FAULT	On the third MP/HPCO Inhibit fault, the MP/HPCO Fault will lockout the system for 30 minutes.
SYS 1 HIGH MTR CURR SYS 2 HIGH MTR CURR	Actual system voltage exceeds trip voltage for 5 seconds and system shuts down. Clears when condition no longer present.
SYS 1 LOW SUPERHEAT SYS 2 LOW SUPERHEAT	Shuts down the compressor(s) to protect from liquid floodback due to low suction superheat.
SYS 1 SENSOR FAILURE SYS 2 SENSOR FAILURE	Prevents system from running when sensors measuring superheat are not functioning properly. Locks out system and prevents auto restarting.
Unit Safeties - Faults that cause all running compressor(s) to shutdown. Auto reset after condition is no longer present.	
UNIT FAULT: LOW AMBIENT TEMP	Unit shutdown to protect chiller from operating in a low ambient condition. Restart can occur when temperature rises 2°F above the cutoff.
UNIT FAULT: LOW LIQUID TEMP	Unit shutdown to protect evaporator from freeze-up should water temperature fall below the freeze point. Restart can occur when temperature rises 2°F above the cutoff.
UNIT FAULT: 115VAC UNDER VOLTAGE	Unit shutdown to ensure system is not operated at voltages where malfunction of the microprocessor could result in system damage. Restart allowed after power restored and anti-recycle timers have timed out.

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Attachment 2
York Control Center Display Information

Status Messages

Display Message	Meaning / Action
UNIT FAULT: HIGH MTR CURR	Unit shutdown when voltage exceeds programmed trip voltage for 5 seconds when the CURRENT FEEDBACK ONE PER UNIT option is selected under the OPTIONS key. Restart allowed after anti-recycle timer has timed out.
Unit Warning - Not a safety and will not be logged in history buffer. Unit will not auto-restart. Operator reset required.	
! ! LOW BATTERY ! ! CHECK PROG/SETP/OPTN	Can only occur at startup. If low battery is found, all values are reset to default. Replace battery and press PROGRAM key to reset. This sets anti-recycle timer to allow time to check setpoints and reprogram as necessary.

Display Operator Data

Display	Parameter
OPER DATA KEY DISPLAYS - use UP and DOWN arrow keys to scroll through displays.	
LCHLT = XX.X°F RCHLT = XX.X°F	Chilled Water leaving and returning temperatures. Display Limit is 9.2 - 140°F
AMBIENT AIR TEMP = XX.X°f	Ambient Air Temperature. Display Limit is 0.4- 131.2°F
SYS X SP = XX.X PSIG DP = XX.X PSIG	Suction and discharge pressures. Suction Pressure Display Limit is 0 - 200 psig. Discharge Pressure Display Limit is 0 - 400 psig.
SYS X HOURS 1 = XXXXX 2 = XXXXX	Compressor accumulated runtimes.
SYS X STARTS 1 = XXXXX 2 = XXXXX	Number of starts for each compressor.
LOAD TIMER XX SEC UNLOAD TIMER XX SEC	Time in seconds until the unit can load or unload. Whether system loads or unloads is determined by how far actual liquid temperature is from setpoint.
COOLING DEMAND X OF X STEPS	Current “step” in capacity control scheme when in Return Water Control Mode.
TEMP ERROR XXX.X°F TEMP RATE XXX.X°F/M	Temperature error and rate of change of Chilled Water when in Leaving Chilled Liquid Control mode.
EVAP PUMP IS OFF EVAP HEATER IS OFF	Evaporator pump and heater status. Evap Pump should be OFF since we do not have our pump wired to the chiller unit.
ACTIVE REMOTE CTRL NONE	Type of Remote Control Active. Our units do not have remote control.

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Attachment 2
York Control Center Display Information

Display Operator Data

Display	Parameter
UNIT AMPS = XX.X VOLTS = XX.X	Total chiller current and voltage, if CURRENT FEEDBACK is programmed as NONE.
SYS X COMP STATUS 1 = XXX 2 = XXX	Indicates compressors running.
SYS X RUN TIME XX - XX - XX - XX D-H-M-S	Run time for the current system cycle. (NOT accumulated runtime.)
SYS X LLSV IS ON HOT GAS SOL IS OFF	Status of liquid line solenoid and hot gas solenoid as called for by controller board.
SYS X FAN STAGE X	Indicates what stage of condenser fan operation is active.
SYS X AMPS = XX.X VOLTS = XX.X	System current and voltage, if CURRENT FEEDBACK is programmed.